

Pension Fund Asset Allocation, Household Investments and Capital Market Depth

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Motivation

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- Pension funds play an increasingly important role in Denmark.
 - Pension assets 200% of GDP in Denmark, up from 70% in 1990.
- The share of risky assets in pension fund investments is increasing.
 - 75% of contributions go to market-sensitive products, compared to 10% in 2005.
- How do these changes in riskiness of pensions affect households' non-retirement savings?
 - Implications for optimal risky asset allocation of pension funds.
 - Implications for capital market development.

What do we do?

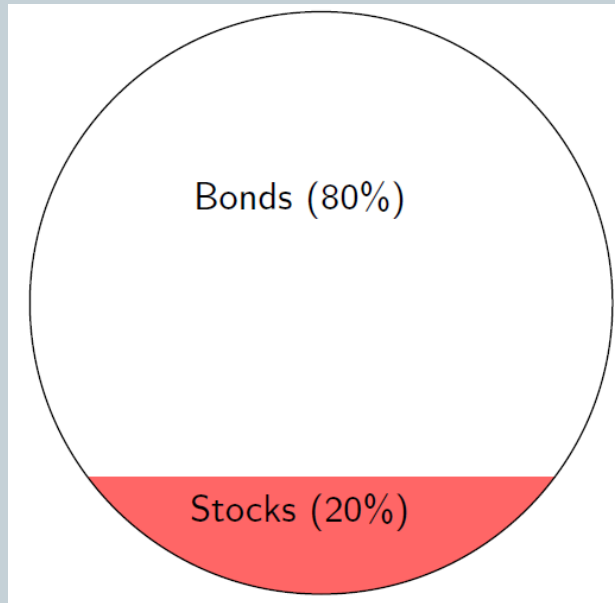
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- We investigate members of a Danish pension fund (JØP), who in 2011-2012 were given the opportunity to change from a guaranteed pension product to a risky market sensitive product.
- Households who switch can react to this increase in pension risk in three ways:
 - They become less likely to participate (or, generally, reduce risk outside pensions), as total wealth was optimally invested before the switch.
 - They ignore their pension risk completely, cf. mental accounting.
 - They become more likely to participate, as they become more familiar with risky assets (capital-market deepening).

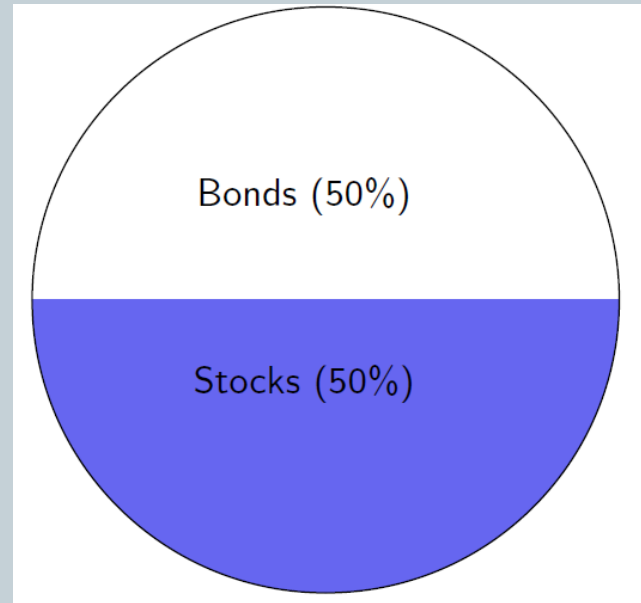
Asset Allocation Before Change

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Pension Fund's Guaranteed Product Portfolio



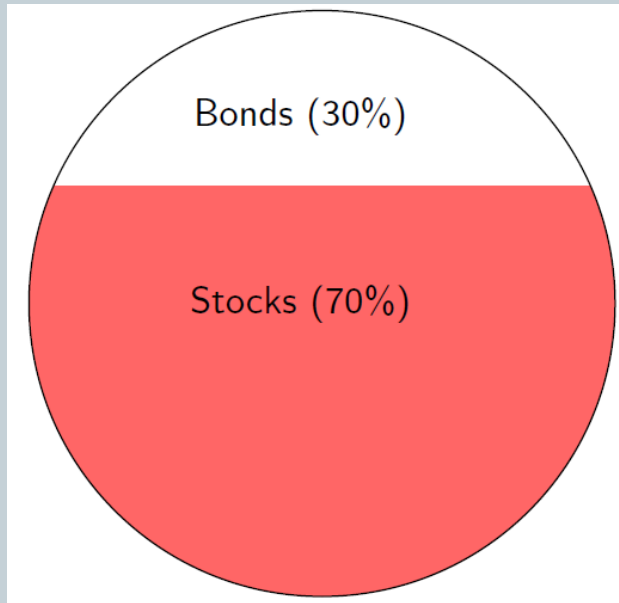
Individual's Portfolio Outside Pension Fund



Asset Allocation After Change

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Pension Fund's Market Sensitive Product Portfolio



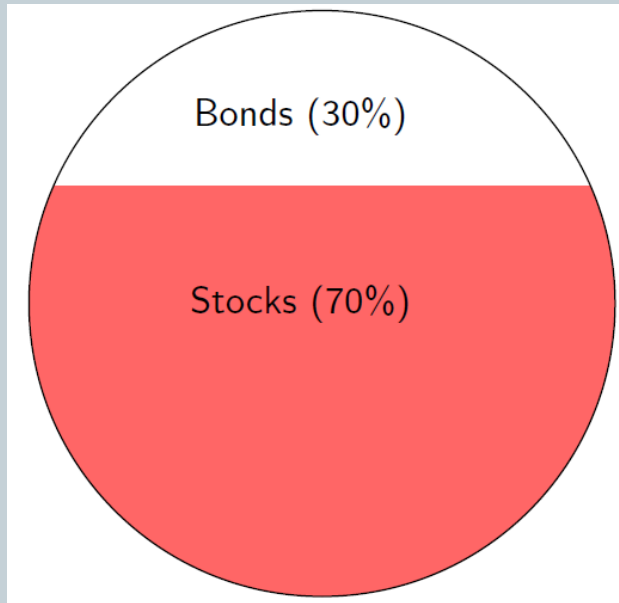
Individual's Portfolio Outside Pension Fund

- What happens here?

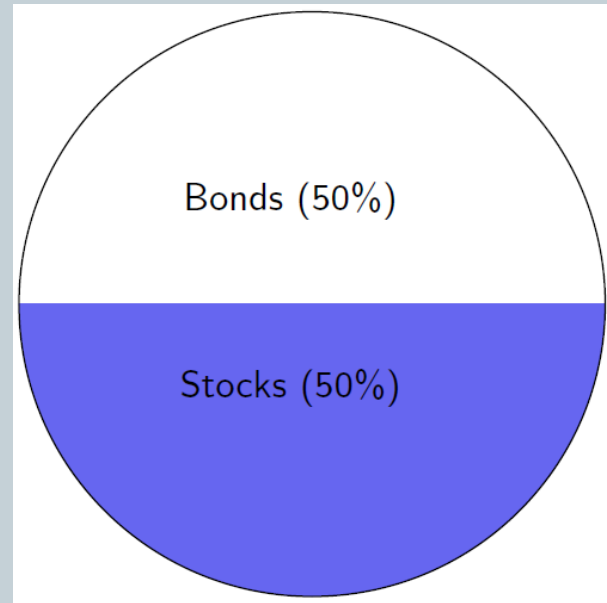
Option I – Mental Accounting: No change

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Pension Fund's Market Sensitive Product Portfolio



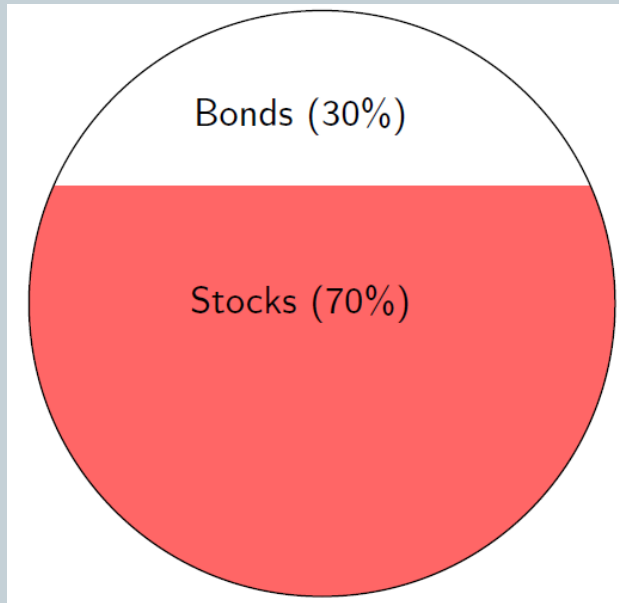
Individual's Portfolio Outside Pension Fund



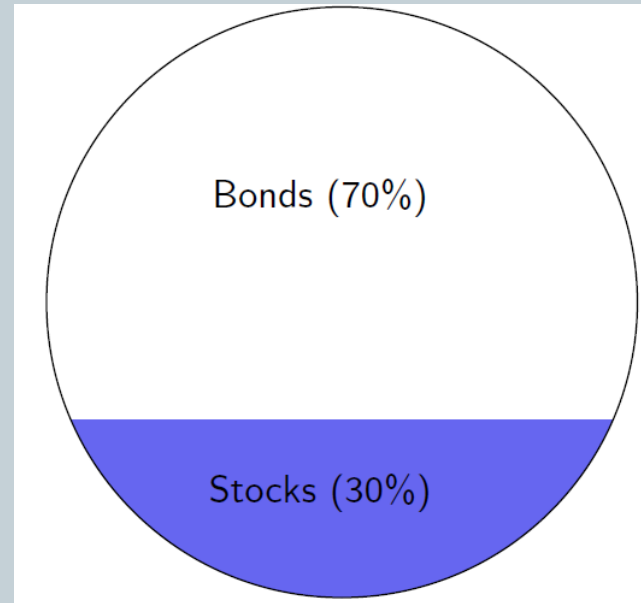
Option II – “Rational” Decision: Decrease Equity

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Pension Fund's Market Sensitive Product Portfolio



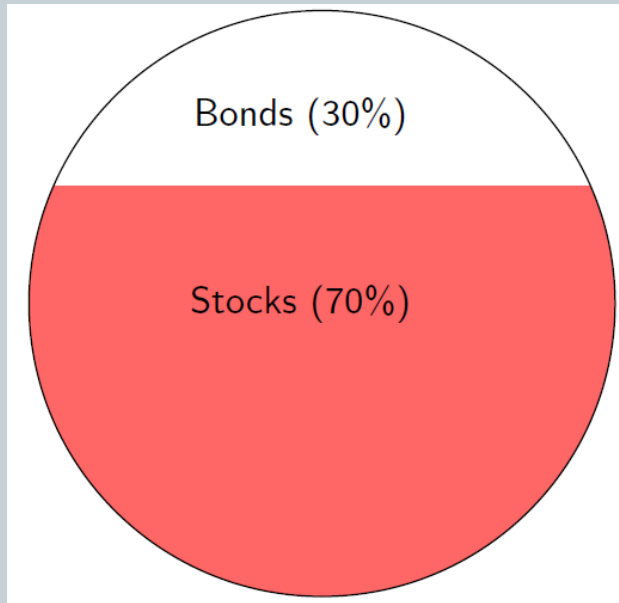
Individual's Portfolio Outside Pension Fund



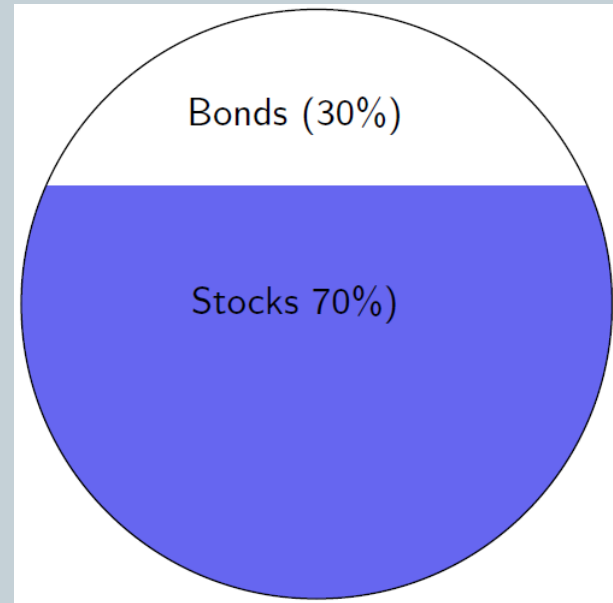
Option III – Learning: Increase Equity

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Pension Fund's Market Sensitive Product Portfolio



Individual's Portfolio Outside Pension Fund



What do we find?

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- We find evidence that people become more likely to participate, as they become more familiar with risky assets.
- These results support the idea of "capital market deepening" (Scharfstein, 2018).
 - Fixed cost decreases with familiarity with the stock market from risky pensions.
 - This pulls more households into stock market over time.
 - This exacerbates differences between with PAYGO vs. privately funded countries.
- Deepening effect: For each DKK invested by the pension fund in the stock market, as a result of the transfer of wealth from the guaranteed to market-sensitive products, an additional 4 øre were invested privately in stocks.

Data

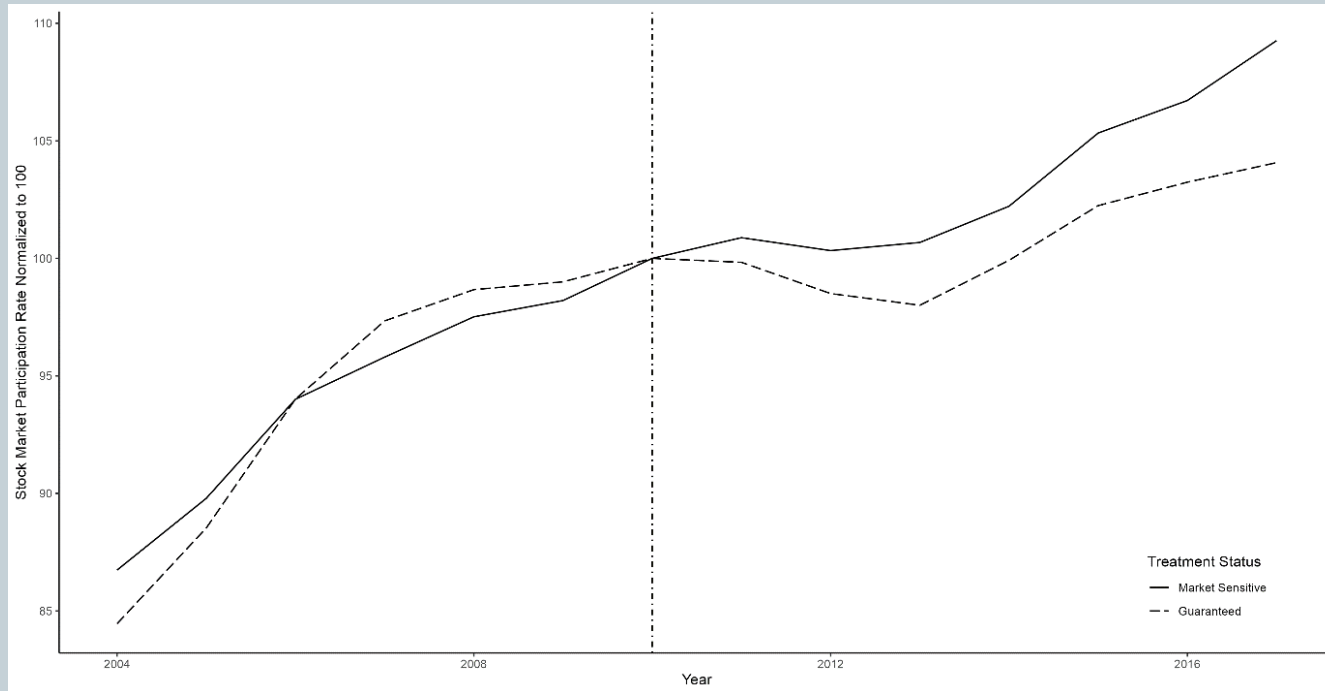
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- Data on members of a Danish pension fund, with two products: Product with positive guaranteed average return, and product with zero guaranteed average return.
- Before 2005 all new members were allocated to the guaranteed product but given the opportunity to switch in 2011/2012.
- Guarantee gives you at most 4.25%, for some 2%, dependent on when you joined.

Year	Guaranteed Product				Market-Sensitive Product				
	Government Bonds	Corporate Bonds	Equities	Real Assets	Government Bonds	Corporate Bonds	Equities	Real Assets	Returns
2012	92.0%	0.0%	0.0%	8.0%	72.7%	0.0%	16.4%	10.9%	6.10%
2013	91.1%	0.0%	0.0%	8.9%	56.4%	5.8%	30.1%	7.7%	4.90%
2014	90.0%	0.0%	0.0%	10.0%	46.1%	8.1%	32.3%	13.5%	7.00%
2015	90.0%	0.0%	0.0%	10.0%	29.8%	13.2%	43.2%	13.8%	4.10%
2016	90.0%	0.0%	0.0%	10.0%	25.6%	16.3%	43.2%	14.9%	6.60%
2017	90.0%	0.0%	0.0%	10.0%	35.9%	15.8%	34.4%	13.8%	9.10%

Stock Market Participation

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Matching

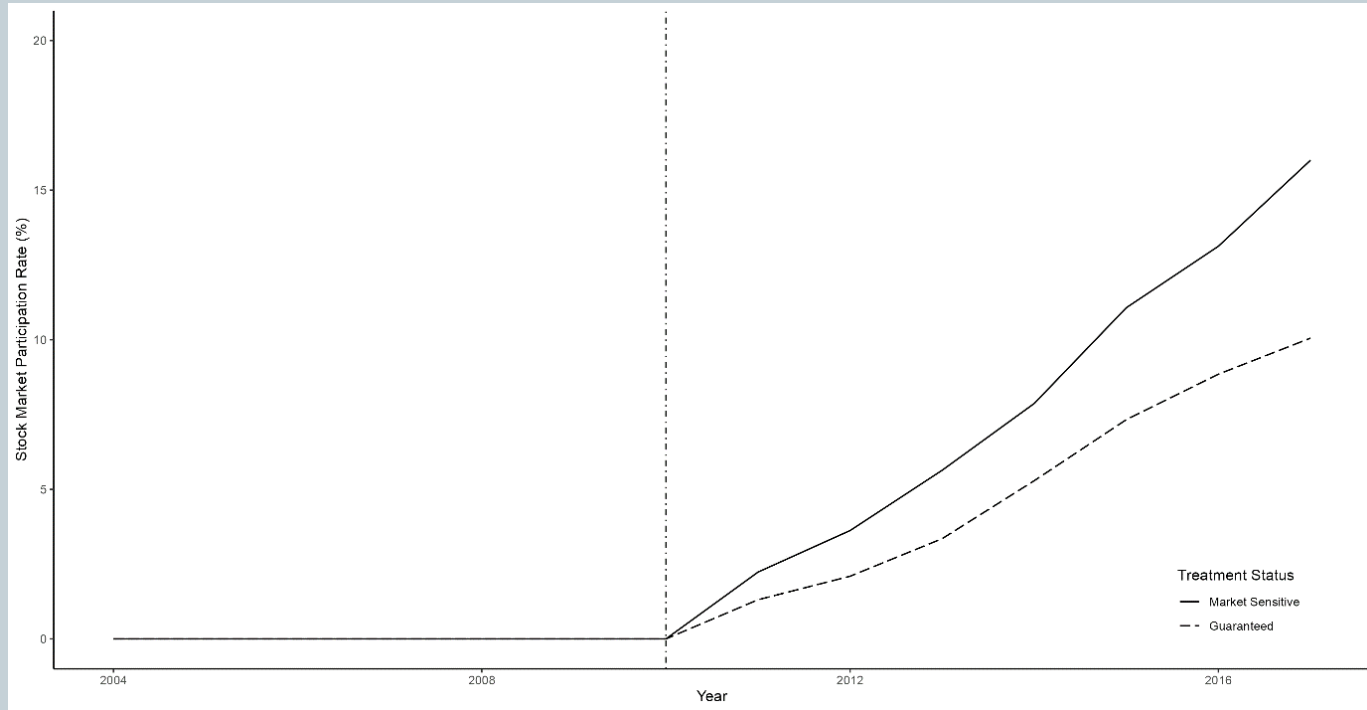
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Match in 2010, year prior to switch:

	Switched	Did Not Switch
Did not participate in the stock market in any year: 2004-2010	Treatment group 1	Control group 1 - matched to make similar to treatment group 1
Participated in the stock market every year: 2004-2010	Treatment group 2	Control group 2 - matched to make similar to treatment group 2

Result: Stock market entry after switch

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Cumulative Effect of Switch

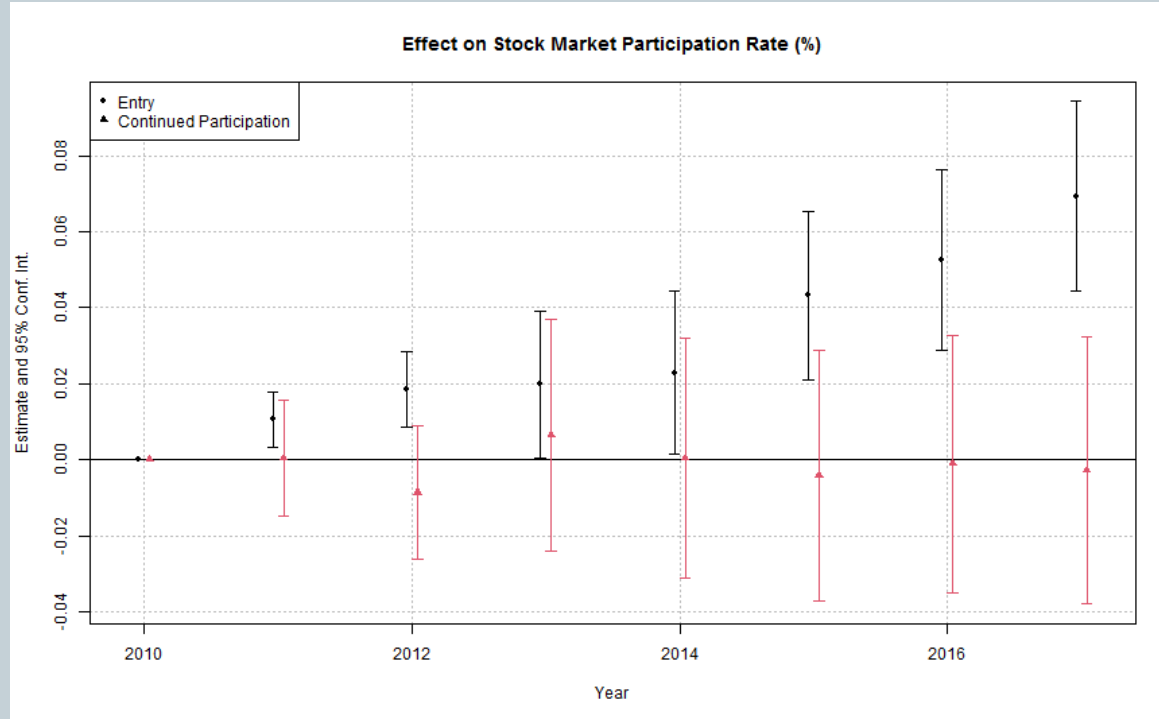
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$$StockMktPart_i = a + \delta MarketSensitive_i + x_i\beta$$

	Stock Market Participation					
	Entry			Continuation		
	(1)	(2)	(3)	(4)	(5)	(6)
Market Sensitive	0.066*** (0.012)	0.069*** (0.014)	0.069*** (0.013)	-0.002 (0.018)	-0.003 (0.018)	-0.003 (0.017)
Control Variables	No	Yes	Yes	No	Yes	Yes
Logit	No	No	Yes	No	No	Yes
No.Obs.	14,674	14,674	14,674	9,450	9,450	9,450
R2 Adj.	0.010	0.050	0.064	0.000	0.037	0.071
* p < 0.05, ** p < 0.01, *** p < 0.001						

Dynamic Effect of Switch

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Participation Mode

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$$P(\text{ParticipMode}_i = j | x_i) = \frac{\exp(a_j + \delta_j \text{MarketSensitive}_i + x_i \beta_j)}{1 + \sum_{h \in J} \exp(a_h + \delta_h \text{MarketSensitive}_i + x_i \beta_h)}$$

	Participation Mode					
	<u>Direct Stockholding</u>		<u>Indirect Stockholding</u>		<u>Both</u>	
	(1)	(2)	(3)	(4)	(5)	(6)
Market Sensitive	0.015 (0.010)	0.021* (0.011)	0.039*** (0.007)	0.036*** (0.008)	0.012** (0.003)	0.013*** (0.003)
Control Variables	No	Yes	No	Yes	No	Yes
No.Obs.	14,674	14,674	14,674	14,674	14,674	14,674
Pseudo R2	0.011	0.074	0.011	0.074	0.011	0.074
* p < 0.05, ** p < 0.01, *** p < 0.001						

Multiplier Effects

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- On average, for every dollar reallocated by JØP from safe assets to risky assets due to the switch, individuals contribute an additional 4 cents to the stock market privately.

	Market Sensitive	Matched Guaranteed	Difference
Average Wealth in Equities (DKK)	85.56	53.70	31.86
Average Pension Wealth in Equities (DKK)	788.35	0.00	788.35

$$\frac{(85.56 - 53.70)}{(788.35 - 0)} = 4\%$$

Robustness

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- Results could be driven by differences in inertia:
 - Effect of the switch does not depend on year of switch.
- Results could be driven by differences in risk tolerance:
 - There is no effect of the switch on insurance behavior.
- Results could be driven by other confounding unobservables:
 - Results are the same when we limit our control group to individuals who switch in 2018.
 - Results are the same when only comparing family members of members.
- Results are robust to parametric misspecification.
- Results are robust to different identification strategy (difference in difference).

Conclusion

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- What is the effect of changes in the riskiness of retirement savings on stock market participation?
- Using data from a Danish pension fund, we find there is an increase in the stock market participation rate of individuals who increased their pension risk after being offered and informed about increased risk taking in their pensions.
- We find that this effect is driven by people entering the stock market.
- Individuals mostly enter the stock market by buying mutual funds.
- These results support "capital market deepening" (Scharfstein, 2018).
 - For every dollar invested in stocks by the pension fund, 4 extra cents are invested by individuals privately.

Appendix: Summary Statistics –Probit Regression

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Numerical Variables	Kept Guaranteed			Switched to Market Based		
	Mean	Std	Median	Mean	Std	Median
Wealth in Equities (DKK)	76,825.94	326,339.24	0.00	111,954.30	373,484.56	0.00
Share of Financial Wealth in Equities	11.45%	24.04%	0.00%	13.90%	24.98%	0.00%
Number of Stocks	0.85	2.43	0.00	1.17	2.86	0.00
P+ Pension Wealth (DKK)	655,991.71	702,875.69	493,857.10	1,265,261.95	927,574.95	996,990.80
Guaranteed Rate	3.07%	0.91%	3.00%	3.48%	0.87%	3.70%
Age	45.76	10.30	43.00	49.85	10.57	49.00
Non Equity Financial Wealth (DKK)	300,387.86	648,479.69	79,892.30	344,161.70	644,217.25	115,313.70
Housing Wealth (DKK)	1,380,322.63	1,525,033.75	1,100,000.00	1,546,521.35	1,486,496.47	1,250,000.00
Total Liabilities (DKK)	1,109,415.47	1,167,319.02	911,031.80	1,060,210.72	1,084,142.86	872,598.10
Disposable Income (DKK)	331,430.74	208,039.21	298,025.15	351,927.17	178,768.95	317,203.20
Work Experience (Years)	14.66	7.01	13.60	19.14	7.75	18.73
Lifetime Unemployment (Years)	1.22	2.18	0.34	0.72	1.40	0.16
Categorical Variables	Fractions			Fractions		
Stock Market Participation	36.54%			43.74%		
Direct Stockholding Only	25.61%			27.17%		
Indirect Stockholding Only	3.37%			4.48%		
Both Direct and Indirect	7.56%			12.09%		
Female	50.33%			43.77%		
Highest Education: Business or Econ	31.59%			28.73%		
Highest Education: Other Social Science	57.62%			61.48%		
Highest Education: STEM	4.59%			4.20%		
Highest Education: Other Higher Education	2.67%			1.75%		
Employed	81.50%			85.07%		
Self-Employed	5.74%			3.49%		
Retired	8.02%			8.99%		
Homeowner	73.94%			82.17%		
Unemployment Insurance	74.76%			74.63%		
Has Spouse	64.58%			72.63%		
Separated	11.51%			10.76%		
Capital Region	60.66%			59.77%		
No. Individuals	3,292			14,533		
No. Individual-Year Observations	46,088			203,462		

	Switched (1)
Pension Wealth (100,000 DKK)	0.019*** (0.001)
Age	0.000 (0.001)
Female	-0.027*** (0.009)
Owns Stocks	0.031*** (0.006)
Homeowner	0.035*** (0.009)
Guaranteed Rate = 3%	-0.019* (0.009)
Guaranteed Rate = 3.7%	-0.017* (0.008)
Guaranteed Rate = 4.25%	-0.053*** (0.012)
Control Variables	Yes
No.Obs.	17,825
R2 Adj.	0.12
* p < 0.05, ** p < 0.01, *** p < 0.001	

Do pension funds cause capital market deepening?

Appendix: Heterogeneity - Participation

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<i>Panel A: Participation</i>	Stock Market Participation					
	(1)	(2)	(3)	(4)	(5)	(6)
Market Sensitive	0.077*** (0.015)	0.070*** (0.014)	0.069*** (0.014)	0.069*** (0.014)	0.070*** (0.014)	0.076*** (0.015)
Market Sensitive X log(Pension Wealth)	0.042*** (0.013)					0.026 (0.013)
Market Sensitive X log(Liquid Wealth)		0.018*** (0.005)				0.016*** (0.005)
Market Sensitive X Economics Education			-0.009 (0.024)			0.005 (0.025)
Market Sensitive X Gender				0.023 (0.025)		0.028 (0.026)
Market Sensitive X Age					0.004*** (0.001)	0.003* (0.001)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
No.Obs.	14,674	14,674	14,674	14,674	14,674	14,674
R2 Adj.	0.053	0.057	0.049	0.050	0.051	0.058

Appendix: Intensive Margin -Entrants

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<i>Panel A: Wealth</i>		Log(wealth) in:				
	Equities		Stocks		Mutual Funds	
	(1)	(2)	(3)	(4)	(5)	(6)
Market Sensitive	0.770*** (0.142)	0.793*** (0.166)	0.279* (0.113)	0.350** (0.121)	0.610*** (0.102)	0.571*** (0.123)
Control Variables	No	Yes	No	Yes	No	Yes
No.Obs.	14,674	14,674	14,674	14,674	14,674	14,674
R2 Adj.	0.009	0.061	0.002	0.020	0.008	0.062
<i>Panel B: Share of Wealth</i>		Share of wealth in:				
	Equities		Stocks		Mutual Funds	
	(1)	(2)	(3)	(4)	(5)	(6)
Market Sensitive	0.031*** (0.007)	0.029** (0.009)	0.005 (0.006)	0.007 (0.006)	0.025*** (0.005)	0.021** (0.007)
Control Variables	No	Yes	No	Yes	No	Yes
No.Obs.	14,314	14,314	14,314	14,314	14,314	14,314
R2 Adj.	0.006	0.048	0.000	0.012	0.006	0.055
* p < 0.05, ** p < 0.01, *** p < 0.001						

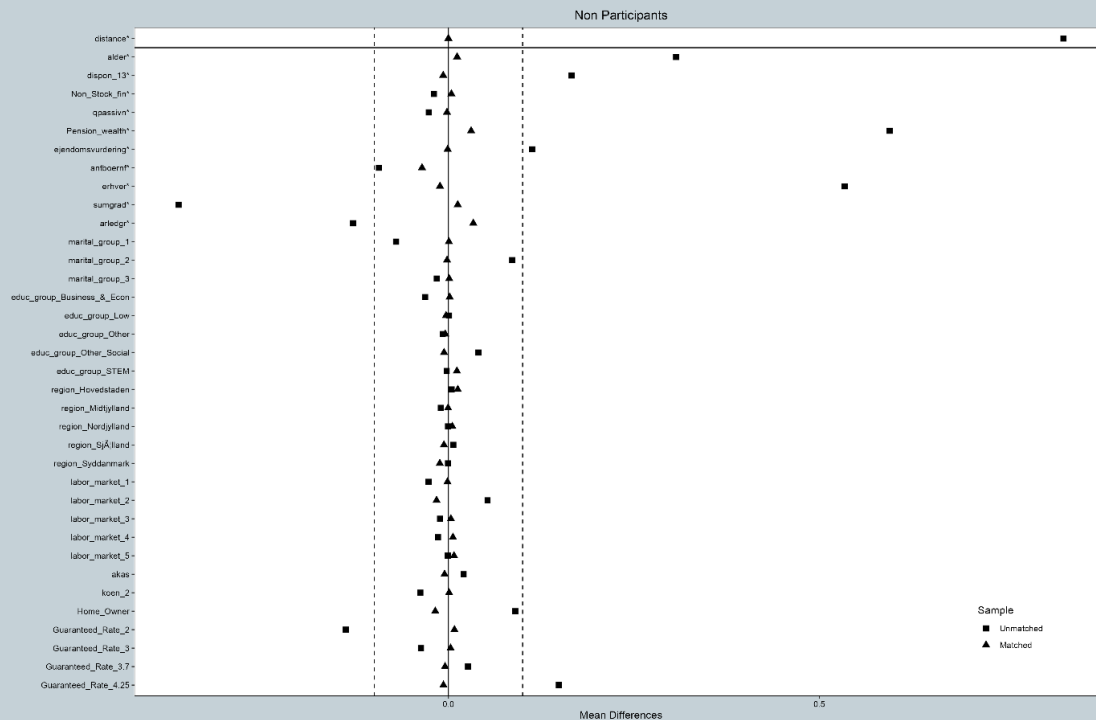
Appendix: Intensive Margin - Participants

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	Share of Wealth in Equities		Log(Wealth) in Equities	
	(1)	(2)	(3)	(4)
Market Sensitive	0.010 (0.021)	0.020 (0.024)	-0.048 (0.207)	-0.017 (0.219)
Control for Past Outcome	Yes	Yes	Yes	Yes
Control Variables	No	Yes	No	Yes
No.Obs.	9,400	9,400	9,450	9,450
R2 Adj.	0.302	0.321	0.362	0.383
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$				

Appendix B.1: Match Quality - Non-Participants

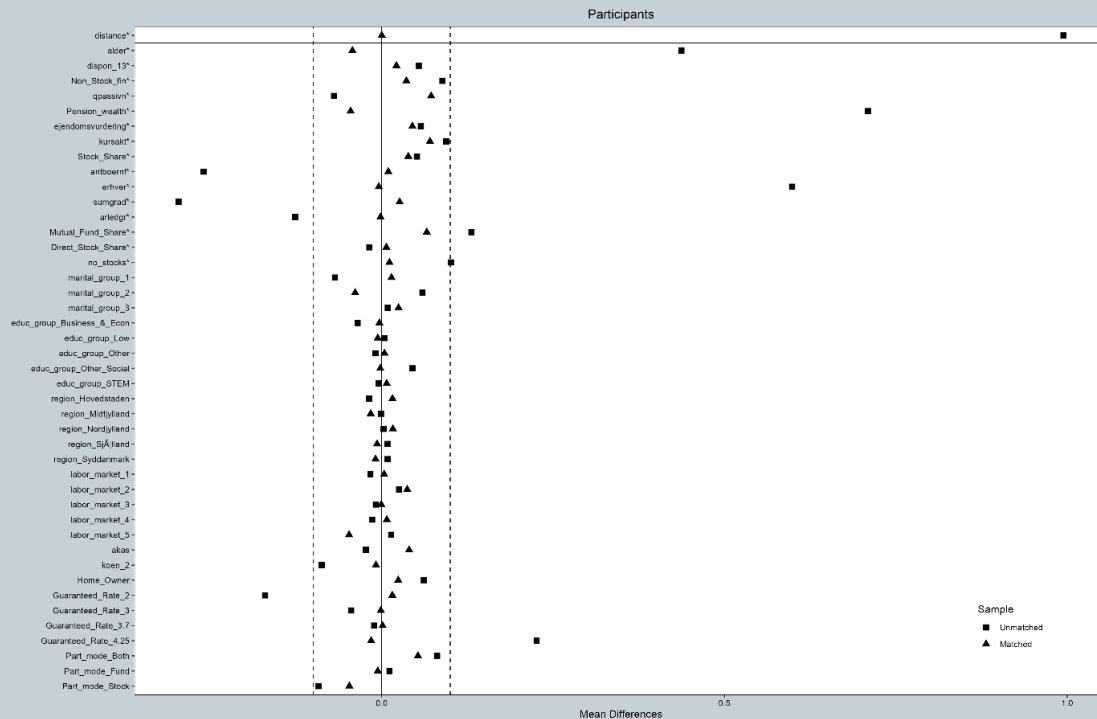
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Do pension funds cause capital market deepening?

Appendix B.2: Match Quality - Participants

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Do pension funds cause capital market deepening?