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Evidence from the Netherlands, using pension funds supervisory data

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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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Abstract

We show heterogenous displacement effects of mandatory occupational pension savings on private household wealth for different groups. This contributes to explaining why empirical studies often come with different estimates of this effect. We study the case of the Netherlands, where wage employed and self-employed are differently exposed to compulsory pension savings, and the institutional setting provides exogenous variation in pension wealth that can be used as instrument in the analysis. We use rich administrative data on (pension) wealth and income combined for the first time to supervisory data of pension funds. Our results show a displacement effect of -31% for wage employed and of -61% for self-employed. The higher displacement effect we find for self-employed might be explained by the fact that self-employed are arguably more aware of their pension accrual, or lack thereof, because there is no employer who pays their pension premiums or adds an employer contribution.

Keywords: Displacement effect; pension wealth; savings.
JEL codes: D14, H31.

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1 Introduction

A mandatory retirement system can affect private savings through the displacement effect, and by inducing early retirement (Feldstein, 1974). The effects on early retirement have been extensively documented by e.g. Gruber and Wise (1999, 2008). Our paper further investigates the displacement effect of compulsory pension savings on private (discretionary) savings. More information on the displacement and wealth effects – and the heterogeneity thereof – can be of guidance to policy makers who are looking for ways to help vulnerable groups to better prepare for retirement or to make the pension system more robust in light of an ageing society.

Many studies have appeared on this subject, resulting in a wide range of estimates for the displacement effect. This large variety in outcomes reflects the heterogeneity among the research subjects. The studies vary, for example, in the periods, the countries and the pension schemes (public and/or private) they examine. Part of the deviation in estimates will stem from the biases and measurement errors that challenge this field of research, but in part it is also inherent to the institutional setting to which different groups are exposed, for instance because of their occupation. In fact, we argue that a large range of displacement effects in the literature can actually represent the large true heterogeneity in displacement effects over subgroups, provided that the identification of these effects is plausible. Several studies have already explicitly mentioned the potential underlying heterogeneity they found among subgroups. Attanasio and Brugiavini (2003) provided one of the first micro-based studies of the displacement effect, which they identify using the 1992 Italian pension reform. They exploit the variability in exogenous changes in pension wealth across groups of Italian households to identify the effect that pension wealth has on saving rates. Based on estimated pension wealth they find a displacement effect of -35% on average, but close to -100% for workers aged between 35 and 45. Attanasio and Rohwedder (2003) perform a comparable analysis using UK pension reforms over the period 1975-1981, with comparable results. They find substantial displacement effects (–55% to –75%), primarily among the older and higher income households. They state that the lower displacement among the poorer and younger households might be caused by liquidity constraints.

Engelhardt and Kumar (2011) study the 1992 wave of the US Health and Retirement Study to estimate the displacement effect. They also find that displacement is higher for the higher wealth quantiles. Using a large Danish panel data set over the period 1995 to 2009, Chetty et al. (2014) show that the effects of retirement savings policies on wealth accumulation depend on whether these policies change savings rates as an active or passive choice. They find that approximately 85% of individuals are passive savers who save more when induced to do so by

an automatic contribution, but do not respond at all to price subsidies. Such subsidies lead to little action at all and, if so, than primarily by individuals who are planning on saving for retirement already and who respond by shifting savings across accounts, which leads to almost full displacement.

Hurd et al. (2012) use micro data sets from 12 countries to construct income replacement rates and private saving measures by education level and marital status, as proxies for lifetime earnings. They estimate the displacement effect by using cross-country differences in the progressivity of the pension formula and the average generosity and find that an extra dollar of public pension displaces 22 cents of accumulated financial assets. Alessie et al. (2013) estimate the displacement effect for 13 European countries, including the Netherlands, based on SHARELIFE data. Their data include retrospective data on lifetime earnings. They suggest a displacement effect of 47 (61) percent. They also explore IV estimates, which suggest full displacement, but with less precision. Van Santen (2019) uses survey data from the Netherlands. Using exogenous variation in pension fund performance as an instrument for the expected retirement replacement rate, he finds that uncertainty in pension income drives households to save significantly more. Not controlling for uncertainty would bias the estimated displacement effect of pensions on private savings towards zero.

Our study is similar in spirit to Van Santen (2019), but also differs on some important aspects. We use similar instruments, but drawn from supervisory data of DNB (the Dutch National Bank, tasked supervisor of pension funds) where not only the financial performance of the pension fund is included, but also information on supervisory actions that funds in financial distress must enact in accordance with DNB. Also we do not use the subjectively expected replacement rate to proxy pension wealth. This variable, due to anchoring, has been found to vary unrealistically little in Dutch survey data (see van Duijn et al, 2010), so we use pension wealth directly as reported in administrative data for a large sample of the Dutch population. Using rich administrative datasets on pension participation and wealth in the Netherlands is an important addition, and it allows us to take into account the differences in institutions related to occupational choices and income levels. In survey data some groups, such as self-employed with compulsory pension savings, cannot be identified or if they are, their sample size is too small. This allows us to assess the displacement effect for the self-employed as well, and compare this to the displacement effect for the wage employed. Our link of balance sheet and supervisory data of pension funds to our micro data is also very precise, as we identify workers in several binding labor agreements, which in turn also allows us to set up different robustness and specification checks. This means that we can use as instruments not only the funding ratio, but also the status of recovery plans, if active, within the current financial assessment framework for pension funds. We find an average

displacement effect for couples of -31% for wage employed and of -61% for self-employed. The higher displacement effect we find for self-employed might be explained by the fact that self-employed are arguably more aware of their pension accrual, or lack thereof, and might have developed an habit in savings (Alessie and Teppa, 2010) for reasons related to their business.

The remainder of this paper is organized as follows. We start with presenting a structural model in Section 2. In Section 3 we describe our data sources. Section 4, on the empirical implementation, contains our identification strategies and our primary results. We conclude in Section 5.

2 Model

Our model is meant to illustrate the main factors that should be accounted for in the empirical analysis. As such, we use several simplifications that are common in the literature (see e.g. Alessie et al., 2013). For example, we assume full information about the pension system for all participants, ignore liquidity constrains and assume perfect capital markets. In accordance with Alessie et al. (2013) we start with the following general intertemporal maximization problem:

$$\max_{C_t} \sum_{t=1}^{T}(1+\delta)^{1-t}\frac{C_t^{1-\gamma}}{1-\gamma} \tag{1a}$$

$$\text{s.t. } \sum_{t=1}^{T}(1+r)^{1-t}C_t = \sum_{t=1}^{T}(1+r)^{1-t}Y_t \tag{1b}$$

Here C_t is per period consumption, δ is the individual discount rate, γ is the coefficient of relative risk aversion, r is the interest rate and Y_t is per period income. The Euler equation, which shows that the marginal utility of consumption should be equalized over the lifetime, is:

$$E_t({C_{t+1}}^{-\gamma}) = \frac{1+\delta}{1+r}{C_t}^{-\gamma} \tag{2}$$

For the purpose of our study, we simplify the intertemporal problem by assuming a model with only two-periods, but we enrich the model by allowing for some uncertainty, to explore its potential impact on savings. In the first period an income is earned, such that $c_1 = y - s_c - s_f$, with s_c[1] and s_f respectively representing compulsory and free savings. In the second period these savings are consumed, and the compulsory part of savings could be hit by some shock k, such that $c_2 = (s_c + s_f) * (1+r) + k$. The inclusion of k testifies of exogenous shocks due to the uncertainty of pension fund performance, which might result in pension cuts. These cuts have often been compensated (first postponed and then eliminated because of improving market conditions), so that k can be considered as a mean preserving spread to income with $E(k) = 0$. In order to ease computations, we further assume that all savings receive the same return and that the individual discount rate $r = \delta = 0$. Notice that the standard solution including the discounts would imply that lower assets are accumulated by those who are more impatient (with $\delta > r$).

[1] Gale (1998), Engelhard and Kumar (2011) and Alessie et al. (2013) adjust compulsory savings by a discount factor or "Gale's Q" in their theoretical models. This allows them to compare compulsory savings across generations that are far from retirement with those of the elderly. We will adjust our proxy of compulsory savings, in our empirical analysis in order to account for it.

Using a second order Taylor expansion, and simplifying out the rate of time preference and some higher level terms, we can rewrite Equation (2) into:

$$s_f = \frac{y}{2} - s_c + \frac{1}{4}\gamma\left\{\mathrm{Var(k)}+\mathrm{Var}\left(y + 2\left(s_c + s_f\right)\right)\right\} \tag{3}$$

This shows that free savings is positively related to permanent income $\frac{y}{2}$ (or $\bar{y}$, the sum of total income divided by the number of periods, where the factor 1/2 also relates to the age-related adjustment known as "Gale's Q", Gale (1998)), negatively to compulsory savings s_c and positively to income uncertainty – represented here by the variance term. This variance term embodies precautionary savings, which increase with a higher risk aversion parameter γ. Also, the results suggest that the mean preserving spread in income k does not affect the first moment of Equation (3) but does have an effect on uncertainty. Based on this, we would ideally estimate an equation like the following:

$$s_f = \beta_0 + \beta_1 s_c + \beta_2 \bar{y} + \beta_3 \mathrm{Var}(y) + \beta_4 \mathrm{Var}(k) + \beta_5 \gamma + \varepsilon \tag{4}$$

The term β_1, the displacement effect, is precisely estimated if s_c is exogenous and accurately measured. Later we explain how we instrument this variable in order to achieve this. Full displacement, where each euro increase in (mandatory) pension wealth results in a euro less saved, would imply that β_1 is equal to –1. β_2 captures the effect of permanent income, β_3 captures the effect of the variance of income over time, which proxies for income uncertainty. β_4 captures the uncertainty related to the income spread. β_5 will capture the risk aversion (γ), as a separately added term. This is a deviation from Equation (3), partly due to the limited availability of empirical proxies for it in our data, but we also implicitly account for it by showing separate estimation results for wage employed and self-employed, who are typically different in risk preferences.

3 Data

Our analysis is based on the Dutch Income Panel Study with Wealth ("Inkomens Panel Onderzoek met Vermogen" in Dutch, hereafter IPO Wealth) over the period 2007 to 2010. IPO Wealth is an administrative panel dataset containing yearly records obtained from various government registers on around 270,000 individuals from almost 100,000 households, or approximately 1.5% of the entire Dutch population. This is a highly accurate and representative panel, where only migration or death could cause attrition. After merging with other micro datasets,[2] the dataset we use contains detailed information on personal wealth and income and the affiliation to the compulsory occupational pension, augmented with various background variables, such as gender, age, marital status, household composition, country of birth, municipality of residence, homeownership, wage-employment and self-employment status and sector. Finally, we also merge the data with pension-fund level balance sheet and supervisory information through the corresponding binding labor agreements. Although we will make use of the information on both partners in households with couples, we make some selections of households based on characteristics of only the household head, such as the age and labor market status. We define as the household head the oldest male in the household, or the oldest female when there are no males in the household. We focus our analysis on households with a household head aged 40 to 60, because at later ages early retirement might bias the sample and at younger ages respondents have cumulated very little pension wealth.

Table 1: Selection criteria and available number of observations

Selection criteria	***N***
Number of households from IPO Wealth panel	95,016
Selection on age of household head: 40-60	41,090
Selection on labor market status household head: WE and/or SE	33,793
Selection on labor market status household head: WE or SE *(=dropping hybrids)*	32,259
Selection of standard households, loss due to merging datasets, etc. [a]	28,511
o/w WE couple households	*20,616*
o/w WE single households	*4,085*
o/w SE couple households	*3,402*
o/w SE single households	*408*

Notes: [a] We drop households composed of more than one family and those with children above 25 still living in the household. We also drop the top and bottom 1% for household wealth, household occupation pension wealth and household income. Additionally, there is some loss of observations due to merging with other datasets.

[2] We enriched the IPO data with several other administrative datasets from CBS: 1) "Witte vlekken onderzoek" , which contains information about the current occupational pension fund affiliation, 2) Pensioenaanspraken and Pensioendeelnemingen, which contain information on occupational pension entitlements , 3) Zelfstandigentab, which contains information about self-employment, and 4) SSBbaankenmerkenbus , which contains information about wage-employment.

As our aim is to highlight heterogeneity across groups, we need to precisely identify one's employment status. Following the administrative data from the tax office, we define someone as self-employed if he/she has non-zero income from his/her own business. Additionally, we define those who have income from both their own company and wage-employment as hybrid self-employed, and we remove them from our dataset to get clear comparisons between pure wage employed (WE) and pure self-employed (SE). We only consider singles and couple households (with or without children) and drop the otherwise composited households, for a clearer interpretation of household wealth and financial planning. Table 1 shows what the selection criteria mean for our available observations.

Previous studies on the Dutch case typically used survey data for their analyses.[3] Using administrative data means that we lack the less tangible but also very valuable information that surveys can provide, such as information on the expected replacement rate or on preferences for saving and risks (van Santen, 2019). We do not observe expected or planned retirement age. However, Disney (2006) shows that, the more actuarially fair the pension scheme is, the more it will lead to the displacement of private assets and the less it will result in changes in the retirement age. The Dutch occupational pensions became substantially more actuarially fair since new legislation in 2006 largely abolished (the explicit or implicit subsidies on) early retirement schemes.[4] The saving propensity and relative risk-aversion of individuals is also not observed in our data. We partly correct for the between-group heterogeneity by separating the analyses by occupation and pension fund affiliation, which is correlated with these preferences. We will also use dummies for having stocks, for having third pillar pension savings and for homeownership, to approximate relative risk-aversion and saving preference within the groups.

The primary dependent variable in our analyses is household wealth (in euro). Table 7 in Appendix 1 lists the composition of private wealth, at the household level. Financial wealth is the sum of checking accounts and savings accounts, bonds and stocks, minus financial liabilities. The net value of housing wealth and business equity are available too. Additionally, we make extrapolations for the savings in private commercial (third pillar) pension products, based on the available historical information on the premiums paid to these products. The total household wealth is defined as the value of assets net of liabilities.

[3] E.g. Euwals (2000) used the CentER Savings Survey, Alessie et al. (1997) and Kapteyn et al. (2005) used the Dutch Socio-Economic Panel, Alessie et al. (2013) used SHARELIFE and Van Santen (2019) used the DNB Household Survey and the Pension Barometer, as administered by CentERdata.

[4] Since 2006 there has been a strong increase of the average effective retirement age for wage-employed from 61 year in 2006 to 64 year in 2014. Meanwhile, the average effective retirement age for self-employed remained almost stable at close to 66 year over that period (Statistics Netherlands, January 2015).

The primary independent variable is the accumulated occupational pension wealth at the household level. Statistics Netherlands sampled information from pension funds and insurance companies on occupational pension entitlements for everyone in the Netherlands between the age of 15 and 64. The data set contains information on the gross pension annuity that participants receive at retirement age (which was still 65 for the period we study), both as accrued at the reference date and as accrued at the retirement age, assuming the current job and wage remain unchanged. These two annuity values are also what pension funds typically communicate to their participants yearly, in what is called the 'Uniform Pension Overview' (UPO). The annuity at retirement as accrued at the reference date is also converted into a net present value at the reference date and we use this as our proxy for net pension wealth. Because first pillar entitlements in the Netherlands are not income related (see Appendix 2) and the full benefit level only varies between single and coupled households – which we study separately – we ignore this in our analyses. Only first generation immigrants miss a part of their first pillar pension build-up if they entered the country after age 15. We control for this by using several dummies on country of origin.

Later on, we propose to instrument pension wealth using, among others, information on the funding ratio of the pension fund and the possible recovery mode imposed to pension funds by the supervisory authority within the financial assessment framework. Within our observation period (2007-2010), we observe a strong reduction in the funding ratios in almost all pension funds. We have used supervisory data from Dutch central bank (DNB) to link the funding ratio to our data, together with information on cuts and indexation from recovery plans. The funding ratio of many pension funds became so low that DNB required them to develop a recovery plan to increase the funding ratio again within a few years. Funds in such cases must refrain from indexation (i.e. no inflation correction of pension benefits) and additionally can choose to raise premiums, demand additional employer contributions and/or cut pension entitlement.[5] The obligation to start a recovery plan means a negative and exogenous wealth shock for participants in these funds, compared to funds that were still performing relatively well. This is why we believe that these instruments are valid and relevant to our purpose.

Our information on the actual and the required funding ratios covers 19 of the biggest Dutch pension funds over the period 2007-2010, and also reports whether or not they implemented a recovery plan in these years. The 19 pension funds we were able to incorporate in our

[5] Actually, none of these pension funds cut their pension benefits until 2013, when some were finally forced to do make such cuts due to continually low funding ratios. This is well beyond our observation period. All funds in a recovery plan needed to freeze their indexation, which arguably made the biggest difference for the development of their funding ratios during our observation period.

analysis serve between 70 and 75% of the active Dutch pension scheme participants. We were able to link this to our dataset through the corresponding labor agreement (CAO) identifiers.[6] We established in each year if the pension fund of each individual had a recovery plan or not.[7]

Table 2: Pension funds, funding ratios and participants, by recovery plan status (2007-2010)

		Recovery plan	
Year		*No*	*Yes*
2007	Number of pension funds	19	0
	Average actual funding ratio	150%	-
	Average required funding ratio	105%	-
	Actual – required	45%	-
	Number of active participants (x 1,000)	3,966	0
	Number of observations in our dataset	7,471	0
2008	Number of pension funds	8	11
	Average actual funding ratio	110%	99%
	Average required funding ratio	105%	105%
	Actual – required	5%	-6%
	Number of active participants (x 1,000)	564	3,406
	Number of observations in our dataset	1,865	6,576
2009	Number of pension funds	6	13
	Average actual funding ratio	123%	108%
	Average required funding ratio	113%	118%
	Actual – required	10%	-10%
	Number of active participants (x 1,000)	211	3,757
	Number of observations in our dataset	494	8,405
2010	Number of pension funds	4	15
	Average actual funding ratio	124%	108%
	Average required funding ratio	114%	117%
	Actual - required	10%	-9%
	Number of active participants (x 1,000)	95	3,917
	Number of observations in our dataset	147	7,707

Sources: DNB, CBS and authors' calculations.

Table 2 shows the pension funds, the average actual and required funding ratios and the numbers of active and observed participants, by year and recovery plan status. Overall, 15 funds needed a recovery plan within our observation period, that came into effect in either 2008, 2009 or 2010. No recovery plan ended during these years. The table also shows the very substantial impact of the financial crisis on the funding ratios of these pension funds. All

[6] The individual pension fund affiliation is not available in the datasets of Statistics Netherlands, so we linked respondents to pension funds through their labor agreement identifier, as described by Eberhardt and Bosch (2014), Bijlage Achtergronddocument Pensioenpremiedatabase, CPB. They mapped how the biggest Dutch pension funds are connected to the top 110 Dutch labor agreements. We were able to link about 45% of those wage-employed who actively participate in a pension scheme to one of these funds.

[7] This implies that this analysis only focuses on those wage-employed who actively participate in a pension scheme within the observation period. Those who do not participate in a particular year, but once did participate and still have entitlements with a pension fund, can be affected by the recovery plan status, but we cannot take this into account. We also restrict our analyses to those individuals who do not change pension fund within our observation period, for more confidence in the calculation of the pension wealth shock people experienced and for minimizing the influence of other possible life events on our results.

funding ratios dropped dramatically in 2008, but those falling below a threshold needed a recovery plan.

3.2 Current pension scheme participation

For several alternative robustness and specification checks, which will be explained in the next section, we also want to look at the current pension scheme participation status of the households we study. The pension scheme participation status – and thus also the accumulated amount of pension wealth – strongly depends on occupational choices. This is why we need to examine the displacement effect for wage employed and self-employed separately. Yet, while most Dutch wage employed are affiliated to the compulsory occupational pension system (in the tables we call this group WEP: Wage employed with compulsory Pension) and most self-employed are not (we call this group SEN: Self-Employed with No compulsory pension), this relationship is not 100%. Both groups include a substantial minority with a divergent pension regime, that is typically unavailable in survey data but can be identified in our administrative data.

Among wage employed there is a group, largely invisible in both official statistics and academic studies that use survey data, who do not participate in a mandatory pension scheme (we call this group WEN: Wage employed with No compulsory pension). We use data from Netherlands Statistics (CBS) to identify this group over the period 2007-2010. Their data showed that in 2010 about 9% of all male employees aged 25-64 did not participate in an occupational pension scheme. Wage employed without compulsory pension are relatively overrepresented among those with an income that is over about twice the median income (15%), those working in the commercial service sector (15%) or those working at a small company (21% for companies with less than 10 employees, 6% for companies with over 100 employees), and should not be included in an estimate of the displacement effect for pension funds participants.[8] This is relevant because in survey data, when information about pension fund affiliation is not available, one does not know whether the pension wealth is missing or zero (see van Santen, 2019). Here instead we do.

At the same time, a proportion of self-employed, who are often mentioned for their lack of affiliation to the occupational pension system, do actually participate in a mandatory professional or industry pension fund (we call this group SEP: Self-Employed with compulsory Pension) and should be included in a study of the displacement effect for pension funds participants. For instance medical specialists, general practitioners, physiotherapists,

[8] Mooij, M. de, A. Dill, M. Geerdinck and E. Vieveen (2012). *Witte vlek op pensioengebied 2010.* Centraal Bureau voor de Statistiek, Den Haag/Heerlen

notaries and a group of painters and carpenters (see Appendix 2 for more details). We identify the self-employed with compulsory pension by using the code on the industry in which the self-employed is active (the SBI-code). Participation in the industry pension fund for painters, carpenters and glaziers is explicitly obliged for those self-employed active in a specific sector. For the other groups of self-employed with compulsory pension their profession is precisely enough defined for us to be sufficiently confident that the professional pension fund obligation applies to them.

Table 3a: Descriptive statistics – wealth and income for couples, 2010 (x 1,000 euro's)

Variables	WEN	WEP	t-test sign.[A]	SEN	SEP	t-test sign.[A]
Means						
Household Wealth (HW)	172.1	154.1	***	301.2	397.6	***
o/w Net Primary residence	80.2	87.6	***	117.9	122.3	
o/w Financial wealth	65.9	47.9	***	58.8	140.6	***
o/w Saving account	47.9	38.7	***	44.5	107.3	***
o/w Shares	16.8	8.6	***	12.9	30.9	***
o/w HH 3rd pillar pension wealth	11.0	9.2	***	23.1	49.6	***
HH occupational pension wealth (PW)	49.9	102.7	***	34.4	96.9	***
HH net income 2010	50.4	44.8	***	45.6	81.8	***
HH net total compensation 2010	51.4	50.6	**	46.5	97.4	***
HH average total compensation '07-'10	51.8	50.3	***	47.4	102.4	***
HH total compensation '07-'10 (st.d.) [B]	10.9	10.4		16.9	25.9	***
Medians						
Household Wealth (HW)	114.1	115.0	-	194.2	280.6	-
o/w Net Primary residence	50.9	64.5	-	83.8	98.2	-
o/w Financial wealth	23.9	21.5	-	22.3	49.9	-
o/w Saving account	20.0	18.6	-	17.9	41.9	-
o/w Shares	-	-	-	-	-	-
o/w HH 3rd pillar pension wealth	-	-	-	0.5	11.7	-
HH occupational pension wealth	20.6	74.2	-	12.1	69.1	-
HH net income 2010	46.3	42.2	-	41.8	68.3	-
HH net total compensation 2010	47.3	47.2	-	42.5	79.6	-
HH average total compensation '07-'10	47.6	46.9	-	43.7	85.2	-
Total number of observations	1,830	18,066	-	3,057	232	-
% within occupational group (WE/SE)	9.2%	90.8%	-	92.9%	7.1%	-
% overall	7.9%	78.0%	-	13.2%	1.0%	-

*Notes: (d) = dummy variable, [A] two-sided p-value: * p<0.10 ** p<0.05 *** p<0.01, [B] regressions include variance of income.*

Table 3a compares (for couples) the means and medians of a number of wealth and income related variables for the afore mentioned groups over the year 2010. Table 3b shows our available set of control variables, for both the household head and the partner. Both tables also report the total number of observations for each of the four groups in our dataset. We notice that there are around 9% wage employed who are not affiliated to the occupational pension system, and around 7% self-employed who are affiliated to the occupational pension system in the year 2010. Overall, about 14% of the households in our dataset have a self-employed household head.

Table 3b: Descriptive statistics – other controls variables for couples, 2010

Variables	WEN	WEP	t-test sign.[A]	SEN	SEP	t-test sign.[A]
Personal Characteristics						
Pension fund perform. uncertainty, $Var(k)$	0	0.02	***	-	-	-
HH Stock ownership (d)	0.37	0.29	***	0.31	0.38	**
HH 3rd pillar pension wealth (d)	0.44	0.46	*	0.52	0.71	***
HH Homeownership (d)	0.85	0.86		0.83	0.95	***
Non-temp contract (d)	0.95	0.98	***	-	-	-
Full-time contract (d)	0.85	0.85		-	-	-
Age	47.18	48.05	***	47.66	49.21	***
Male (d)	0.98	0.98		0.99	0.99	
Household size	3.71	3.65	**	3.79	3.78	
High urbanization (d)	0.14	0.13	**	0.15	0.13	
Dutch (d)	0.81	0.87	***	0.85	0.84	
Western immigrant, 1st generation (d)	0.05	0.02	***	0.03	0.04	
Western immigrant, 2nd generation (d)	0.05	0.05		0.04	0.10	***
Non-Western immigrant, 1st gen. (d)	0.08	0.06	***	0.08	0.02	***
Non-Western immigrant, 2nd gen. (d)	0.01	0.00	**	0.00	0.00	
Unmarried (d)	0.11	0.09	**	0.13	0.09	**
Married (d)	0.85	0.87	**	0.81	0.87	**
Widowed (d)	0.00	0.00		0.00	0.00	
Divorced (d)	0.04	0.04		0.05	0.04	
Sector dummies						
Agriculture	0.01	0.01	**	0.11	0.00	***
Industry	0.18	0.19	*	0.06	0.00	***
Public service and education	0.02	0.20	***	0.03	0.00	***
Construction	0.01	0.11	***	0.18	0.39	***
Wholesale and retail	0.18	0.14	***	0.22	0.00	***
Transportation and storage	0.05	0.08	***	0.04	0.00	***
Accommodation and food services	0.00	0.01	***	0.06	0.00	***
Information and communication	0.13	0.04	***	0.03	0.00	**
Finance related	0.19	0.04	***	0.02	0.00	**
Business services	0.22	0.10	***	0.17	0.07	***
Health care	0.00	0.04	***	0.02	0.53	***
Culture and sport	0.01	0.01	***	0.03	0.00	**
Other	0.01	0.03	***	0.04	0.00	***
Partner Characteristics						
WEP: WE with pension (d)	0.54	0.63	***	0.35	0.38	
WEN: WE without pension (d)	0.09	0.06	***	0.05	0.05	
SEP: SE with pension (d)	0.01	0.01		0.06	0.20	***
SEN: SE without pension (d)	0.05	0.03	***	0.26	0.06	***
Age	44.41	45.28	***	44.62	47.12	***
Male (d)	0.02	0.02	**	0.01	0.00	
Dutch (d)	0.79	0.84	***	0.82	0.90	***
Western immigrant, 1st generation (d)	0.06	0.04	***	0.05	0.03	
Western immigrant, 2nd generation (d)	0.05	0.05		0.05	0.04	
Non-Western immigrant, 1st gen. (d)	0.09	0.07	***	0.08	0.02	***
Non-Western immigrant, 2nd gen. (d)	0.01	0.01		0.01	0.00	
Total number of observations	**1,830**	**18,066**	**-**	**3,057**	**232**	**-**
% within occupational group (WE/SE)	9.2%	90.8%	-	92.9%	7.1%	-
% overall	7.9%	78.0%	-	13.2%	1.0%	-

*Notes: (d) = dummy variable, Province dummies are not shown, [A] two-sided p-value: * p<0.10 ** p<0.05 *** p<0.0*

When we focus on the wage employed, the statistics show that those without active pension build up have accumulated more household wealth than those with, primarily in the form of household financial wealth and also have built up slightly more third pillar pension wealth.

As we would have expected, wage employed with active pension build up have a higher net present value of occupational (second pillar) pension wealth and household occupational pension wealth that is almost twice as large. This partly represents the dynamics in pension participation status over time. Not all inactive pension participants have always been without pension accrual, and not all active ones have always been accruing pensions before. Another important explanation is that we look at pension wealth at the household level. The occupational choice and pension scheme participation status of the partner are only mildly correlated with those of the household head. Over half of the household heads with inactive pension status has a partner who does participate in an occupational pension scheme. Pension-active households earn a lower (gross and net) income, but when we look at total compensation, which includes an approximation for pension accrual, they earn almost the same on average.[9] There are several significant, but mostly small, differences in personal and household characteristics between pension-active and inactive households. The latter are relatively concentrated in sectors such as information and communication and in finance and they are almost absent in public service and education and in health care.

When we focus on the self-employed, we find that those with a pension fund affiliation have more household wealth. They also earn a substantially higher net household income on average, even more so when we look at total compensation, including pension accrual. Corresponding to the professional pensions funds for self-employed we discussed before, they are only found in construction, business services and health care. When the household head is self-employed, the partner more often is self-employed too, and there is also a strong positive correlation between their pension participation status. A comparison between wage employed and self-employed shows that on average the self-employed are substantially wealthier, but only those with a pension fund stand out with a relatively very high household income. They are also the oldest group on average, but these differences are much smaller.

All in all, the descriptive statistics indicate that especially self-employed with and without active pension affiliation are two quite heterogeneous, non-random groups. This means that it is unlikely that we can fully control for possible selection effects in the displacement effects with the available covariates. That is why we will also specifically analyze the self-employed active in the construction sector, where compulsory pension accumulation is arguably more random and the two groups are more comparable. The descriptive statistics in Appendix 3, Table 8b for construction sector confirm this. The differences in household wealth measures

[9] We approximate total compensation, including pension accrual, by multiplying personal income above the first pillar pension (AOW) exemption by 1.25, because total (employer + employee) pension premiums typically amount to around 20% of this part of income. We also differentiate between an exemption for full-time (13,000 euro) and for part-time (10,000 euro) workers.

between these two groups are small and none is significant. The levels are close to those of all self-employed without compulsory pension, which means that with this selection we basically exclude a few exceptional (very wealthy) groups of households among the self-employed with compulsory pension. The other variables show that the self-employed with compulsory pension in the construction sector have substantially more occupational pension wealth and also a somewhat higher average income than the corresponding self-employed without compulsory pension.

4 Empirical implementation

Above, we presented our model and the available data. Here we will describe the empirical implementation. Rearranging Equation (4), we estimate:

$$HW_i = \beta_0 + \beta_1 PW_i + \boldsymbol{X}_i'\boldsymbol{\beta}_x + \varepsilon_i \quad (5)$$

Here, HW_i is total household wealth (excluding the occupational pension wealth), PW_i is total occupational pension wealth at the household level and $\boldsymbol{X}_i'$ is a list of control variables, including an approximation of permanent income and its variance and of pension fund performance uncertainty, $\mathrm{Var}(k)$ [10], and dummies for the ownership of risky assets that are meant to proxy for γ.

Estimating the displacement effect using an equation like Equation (5) is standard practice in the literature (see e.g. Alessie et al., 2013). They thus found displacement effect can be less than the individual would have preferred, due to e.g. liquidity constraints. There are also several reasons why the true displacement effect is (substantially) underestimated in many empirical studies. Alessie et al. (1997), following an earlier draft of Gale (1998), discuss important sources of bias that plague the analysis of the relationship between pension wealth and assets in such a regression model. Almost all of these biases drive β_1 towards zero or even to be positive. They can be divided into two main categories.

The first important source for bias are omitted variables. We are interested in the effect of occupational pension wealth on private household savings, but the accumulation of occupational pension wealth is not random. For example, those with a relatively high preference for saving might build up a large amount of private household wealth, but also choose a job with a relatively generous pension scheme. We do not observe such preferences. Also, those with a relatively high life expectancy or with plans to retire early might combine relatively high household wealth with high pension wealth. This way pension wealth and assets seem to be less negatively correlated than is actually the case, or even seem to be positively correlated. Though such preference are unobserved, these could be correlated to the interaction between occupational choices and participation in compulsory pension schemes, so accounting for them could alleviate this problem. Due to institutional differences, self-employed in the Netherlands are substantially less likely to participate in a pension scheme. Comparing participants and non-participants into occupational pensions would

[10] We proxy $\mathrm{Var}(k)$ by looking at the variance in the difference between the actual and the required funding ratio of pension funds over the period 1994-2010, based on the pension fund participation in 2010. When an individual is not affiliated or could not be linked to a pension fund in 2010, the funding ratio information is missing, so we multiply this coefficient by a specific dummy indicating the availability of this information.

therefore be uninformative of the displacement effect itself. We would largely be comparing wage employed with self-employed, who also differ, for instance, in terms of risk attitude. Indeed, self-employed are found to be less risk-averse on average than wage employed (Hartog et al., 2002). Also, there is reason to believe that the wage employed – especially those who currently do not participate in an occupational pension scheme – might not be fully aware of their (lack of) pension accrual, while self-employed will probably be aware that they do not accrue any pension entitlements if they do not act on it themselves. And those self-employed who do participate in a pension scheme will probably have a clearer image of how much they contribute, because there is no employer who makes the payments for them or adds an employer contribution. Card and Ransom (2011) study the displacement effects among a group of college professors and find that their supplemental savings are substantially less sensitive to employer pension contributions than to employee contributions, with displacement effects of employee contributions ranging from about 60 to 80 percent and displacement effects of employer contributions about half of that. Also, Bottazzi et al. (2006) find that the offset between private wealth and perceived pension wealth, is particularly substantial for workers that are better informed about their pension wealth. Performing separate analyses on the displacement effect of self-employed and wage employed should partly address the problem of omitted variables, in a way that survey data never could in previous studies. The fact that not all wage employed accumulate pension wealth and not all self-employed do not, ensures sufficient variability within the groups to perform such separate analyses.

The second important source for bias arises from imperfect measurement. Narrow measures of non-pension wealth (e.g. excluding housing wealth) tend to lead to lower displacement estimates. Pension wealth itself is notoriously difficult to measure and, furthermore, should be measured net of taxes. And because an occupational pension is essentially deferred income, those with pension accrual actually make more money in total than those without pension accrual but a comparable net pay-check. So, controlling for income should be based on total compensation (including a correction for pension accrual) and not on current earnings only. Overall, these measurement errors tend to lead to an underestimation of the displacement effect. Here, our available administrative data on pension wealth – though still not perfect – arguably outperform the survey data that are normally used. Also, we do correct for taxes and for pension accrual in our income data.

For determining the displacement effect for the wage employed we start with a simple OLS estimation of Equation (5). Table 4 presents the results. For wage employed couples, we find

a small but significant displacement effect of 3.1%, which slightly increases to 3.9% when we take Gale's Q[11] into account. A breakdown in quintiles shows a slight increase in the displacement effect with income, possibly due to less liquidity constraints or differences in the propensity to consume across the income distribution.[12] For singles, we find in the simple OLS regressions a displacement effect of seven percent. A breakdown in quintiles shows a somewhat more volatile pattern.

Table 4: Estimates of the displacement effect for wage employed (OLS) in 2010

Wage employed	*Couples*	*Singles*
All income levels	**-0.031****	**-0.068****
with Gale's Q	-0.039**	-0.062
Income quintile 1 (lowest incomes)	0.026	0.019
Income quintile 2	-0.074**	-0.247***
Income quintile 3	-0.067**	0.076
Income quintile 4	-0.113***	-0.089
Income quintile 5 (highest incomes)	-0.041	-0.116***
N	***20,197***	***4,031***

*Notes: The numbers reported in this table are the estimates of β_1 in Equation (5) – the displacement effect of occupational pension wealth on household wealth (in euro) – under different specifications. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

The full results for the OLS regression for couples on all income levels can be found in Table 10a in Appendix 4. If we look at the other estimation results, we find that the variance of income has a negative effect on household wealth, contrary to the prediction in Section 3. Possibly, this is due to the fact that the observation period primarily showed negative shocks in income, for example through the loss of employment. This would lead to a negative correlation between the variance of income and household wealth. We also find, contrary to our model prediction, a significant negative effect of $Var(k)$, which is our proxy for pension fund performance uncertainty. This would suggest that those with a pension fund with relatively high variability in its performance save relatively less.

Due to the endogeneity discussed above, OLS estimates are biased as $E(\varepsilon_i|PW_i) \neq 0$. We tackle this using an instrumental variable approach. We include in Z company size, sector,

[11] For the computation of Gale's Q, we assume a discount rate (δ) equal to the interest rate (r) (in accordance with Alessie et al. (2013)), which equals to 0.015. Furthermore, we find that within reasonable ranges away from these parameter values our estimate of the displacement effect does not change significantly.

[12] We also checked the effects of selecting on minimum levels of household wealth, e.g. excluding observations with a net debt or with a wealth level below 20.000 euro. On average, this also leads to increasing displacement levels. Households with low income and wealth levels have little options to compensate higher pension accrual, while high income household can to a certain extent be 'consumption constraint'. In that case a shift from pension accrual to more net income will more or less automatically result in more private saving, because even buying a bigger house is basically only a transfer from one wealth component to another.

funding ratio and recovery plan status, where $Cov(PW_i, Z_i) \neq 0$. The usual assumption apply, so $E(\varepsilon_i|Z_i) = 0, \forall i$, which we will explain below.

Instrumenting pension wealth using company size, sector, the funding ratio of the pension fund and the presence of a recovery plan (needed when funding ratios are too low) is legitimate because, as discussed before, pension scheme participation is strongly correlated with company size and sector. Also funding ratios (van Santen, 2019) and recovery plans could imply cuts to pension wealth or increasing premiums (shifting the burden of financial recovery more on active participants). This qualifies them as relevant and exogenous instruments, where exogeneity here means that changes to these variables can hardly be affected by participants' behavior (they mostly depended on worsening assets returns). For company size, we use the log of the number of employees in the company where the wage employed works.[13] For sector we use the 13 dummies as shown in Table 8c.

The first stage regression results, which can be found in Appendix 4, Table 10b, confirm that these instruments are strongly correlated with occupational pension wealth.[14] They should also be uncorrelated with the error in the second stage of the regression model and the Sargan test for overidentifying testifies of this. Employees could sort into differently sized companies and into separate sectors, partly based on (or correlated with) risk and saving preferences. Yet, the funding ratio should not suffer of these possible selection problems, as its' development is exogenous to individuals choices even if individuals were to move to different companies with other funds. When the original pension fund is underfunded, pension wealth is not portable.

Table 5 shows the results for the IV analyses for couples. The displacement effect is -31%[15],and there is some evidence that it increases with income.[16] When we take Gale's Q into account, it increases to about 46%. The full results of the IV regression for couples over all income levels are shown in Table 10a in Appendix 4. The impact of the instrumentation on

[13] We use the log of company size since the company size distribution is strongly positively skewed. When we perform a first stage regression on 6 splines for the log of firm size, we find that the effect of the log of firm size on accumulated occupational pension wealth is discontinuous, but from the 25th to the 75th percentile it is smoothly and significantly positive.

[14] The F statistic on the joint significance of the instruments in the first stage regression equals 133, indicating that the instruments are relevant.

[15] In order to further mitigate the potential measurement errors in the accumulated pension wealth and possible selection effects, we also apply propensity score matching methods (nearest neighbour matching). This way we can use the occupational pension scheme participation instead of the pension wealth measures to elicit the displacement effect on household wealth accumulation. It also enables us to focus on the most similar individuals and to abstain from imposing a functional form. We tentatively compare the average difference in occupational pension wealth and household wealth between WEP and WEN. The matching results suggest the displacement effect is about -26% for couples and - 24% for singles.

[16] We checked how sensitive this result is to different assumptions for the discount rate we use to calculate the current level of accumulated pension wealth. This sensitivity turns out to be limited.

most of the other variables in the full regression analyses is small, but now the effect of $Var(k)$ is significantly positive, consistent with our original expectations.

Table 5: Estimates of the displacement effect for wage employed (IV), 2010

	Couples	Singles
All income levels	-0.309***	-0.313***
with Gale s Q	-0.455***	-0.467***
Income quintile 1 (lowest incomes)	-0.105	-0.0921
Income quintile 2	-0.365***	-0.323***
Income quintile 3	-0.330***	-0.353***
Income quintile 4	-0.528***	-0.571***
Income quintile 5 (highest incomes)	-0.259***	-0.217**
N	18946	16544

*Notes: The numbers reported in this table are the estimates of β_1 in Equation (5) – the displacement effect of occupational pension wealth on household wealth (in euro), instrumented by the logarithm of company size and industry dummies, under different specifications. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

Table 6: Estimates of the displacement effect for self-employed, 2010

Displacement effect	*Couples*	*N*
All income levels (OLS)	**-0.668*** **	**2,965**
with Gale's Q	-0.959***	
Income quintile 1 (lowest incomes)	-0.350	
Income quintile 2	-0.636**	
Income quintile 3	-0.307	
Income quintile 4	-0.297	
Income quintile 5 (highest incomes)	-0.987***	
All income levels (Construction sector only)	**-0.609*** **	**596**
with Gale's Q	-0.902***	

*Notes: The numbers reported in this table are the estimates of β_1 in Equation (5) – the displacement effect of occupational pension wealth on household wealth (in euro) – under different specifications and the results of PSM. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

Table 6 reports the displacement effect for the self-employed, for all the separate estimation procedures. Because the number of observations is considerably lower than for the wage employed, we only show the estimates for couples. The standard OLS results for couples show a significant and also relatively strong negative displacement effect of about -67%.[17]

[17] When we apply propensity score matching, we find that the matched self-employed couples have accumulated around 61,000 euro less household wealth if they are affiliated to the occupational pension system, but this

The full results for the OLS regression for SE couples on all income levels can be found in Table 11 in Appendix 4. The addition of dummies on stock, third pillar and home ownership and of partner characteristics does not appears to affect the displacement effect. For the self-employed we do find that the variance of income primarily has a positive effect on household wealth, in line with our predictions.

Earlier, we concluded that the self-employed are a highly heterogeneous group. Especially, those self-employed currently participating in a compulsory pension scheme differ substantially from those who do not participate. The instruments we could use for wage employed (company size and sector) are not applicable or suitable for the self-employed. Also the funding ratio can only be assigned to a small group, as most are not affiliated. But within the construction sector the obligation for certain groups of self-employed to participate in the sector pension scheme can be considered to be relatively random, as is illustrated by Table 8b. If we restrict our OLS analysis to the construction sector only, the resulting displacement effect amounts to about -61%, which again suggests the displacement effect is somewhat stronger for the self-employed than for the wage employed.[18] The full regression results can be found in Table 11.

To check the robustness of our results to different specifications and to correct for some further potential selections, we perform several checks, such as differentiation by income quintiles, focus on a specific sector (where compulsory pension participation by the self-employed can be assumed to be relatively random) and estimation method. Table 5 and 6 show results of our preferred model, when we carry out the analysis by income groups. These results are consistent with the baseline specification as by income quintiles, the (significant) displacement effects range between -25% and -55% for wage employed. The displacement effect primarily rises with income. For singles, the overall displacement effect in the IV analyses shows a similar estimate (around -30%). But the breakup in income quintiles shows mostly non-significant results. For self-employed, a breakdown in income levels shows mostly non-significant and quite volatile results, though the significant estimates suggest a displacement effect between -64% and -99%.

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estimate is not significant. Compared to the matched difference in occupational pension wealth the tentative displacement effect would be around -78%.

[18] A Chow test, based on an identical OLS regression specification for both groups, indicates that the displacement effect is significantly higher for self-employed than for wage-employed. This is also the case when we focus only on those self-employed in construction. However, the confidence interval for the displacement effect of self-employed does include the IV estimate of the wage-employed (not vice versa), which calls for some caution in interpreting the differences between them.

5 Conclusion

We look at the displacement effect from mandatory occupational pension saving on household wealth in the Netherlands, taking institutional differences among occupations into account. Where most wage employed in the Netherlands participate in a mandatory occupational pension scheme, a substantial minority does not participate. Conversely, while most self-employed are fully responsible for their own pension accrual (on top of the state pension), some groups of self-employed (about 7% in total) are obliged to participate in a professional or industry pension fund. This requires to separately measure the displacement effects within these groups, thus controlling for unobserved characteristics that correlate with the occupational choice between working as wage employed or self-employed.

In order to correct for several possible biases in the OLS estimation of the displacement effect, we estimate it separately for different occupations and we use an instrumental variables approach. Our IV analyses, where we use sector, company size and pension funding ratio as instruments, suggests a displacement effect of –31% for the wage employed; an effect that rises with income. For the self-employed, where our instruments are not available, we find a stronger displacement effect of greater than -60% using OLS, also when we isolate the construction sector. In that sector the compulsory pension scheme participation by the self-employed is arguably more random (less endogenous) than in other sectors.

Overall, our results suggest a larger displacement effect for self-employed than for wage employed. A possible explanation lies in the fact that self-employed can on average be expected to be much more aware of the pension entitlements they do or do not accrue than wage employed. Such a higher awareness would lead to an on average higher displacement effect among self-employed than among wage employed (Card and Ransom, 2011; Bottazzi et al., 2006).

Appendix 1 – Composition of household wealth

Table 7: Composition of household wealth

Household wealth			
	Assets (+)		
		Financial assets	
			Checking and savings account
			Bonds
			Shares
		Real estate	
			Primary residence
			Other real estate
		Business equity	
		Other assets	
		Third pillar pension wealth	
	Debts (-)		
		Mortgage debt of primary residence	
		Other debt	

Appendix 2 – The pension system in the Netherlands

The Dutch pension system consists of three pillars. The first pillar is the state pension (AOW), which provides a flat rate base income for retirees, only depending on the period someone has lived or worked in the Netherlands in the 50 years before the retirement age and on the household composition (couples receive a lower benefit per person than singles). It is financed through pay-as-you-go.

The second pillar consists of the – capital funded – occupational pension schemes. Tax benefits depend on, and generally rise with, the income level. There is no general obligation to participate in an occupational pension scheme, but social partners can take the initiative for a pension scheme and ask the government to make this scheme mandatory for an entire sector or profession. Effectively, over 90% of all employees participate in the second pillar.

There are also almost a dozen mandatory professional pension funds (mostly founded in the 1970s) for independent professionals like medical specialists, general practitioners, physiotherapists and notaries, with in total about 50.000 active participants, mostly self-employed. Next to these professional funds there is an industry pension fund for painters, carpenters and glaziers (founded in 1951) where the self-employed who are active in that industry are also obliged to participate. This fund had about 30.000 active participants in 2014, among whom a substantial number of self-employed (possibly more than half).

The third pillar consists of capital funded individual pension products. Those without a (full) second pillar pension can take advantage of the available tax benefits with these products. Based on preliminary data of the Dutch Statistics Bureau (CBS) self-employed hold 10% of the third pillar policies, but 20% of the total value. The relative weight of the three pillars is 50-45-5.[19]

[19]CBS (2010), " Pensioenaansprakenstatistiek - Geld van nu voor later", and Grift, M. van de, and W. de Rooij (2008), "Course of life and pension rights": Conference paper IARIW 2008.

Appendix 3 – Descriptive statistics

Table 8b: Descriptive statistics – wealth and income for SE couples within the construction sector,
2010 (x 1,000 euro's)

Variables	SEN Construction	SEP Construction	t-test sign.[A]
Means			
Household Wealth (HW)	235.2	210.9	
o/w Net Primary residence	120.8	110.7	
o/w Financial wealth	41.3	45.3	
o/w Saving account	32.1	31.7	
o/w Shares	8.8	13.5	
o/w HH 3rd pillar pension wealth	20.1	17.8	
HH occupational pension wealth (PW)	39.6	62.3	***
HH net income 2010	40.4	43.3	
HH net total compensation 2010	41.1	49.6	***
HH average total compensation '07-'10	43.7	50.2	***
HH total compensation '07-'10 (st.d.) [B]	13.0	10.7	
Total number of observations	577	95	-
% within occupational group (SE in construction)	85.9%	14.1%	-

*Notes: (d) = dummy variable, [A] two-sided p-value: * p<0.10 ** p<0.05 *** p<0.01, [B] regressions include variance of income.*

Appendix 4 – Full regression results

Table 10a: Full results OLS and IV regressions wage employed couples, 2010

Household wealth (HW) in 1,000 euro	**OLS-1**	**OLS-2**	**OLS-3**	**IV**
HH occupation pension wealth (PW) (in 1,000 euro)	-0.0270**	-0.0247**	-0.0308**	-0.309***
HH average total compensation 07- 10	2.305***	2.274***	2.329***	2.773***
HH variance total compensation 07- 11	-0.00129***	-0.00130***	-0.00139***	-0.00173***
Pension fund performance uncertainty, Var(k)	-211.1***	-182.6**	-153.2**	331.4***
Var(k) unknown (d)	-22.59***	-19.82***	-19.02***	-17.45***
Stock ownership (d)	63.88***	62.16***	60.90***	60.37***
3rd pillar pension wealth ownership (d)	15.20***	16.14***	15.89***	15.66***
Home ownership (d)	99.37***	96.82***	97.93***	104.0***
Age	142.0***	117.1**	84.76*	61.78
Age^2	-2.616***	-2.138**	-1.516	-1.008
Age^3	0.0167**	0.0138**	0.00942	0.00589
Non-temporary contract (d)		10.06**	11.89**	3.505
Full-time contract (d)		-16.28***	-18.17***	-24.77***
Male (d)		10.01	16.42	12.43
Household size		9.725***	11.91***	12.07***
High urbanization (d)		-7.091**	-5.364	-4.186
Western immigrant, 1st generation (d)	-47.63***	-45.10***	-34.05***	-43.68***
Western immigrant, 2nd generation (d)	-32.30***	-30.56***	-27.60***	-28.89***
Non-Western immigrant, 1st generation (d)	-44.44***	-42.57***	-19.99***	-20.99***
Non-Western immigrant, 2nd generation (d)	-34.31*	-29.10	-22.41	-33.16*
Married (d)		-12.13***	-14.00***	-15.51***
Widowed (d)		-18.63	-22.79	-29.66
Divorced (d)		-37.43***	-32.18***	-33.32***
Partner is WE with pension (d)			-23.15***	-17.93***
Partner is WE without pension (d)			-17.47***	-22.72***
Partner is SE with pension (d)			-22.06**	-23.99**
Partner is SE without pension (d)			9.905	8.456
Partner age			3.300***	3.980***
Partner is Male			1.216	-4.327
Partner Western immigrant, 1st generation (d)			-26.77***	-28.29***
Partner Western immigrant, 2nd generation (d)			-24.93***	-24.57***
Partner Non-Western immigrant, 1st generation (d)			-25.56***	-28.75***
Partner Non-Western immigrant, 2nd generation (d)			6.575	9.860
Province dummies	No	Yes	Yes	Yes
Constant	-2,674***	-2,313***	-1,864**	-1,564**
Observations	20,197	20,197	20,196	18,946
R-squared	0.258	0.277	0.289	0.264

*Notes: The numbers reported in this table are the regression estimates of Equation (5) – with household wealth (in 1,000 euro) as the dependent variable – under different specifications. A complete list of the included partner characteristics can be found in Table 8c. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

Table 10b: First stage IV regression results wage employed couples

HH occupation pension wealth (PW) (in 1,000 euro)	first stage
Sector dummies	
Agriculture	-56.26***
Industry	-38.58***
Public sector and Education	18.72***
Construction	-29.28***
Wholesales and Retail	-53.74***
Transportation and Storage	-51.98***
Accomodation and food services	-13.01**
Information and communication	-50.36***
Finance related	-51.40***
Business services	-36.17***
Health care	21.51***
Culture ans sport	-20.54***
Other variables	
HH average total compensation 07- 10	1.645***
HH variance total compensation 07- 11	-0.00105***
Pension fund performance uncertainty, Var(k)	829.5***
Var(k) unknown (d)	6.018***
Stock ownership (d)	3.072**
3rd pillar pension wealth ownership (d)	2.330**
Home ownership (d)	20.07***
Age	-98.79***
Age^2	2.041***
Age^3	-0.0135***
Non-temporary contract (d)	8.440*
Full-time contract (d)	-9.345***
Male (d)	-9.739
Household size	0.681
High urbanization (d)	1.883
Western immigrant, 1st generation (d)	-8.548**
Western immigrant, 2nd generation (d)	-0.427
Non-Western immigrant, 1st generation (d)	-6.076*
Non-Western immigrant, 2nd generation (d)	-16.60*
Married (d)	-6.686***
Widowed (d)	-25.07
Divorced (d)	-3.280
Partner is WE with pension (d)	13.49***
Partner is WE without pension (d)	-19.66***
Partner is SE with pension (d)	-8.516
Partner is SE without pension (d)	-16.74***
Partner age	2.182***
Partner is Male	-22.21***
Partner Western immigrant, 1st generation (d)	-11.23***
Partner Western immigrant, 2nd generation (d)	-0.327
Partner Non-Western immigrant, 1st generation (d)	-6.192*
Partner Non-Western immigrant, 2nd generation (d)	-1.517
Province dummies	Yes
Instruments	
Log company size	2.348***
Recovery plan activated	-13.52***
Change in funding ratio relative to previous year	148.6***
Constant	1,414***
Observations	18,946
Sargan statistic	133

*Notes: The numbers reported in this table are the first stage regression estimates of an IV specification of Equation (5) with household occupational pension wealth (in 1,000 euro) as the instrumented variable. A complete list of the included controls can be found in Table 10a. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

Table 11: full results OLS regression SE couples, overall and in Construction sector, 2010

Household wealth (HW) in 1,000 euro	**OLS-1**	**OLS-2**	**OLS-3**	**Construction**
HH occupation pension wealth (PW) (in 1,000 euro)	-0.774***	-0.758***	-0.668***	-0.609***
HH average total compensation 07- 10	4.158***	4.060***	3.341***	5.597***
HH variance total compensation 07- 11	2.73e-05***	2.51e-05***	1.98e-05***	2.71e-05
Stock ownership (d)			109,606***	60,486***
3rd pillar pension wealth ownership (d)			-1,866	7,322
Home ownership (d)			142,552***	170,211***
Age	198,778	145,437	183,697	-115,078
Age^2	-3,648	-2,689	-3,528	2,462
Age^3	23.74	18.43	23.96	-16.44
Male (d)		48,898	24,140	
Household size		26,092***	22,888***	15,705*
High urbanization (d)		-28,057	-807.2	-25,177
Western immigrant, 1st generation (d)	-141,849***	-119,371***	-71,693**	-115,996*
Western immigrant, 2nd generation (d)	-83,920***	-69,867**	-46,315*	-77,740
Non-Western immigrant, 1st generation (d)	-176,451***	-168,499***	-65,062*	-83,667
Non-Western immigrant, 2nd generation (d)	-100,106	-107,383	-83,896	
Married (d)		9,817	-3,210	37,244
Widowed (d)		57,424	21,476	-17,374
Divorced (d)		-63,484**	-50,447*	-22,112
Partner is WE with pension (d)			-33,723**	-25,486
Partner is WE without pension (d)			-71,543***	-47,257
Partner is SE with pension (d)			29,963	-59,849
Partner is SE without pension (d)			77,207***	15,849
Partner age			2,754**	5,903**
Partner is Male			-14,320	
Partner Western immigrant, 1st generation (d)			-25,880	19,611
Partner Western immigrant, 2nd generation (d)			-53,184**	-148,774***
Partner Non-Western immigrant, 1st generation (d)			-30,438	-3,736
Partner Non-Western immigrant, 2nd generation (d)			-26,839	106,897
Male (d) = o,				-
Non-Western immigrant, 2nd generation (d) = o,				-
Partner is Male = o,				-
Province dummies	No	Yes	Yes	Yes
Constant	-3.625e+06	-2.841e+06	-3.581e+06	1.183e+06
Observations	2,956	2,956	2,955	596
R-squared	0.215	0.232	0.294	0.374

*Notes:The numbers reported in this table are the regression estimates of Equation (5) –with household wealth (in 1,000 euro) as the dependent variable – under different specifications. A complete list of the included partner characteristics can be found in Table 8c.Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

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