Private wealth and pensions across European countries

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Very preliminary - Do not quote

Abstract:

Our paper analyses the offset effect of pension wealth on private wealth across countries which differ in terms of pension systems. To do so we estimate a reduced form equation for wealth accumulation at the household level in line with the life-cycle framework which accounts for pension wealth. For the empirical analysis, we use data from the Household Finance and Consumption Survey (Eurosystem Household Finance and Consumption Network, 2013) and data from the fourth wave of the SHARE Survey (Survey of Health, Ageing and Retirement in Europe) which provide harmonised information on household wealth, individual retirement conditions and various socio-demographic characteristics. We also rely on the OECD pension models to estimate pension wealth for various types of individuals across countries. The analyse is done for six European countries (Austria, Belgium, Germany, France, Netherlands, Portugal, and Spain).The preliminary results show a non-linear effect of pension wealth on savings. The marginal effect is non-significant or close to zero when pension wealth is either a very small part or a very large part of total wealth, while a large offset is obtained when the pension wealth/income ratio is in the middle of the distribution.

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[♦] This paper represents the views of the authors and does not necessarily correspond to the views of the OECD (or its Member Countries) or of the Banque de France. The usual disclaimer applies.

1. Introduction

Differences in pension entitlements across households, and in pension systems across countries, may help explaining some of the heterogeneity in individual savings' behaviours. Indeed, the life cycle framework suggests that public pension benefits lower the need to save during one's working life to smooth consumption over the life cycle. However, there is no consensus in the empirical literature on the extent to which pension wealth and other sources of wealth accumulated are substitute (e.g. Feldstein, 1974; Hubbard, 1986; Gale, 1998; Attanasio & Rohwedder, 2003; Attanasio & Brugiavini, 2003; Gale & Phillips, 2006; Engelhardt & Kumar, 2011; Alessie, *et al*., 2013). Those papers find a wide range of estimates, from a slightly positive impact of pensions on wealth (negative offset coefficient) to complete compensation (offset coefficient of 100%). Such a wide range of estimates is due to the differences in data sources (time series, cross-section, survey data, administrative records, subjective evaluations, etc.), in identification strategies and in model specifications.

In our paper, we estimate the offset effect of pension wealth on private wealth for six European countries (Austria, Belgium, Germany, France, Netherlands, Portugal, and Spain). Those six countries differ both in terms of household wealth distributions (see Eurosystem Household Finance and Consumption Network, 2013) and in terms of pensions (OECD, 2011; 2013a). We estimate a reduced form equation for wealth accumulation at the household level in line with the life cycle framework which takes pension wealth into account.

It is now well known in the empirical literature that simply regressing private wealth against pension wealth and controlling for earnings would yield downward biased estimates because the wealth effect of pension on the saving path is not taken into account (Gale, 1998). Gale (1998) proposes an adjustment factor (known as the Q factor) to correct for this bias, which has been adopted by several other papers (Hurd, *et al*., 2009; Alessie, *et al*., 2013; Engelhardt & Kumar, 2011). This adjustment factor requires however very strong assumptions on the

behaviour of the households and on the environment in which they make their decisions. Blau (2011) has estimated such regressions on data issued from a microsimulation model that faithfully reproduces the US pension and social security system, and has observed that those regressions tended to over-estimate the crowding out of private wealth. For our empirical model, we adopt a less constrained specification, which nevertheless accounts for "Gale's critic": we introduce the actualised pension benefits as a component of the household permanent income. The comparison of the results estimated with and without this permanent income component then gives lower and upper values for the offset.

We use data from the Household Finance and Consumption Survey (Eurosystem Household Finance and Consumption Network, 2013) and from the SHARE Survey (Survey of Health, Ageing and Retirement in Europe), which provides harmonised household level information on retirement and socio-demographics. We also rely on the OECD pension models to estimate pension wealth for various types of individuals across countries.

The preliminary results show a non-linear effect of pension wealth on savings. The marginal effect is non-significant or close to zero when pension wealth is either a very small part or a very large part of total wealth, while a large offset is obtained when the pension wealth/income ratio is in the middle of the distribution. These preliminary results point out to some cross-country differences that need to be further investigated.

The paper is organised as follows. Section 2 presents the empirical specification adopted to investigate our research question. The data used are described in section 3. Section 4 describes the sample and provides some descriptive statistics. Results are presented and discussed in Section 5.

2. The empirical model

We adopt a reduced form model of wealth accumulation based on the seminal empirical paper of King and Dicks-Mireaux (1982). We start from an empirical relation that accounts for the nonlinear relationship between the ratio of wealth to permanent earnings and age implied by the life-cycle hypothesis. That framework, on its own, places little constraints on the relation between age, wealth and the income. Therefore, a fairly general statistical model for cross-section data is:

$$\log\left(\frac{TW}{Y_p}\right) = f(age) + Z\beta + \varepsilon \qquad \textbf{(1)}$$

where:

- TW is the total wealth of individuals, which should include private and pension wealth,
- Y_p is the permanent income, which should include past and future labour income,
- age is the age of individuals,
- Z is a set of control variables. These variables aim at controlling for heterogeneity in saving behaviours due to socio-demographic differences, to differences in preferences (risk aversion, time preferences, non-homothetic preferences) or to other wealth accumulation motives than financing the retirement period (precautionary savings, bequest motives, etc.).

Since pension wealth may be an imperfect substitute for private wealth, it is preferable to decompose total wealth (TW) as the sum of private wealth (W) and pension wealth (PW). Therefore, using a log-linear approximation, we may write:

$$\log\left(\frac{W}{Y_p}\right) = \alpha \log\left(\frac{PW}{Y_p}\right) + f(age) + Z\beta + \varepsilon \qquad \textbf{(2)}$$

where the additional degree of freedom α can account for imperfect subtituability between private and pension wealth. Because we want to account for non-homothetic preferences, we add permanent income (Y_p) as a control in the regression. Our model can thus be written:

$$\log\left(\frac{W}{Y_p}\right) = \alpha_1 \log\left(\frac{PW}{Y_p}\right) + \alpha_2 Y_p + f(age) + Z\beta + \varepsilon \quad \textbf{(3)}$$

Equation (3) is still somewhat restrictive, because it makes strong linearity assumptions in the relations between private wealth, pension wealth and income. A more general specification is:

$$\log\left(\frac{W}{Y_p}\right) = f_1\left[\log\left(\frac{PW}{Y_p}\right)\right] + f_2(Y_p) + f_3(age) + Z\beta + \varepsilon \quad \textbf{(4)}$$

In order to allow for fewer constraints in the functional forms of f_1, f_2, f_3 we introduce the variables $\log\left(\frac{PW}{Y_p}\right)$, Y_p and age as restricted splines in the linear regression.

Equation (4) is closest to the framework of King and Dicks-Mireaux (1982). Gale (1998) and Gale and Philipps (2006) criticised such models arguing that they did not take into account the wealth effect of future pension benefits, and therefore give misleading estimates. We take that criticism into account by including future pension benefits into the permanent income. However, considering pension benefit similarly to other lifetime resources (labour and capital income) does not account for peculiarities of the pension benefits —such as the difficulty to borrow against them. In this respect, the comparison of the estimated results with and without this permanent income component will provide lower and upper values for the offset.

The model we estimate writes as:

$$\log\left(\frac{W}{LY_p}\right) = f_1\left[\log\left(\frac{PW}{LY_p}\right)\right] + f_2(LY_p) + f_3(age) + Z\beta + \varepsilon \quad \textbf{(5)}$$

Where LY_p is the lifetime permanent income, which is defined as the actualised sum of income and benefit over the life-cycle.

3. The data

Various data sources need to be combined in order to estimate the pension/non-pension wealth offset and to perform auxiliary regression to measure the lifetime permanent income.

3.1. Data sources

To do so we rely on: i) the Household Finance and Consumption Survey which provides household level information on wealth, income and household characteristics for 15 European countries; ii) the Survey of Health, Ageing and Retirement in Europe which is used to compute the country specific distribution of retirement age depending on individual's characteristics; iii) the OECD pension models which estimates country specific pension benefits for various individual profiles.

3.1.1 The Household Finance and Consumption survey (HFCS)

We use the first wave of the Household Finance and Consumption survey (HFCS) to obtain information at the household level on wealth, income and many demographics characteristics. The full sample includes 62,521 households and covers 15 euro area countries. The methodology applied ensures country-representativeness and cross-country comparability (see Eurosystem Household Finance and Consumption Network 2013a for all technical features of the HFCS survey). Most of the national surveys were conducted in 2010. There are however some differences in fieldwork periods, and in the reference periods for income and wealth across countries that could affect cross-country comparisons, especially in times of crisis. For example, wealth distribution could be affected by asset prices developments and income distribution could be affected by unemployment.

Despite this, the HFCS provides a unique opportunity to rely on harmonised household level information on wealth and income. As we are interested in wealth accumulation behaviours,

wealth and income are analysed at the household level[1]. The HFCS is a multiplied imputed data set (5 implicates are available). Our regressions are then estimated using multiple imputations techniques.

3.1.2 The Survey of Health, Ageing and Retirement in Europe (SHARE)

SHARE is a multidisciplinary and cross-national panel database of micro data on health, socio-economic status and social and family networks of more than 85,000 individuals aged 50 or over from 19 European countries. Data collected include information on individual labour market status and numerous health variables[2]. We use data on retirement ages extracted from the fourth wave of SHARE (led in 2010/2011) to compute retirement probabilities by age, gender and country.

3.1.3 The OECD Pension models

Estimates of pension benefits are derived from the OECD Pension Models (see OECD, 2011; 2013a for a description of the methodology). The methodology and assumptions are harmonised, allowing direct cross-country comparisons of pension systems Pension entitlements are computed under pension rules of 2010.

3.2. Matching wealth, lifetime income and pension benefits

First, matching of the HFCS data with the pension benefits estimated using the OECD pension models is carried out for each country taking into account individual's gender, age and income whether individuals declare (in the HFCS) to be eligible in the future to (public or private) pensions. Individual's pension wealth and permanent income are weighted by

[1] We choose to work with wealth and income indicators defined at the household level and not per capita figures or figures normalised by any equivalence scale. Theoretical arguments to use equivalence scale in the case of consumption indicators are well documented while wealth is usually considered at the household level. Controls for the size and the structure of the household are included in our empirical model.

2 Such as self-reported health, health conditions, physical and cognitive functioning, health behaviours, use of health care facilities.

estimated probabilities of retirement (see below section 3.2.2). Second, pension wealth is aggregated at the household level. The household total pension wealth is the sum of pension benefits of each member of the household who will be eligible in the future to a benefit from a pension plan.

3.2.1 Household wealth

As the wealth of the household we use the household's net wealth. Net wealth is defined as gross wealth less liabilities at the household level— where gross wealth includes all kind of assets of the households: real assets (household main residence, other properties, business assets, other valuables as car, durable or luxury goods) and financial assets.

3.2.2 Retirement probabilities

The probabilities of retirement are calculated from the non-parametric estimation of a survival function using the Kaplan-Meier estimator. The estimation is country- and gender-specific and uses data from SHARE.

3.2.3 Expected length of survival

The expected length of survival in each relevant year is calculated for each country, year of birth and individual's gender from data on the mortality rates reported in the Human Mortality Database (http://www.mortality.org/). Future mortality rates are predicted by exponential smoothing of the logarithm of past mortality rates.

3.2.4 Lifetime income

We define lifetime income as the discounted sum (at the discount rate of 2%) of all the earnings over the working life. That value is computed from information on the current income and time spent in employment (reported in the HFCS) and under the assumption, coherent with the OECD's pension model, of a 2% wage growth over the career. In some cases, people do not declare current wages in the HFCS because they are unemployed or out

of the labour market at the interview date. In order to impute them a wage level, we estimate a wage equation using the HFCS data[3]. We thus compute a different lifetime income for each possible retirement age, and then use an average weighted by the probabilities of retirement in the regressions.

3.2.5 Pension wealth

Pension wealth is defined as the discounted sum (with a discount rate of 2%) of all future pension benefits taking into account residual life expectancy and indexation of pension benefits in each country. Using the lifetime income and the expected length of survival, we calculate the pension wealth for each possible retirement age using the OECD's pension models. As with lifetime income, we then use its average weighted by the probabilities of retirement.

4. Sample and descriptive statistics

For the purpose of the analysis, we selected seven countries surveyed both in the HFCS and in SHARE. They are: Austria, Belgium, Germany, France, Netherlands, Portugal and Spain.[4] Only households where the reference person is active and with no self-employed individuals are retained.[5,6] Pension wealth is not computed for survey's respondents out of the labour force and for workers starting their working career after 40 years of age. Our sample is made by 5220 households, for which we have information on their socio-demographic

[3] Variables in the selection equation are: children younger than 6, age, age squared, highest level of education completed by the reference person and marital status. Variables in the log-earnings equation are: education, marital status, experience, experience squared. The indicator of age at the beginning of the career is computed as age minus the number of years of work. It could also be individuals who have started to work young but with a lot of inactivity periods. Estimations are made implicate by implicate.

[4] Italy is surveyed both in the HFCS and in SHARE. However, we do not include Italy in our analysis for comparability issues. The information on inheritance is not comparable to that provided by the other countries in HFCS. Because inheritance is a crucial covariate to explain household wealth that we include in our explanatory variables, we decide not to include Italy in our sample.

[5] The reference person is defined according to the OECD Canberra group definition (OECD 2013b).

[6] In most countries self-employed pension schemes are very specific. Moreover business wealth induces differences in the wealth accumulation process between households with and without self-employed people.

characteristics, income, assets and liabilities. The age of the reference person varies between 16 and 66 years old, with a median value equal to 48. 19% of the reference persons in the sample have at most a primary level of education, 16% a lower secondary level, 39% an upper secondary and 26% more than an upper secondary level. 66% are married.

Differences in household net wealth (see figure 1) across the 7 countries retained for the analysis exist especially with respect to the estimated median or mean net wealth. The cross-country heterogeneity may reflect differences in households' savings behaviour (and thus wealth accumulation patterns) which may potentially depend also on the characteristics of the national pension system. Our empirical analysis aims at providing new insights on this relationship.

[INSERT fig. 1]

Figure 2 plots the log of the net wealth on the log of the pension wealth. Without considering control variables, no clear pattern of association emerges between those two variables.

[INSERT FIGURE 2 ABOUT HERE]

5. Results

We first estimate the offset of pension on private saving for the pooled sample of countries, including country dummy variables to control for the structural differences among them. Results are reported in table 1.

[INSERT TABLE 1 ABOUT HERE]

The coefficients of age and age squared have the expected signs. To better capture the age pattern of private wealth accumulation, the estimation is done also using cubic spline for age

(we also include in the same regression cubic spline for permanent income indicators and pension wealth).

[INSERT FIGURE 3 AND FIGURE 4 ABOUT HERE]

The wealth/income ratio increases monotonically with age, with a slight concavity. We do not observe a hump-shaped pattern, but that should not be surprising as retirees are excluded from the sample (see figures 3 and 4).

When added linearly in the model, permanent income or lifetime permanent income variables have negative and significant coefficients. We observe strong nonlinearities, which justify the use of the restricted splines (figure 5). For individuals with low permanent income, an additional euro of income lowers the wealth/income ratio as it is consumed rather than saved. The effect remains negative up to the middle of the income distribution where it becomes slightly positive (i.e. people start saving more when their incomes increase). The marginal effect of income then diminishes and becomes zero (or even slightly negative) for the top of the income distribution. The shape is the same using Lifetime Permanent Income but the standard errors are very high. Nothing is significantly different from 0.

[INSERT FIGURE 5 ABOUT HERE]

The pension wealth/income ratio also has a strong non-linear effect. When pension wealth is either a very small part or a very large part of total wealth, the marginal effect is either statistically not significant or close to zero. However, we do observe strong marginal offset effects when the pension wealth/income ratio is in the middle of the distribution. As for permanent income, the shape is the same using the model including Lifetime Permanent Income but the standard errors are too high. Nothing is significantly different from 0.

[INSERT FIGURE 6 ABOUT HERE]

Coefficients of the country-dummies reflect some partly already known results. The log of the ratio of net wealth over permanent income is higher in Belgium, Spain, Netherland and Portugal than in Austria and Germany, even when controlling for pension wealth in the regression. Results change slightly when we consider net wealth on lifetime permanent income. However, country and pension wealth effect may well not be additive. We have thus estimated the regressions country by country. Results are illustrated in Table 2 and Table 3.

[INSERT TABLE 2 AND TABLE 3]

The coefficients of the indicators of permanent income, when significant, are negative with a strong nonlinear effect as in the global case. If we take for example the two countries with the highest and the lowest coefficient in table 2, i.e. Netherlands and Austria, we observe very different patterns (figure 7 and figure 8).

[INSERT FIGURE 7 AND FIGURE 8 ABOUT HERE]

For Austria, we find the same behaviour as for the pooled sample for all countries. We observe saving of additional euro at the bottom of the permanent income distribution, complementarity saving in the middle of the distribution and a decrease for the higher values of the distribution. For the Netherlands, the profile is flatter and without the increasing part observed for the total sample.

As far as pension wealth is concerned, results under the linear assumption for the variable are difficult to interpret. We observe indeed positive or negative effects in the first model and only one significant for Belgium in the second. This may be explained by quite high standard errors in the second model. Figures 9 and 10 show that France and Germany have opposite significant coefficients but in both cases, they reflect only very partially the offset effect between private and pension wealth which is heterogeneous along the pension wealth distribution.

[INSERT FIGURE 9 AND FIGURE 10 ABOUT HERE]

[TO BE COMPLETED]

Table 1: Pension offset

VARIABLES	Log of net wealth on permanent income	Log of net wealth on lifetime permanent income
Constant	-1.032** (0.483)	-6.897*** (0.453)
Age of reference person	0.0994*** (0.0165)	0.0618*** (0.0149)
Age squared	-0.000599*** (0.000182)	-0.000210 (0.000152)
(Lifetime) Permanent income	-0.472*** (0.0332)	-0.918*** (0.308)
Pension wealth	-0.122* (0.0661)	-0.118 (0.0908)
Unemployed in the household	-0.105 (0.0704)	-0.0731 (0.0656)
Inheritance	0.866*** (0.0581)	0.820*** (0.0667)
Austria	Ref -	Ref -
Belgium	0.361** (0.170)	0.216 (0.189)
Germany	-0.306** (0.128)	-0.191 (0.118)
Spain	0.855*** (0.0927)	1.008*** (0.0829)
France	-0.00592 (0.101)	0.258*** (0.0984)
Netherland	0.510*** (0.129)	0.537*** (0.120)
Portugal	0.332*** (0.113)	0.599*** (0.136)
Observations	5220	5220

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Control variable included: marital status, household type and education
Sources: HFCS, Share and OECD

Table 2: Pension offset by country

Permanent Income

VARIABLES	Austria	Belgium	Germany	Spain	France	Netherlands	Portugal
Constant	-1.340	0.218	-3.629*	3.068***	-2.000***	5.015	-0.920
	(1.107)	(5.353)	(2.010)	(0.783)	(0.394)	(3.464)	(1.265)
Age	0.0808*	0.147	0.0358	0.0336	0.118***	0.136	0.167***
	(0.0487)	(0.189)	(0.0412)	(0.0299)	(0.0267)	(0.101)	(0.0467)
Age squared	-0.000371	-0.00114	-3.07e-05	9.35e-05	-0.000676**	-0.00116	-0.00139***
	(0.000566)	(0.00198)	(0.000514)	(0.000305)	(0.000307)	(0.00107)	(0.000438)
Permanent income	-0.335***	-0.680***	-0.396**	-0.513***	-0.360***	-0.960***	-0.602***
	(0.121)	(0.106)	(0.169)	(0.0615)	(0.0659)	(0.170)	(0.0707)
Pension wealth	0.236	-0.102**	-0.554**	0.132	0.546***	-0.0322	-0.473**
	(0.190)	(0.0477)	(0.243)	(0.294)	(0.173)	(0.329)	(0.223)
Unemployed in the household	0.0335	-0.322	-0.198	-0.159	0.00645	0.0713	-0.0397
	(0.336)	(0.731)	(0.282)	(0.203)	(0.107)	(0.213)	(0.126)
Inheritance	1.048***	0.388*	0.960***	0.561***	0.886***	0.360	1.008***
	(0.123)	(0.210)	(0.120)	(0.158)	(0.0250)	(0.381)	(0.118)
Observations	684	207	695	1135	4304	307	714

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Controls for marital status, household type and education

Sources: HFCS, Share and OECD

Table 3: Pension offset by country

Lifetime Permanent Income

VARIABLES	Austria	Belgium	Germany	Spain	France	Netherlands	Portugal
Constant	-5.762***	-8.949**	-8.926***	-5.741***	-7.837***	-6.218**	-7.291***
	(1.067)	(4.538)	(1.516)	(2.083)	(0.540)	(2.983)	(2.004)
Age	0.0520	0.102	0.0167	0.0132	0.0828***	0.0940	0.110**
	(0.0464)	(0.193)	(0.0390)	(0.0242)	(0.0228)	(0.0972)	(0.0516)
Age squared	-3.19e-05	-0.000650	0.000153	0.000282	-0.000309	-0.000735	-0.000846*
	(0.000549)	(0.00201)	(0.000484)	(0.000227)	(0.000264)	(0.00102)	(0.000500)
Lifetime permanent income	-0.350	-1.927**	-0.743	-4.403*	-4.569***	-0.286	-0.461
	(0.735)	(0.950)	(1.113)	(2.592)	(0.631)	(1.031)	(1.489)
Pension wealth	0.0456	-0.235**	-0.578	-0.718	-0.0463	0.422	-0.304
	(0.261)	(0.0946)	(0.386)	(0.638)	(0.298)	(0.360)	(0.431)
Unemployed in the household	0.0694	-0.251	-0.180	-0.176	0.0528	0.0493	-0.0896
	(0.341)	(0.645)	(0.261)	(0.211)	(0.0994)	(0.213)	(0.171)
Inheritance	1.038***	0.293	0.926***	0.548***	0.865***	0.226	1.026***
	(0.117)	(0.280)	(0.132)	(0.163)	(0.0239)	(0.431)	(0.0907)
Observations	684	207	695	1135	4304	307	714

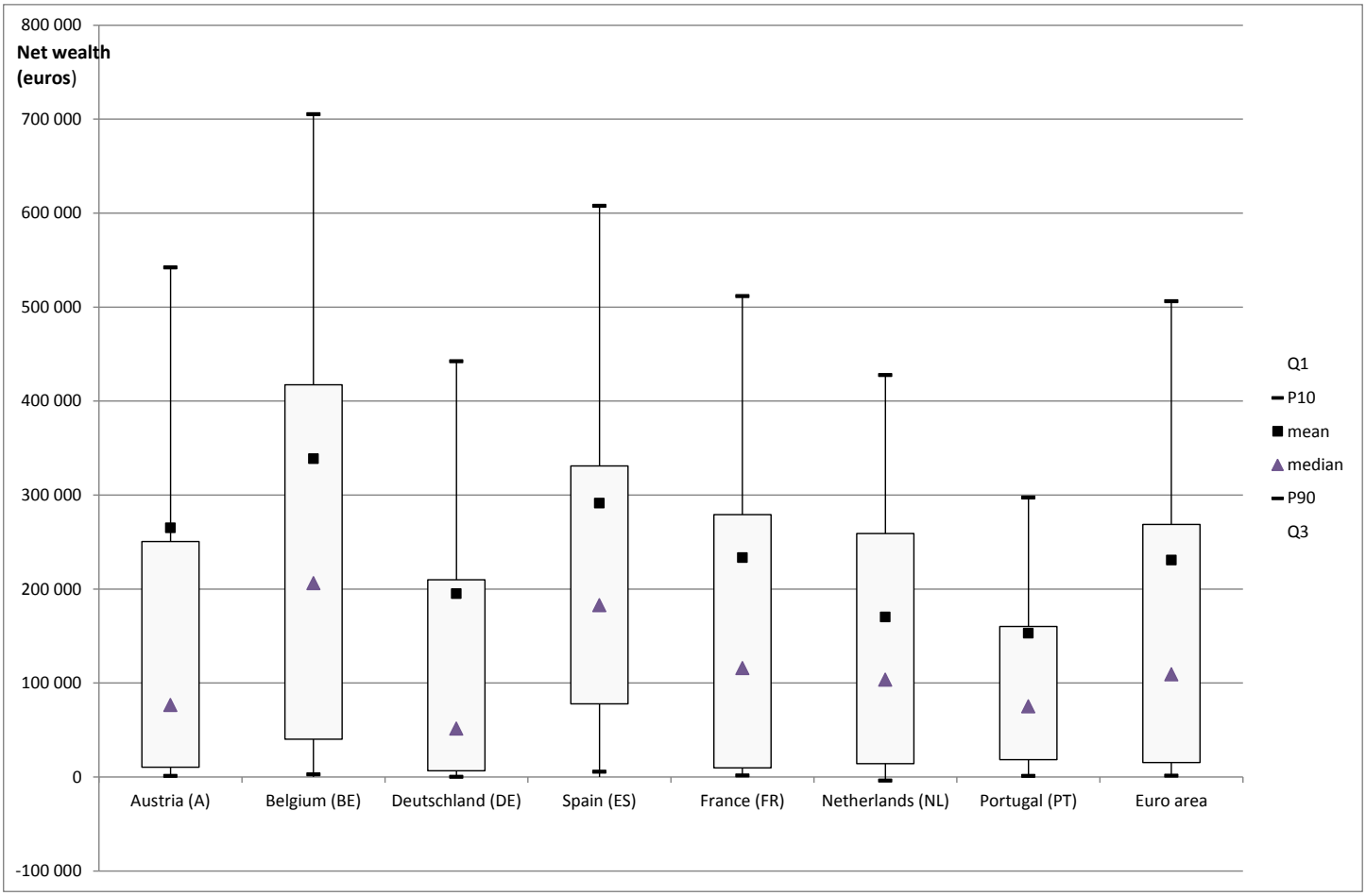
Robust standard errors entre parentheses

*** p<0.01, ** p<0.05, * p<0.1

Controls for marital status, household type and education

Sources: HFCS, Share and OECD

Figure 1: Net Wealth distributions



Source: Household Finance and Consumption Survey

Figure 2: scatter plot: net wealth and pension wealth

Figure 3: Mean effect of age on the log of the ratio of Private Wealth over Permanent Income

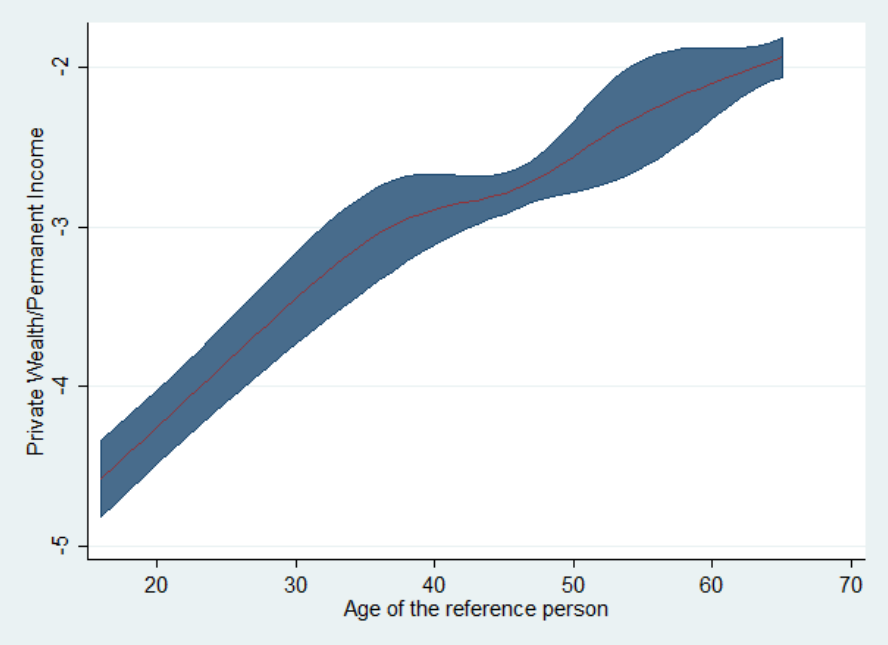


Figure 4: Mean effect of age on the log of the ratio of Private Wealth over Lifetime Permanent Income

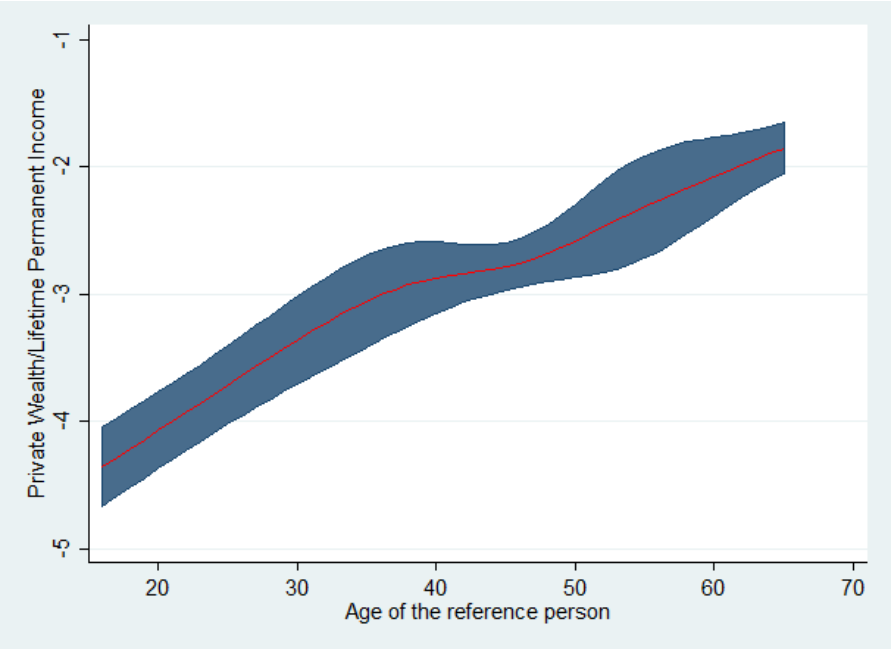


Figure 5: Marginal effect of the log of the Permanent Income on the log of the ratio of Private Wealth over Permanent Income

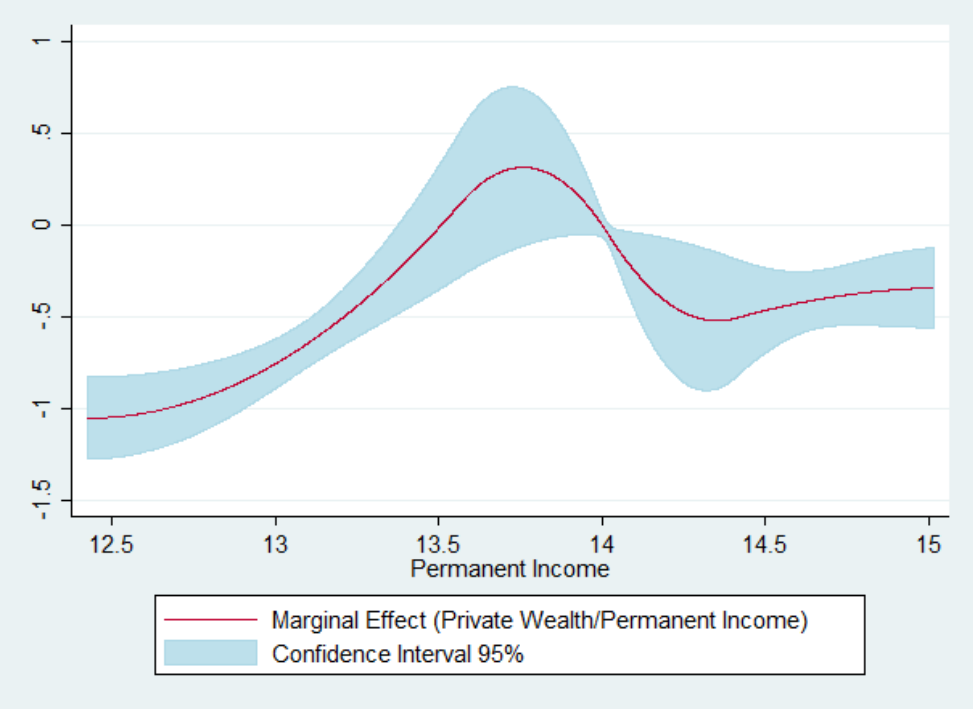


Figure 6: Marginal effect of log of the Pension Wealth on the ratio of the log of Private Wealth over Permanent Income

Figure 7: Marginal effect of log of the Permanent Income on the ratio of Private Wealth over Permanent Income, Netherlands

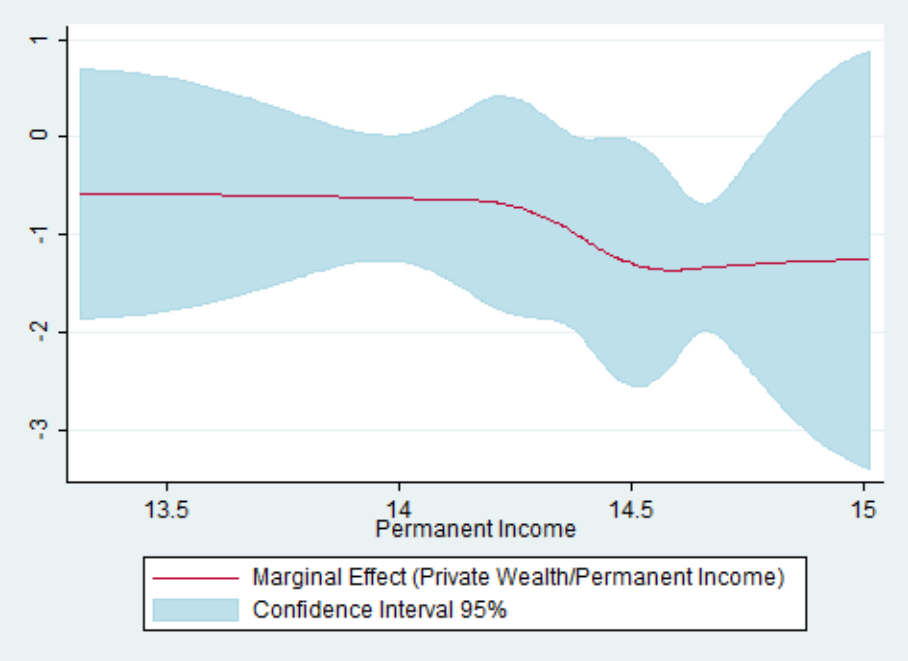


Figure 8: Marginal effect of the log of the Permanent Income on the ratio of Private Wealth over Permanent Income, Austria

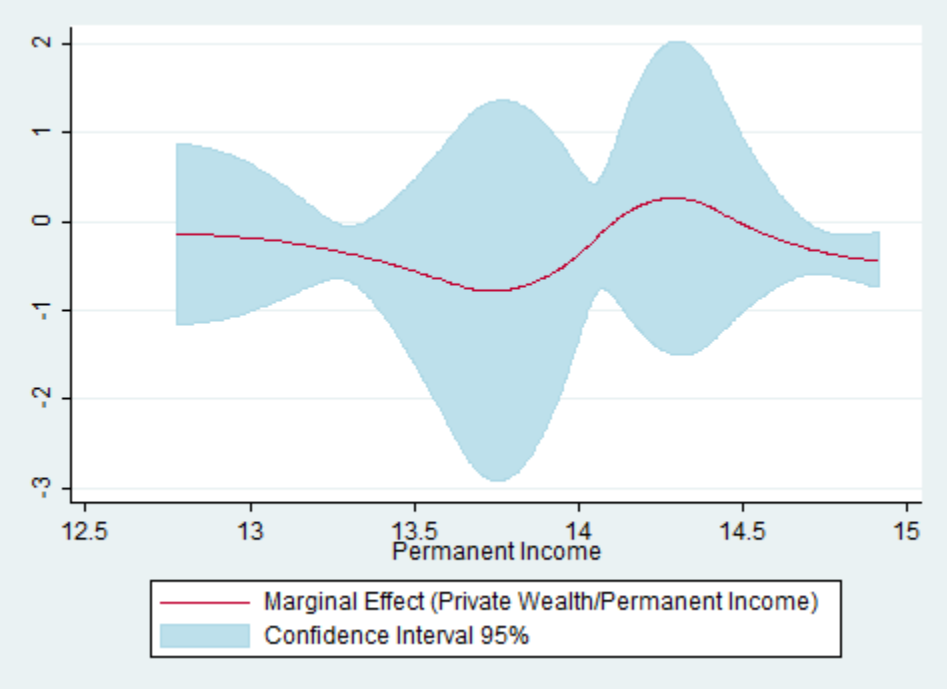


Figure 9: Marginal effect of the log of the Pension Wealth on the ratio of Private Wealth over Permanent Income, France

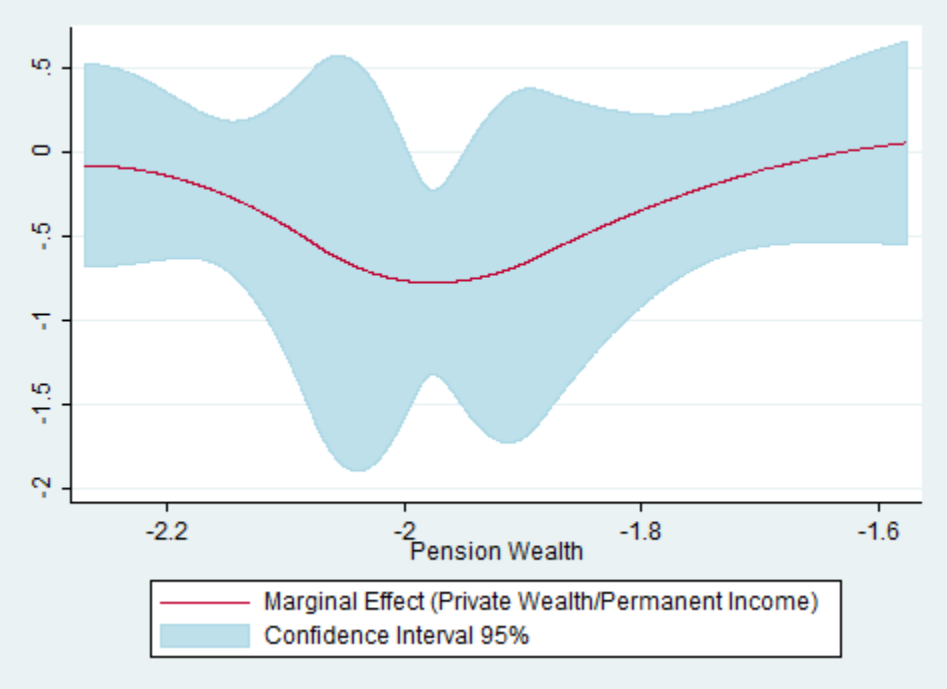
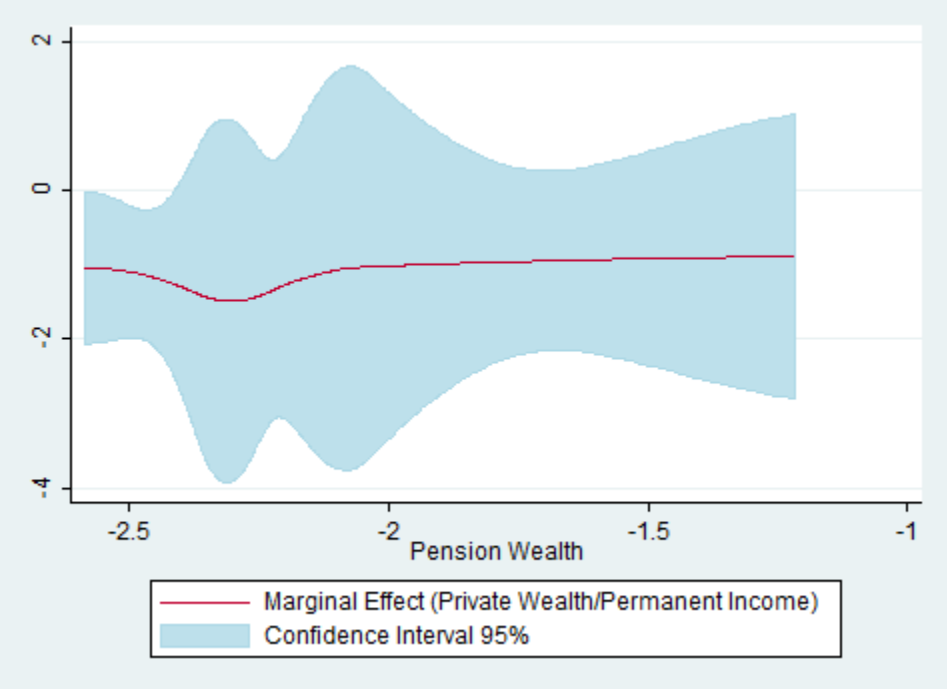


Figure 10: Marginal effect of the log of the Pension Wealth on the ratio of Private Wealth over Permanent Income, Germany



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