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THE GENDER GAP IN PENSION WEALTH IN EUROPE: EVIDENCE FROM TWENTY COUNTRIES

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The gender gap in pension wealth in Europe: Evidence from twenty countries

Tairi Rõõm and Orsolya Soosaar*

Abstract

This study analyses the gender differences in defined contribution pension assets in twenty EU member states. The analysis uses data from the 2017 wave of the Household Finance and Consumption Survey. We evaluate gender gaps in the probability of participating in defined contribution pension schemes and in the value of the assets accumulated in individual retirement accounts. The gaps in pension wealth tend to be in favour of men, but are not statistically significant in the majority of the countries that our study covers. This applies equally to participation in personalised pension schemes and to the value of pension assets. Men are significantly more likely to own pension assets in seven countries and the value of assets is significantly larger for men in six countries. The differences in pension holdings between genders stem from differences in labour market behaviour and remuneration. The patterns of work history for men and women tend to be divergent, with women usually having a lower labour market participation rate and lower wages. Taking this into account eliminates or reduces the gender gaps in pension assets in all of the countries studied. In addition, the earlier literature has shown that gaps in pension assets are related to gender differences in personal traits. Men tend to be more optimistic about investment returns, more willing to take risks when investing, and more competitive. All these traits in combination mean that they accumulate more assets on their pension accounts over the life cycle. There is no conclusive evidence for gender differences in time preferences, which would affect saving behaviour.

JEL Codes: D14, G23, G11, J32

Keywords: retirement saving behaviour, voluntary retirement savings, mandatory retirement saving system, private pension wealth, gender gap, Europe

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Non-technical summary

This study analyses the gender differences in defined contribution (DC) pension assets in twenty European Union member states. The analysis is based on the data from the 2017 wave of the Household Finance and Consumption Survey (HFCS). We evaluate gender gaps in the probability of participating in defined contribution pension schemes and in the value of the assets accumulated in individual retirement accounts.

There are several reasons why it is important to assess whether women have sufficient individual pension rights relative to men. Defined contribution (DC) retirement plans have been increasingly important in providing retirement income in many European countries in response to declining birth rates and population ageing. Pre-paid pension schemes have much less room for redistribution by design than pay-as-you-go systems however, and their growing prevalence increases the inequality of pension wealth, leading to the widening of the gender gap in pension assets as well. This has a negative impact on the pensions of women and increases their risk of poverty in retirement, given that women also have longer life expectancy and their pension savings have to provide income for a longer time. At the same time, marriages are becoming less common and divorce rates are on the rise in most European countries, implying that income sharing within households and widow's pensions are becoming less effective at preventing poverty in retirement. Given all these developments, it is relevant to assess the inequality of pension wealth between the two genders and to evaluate what factors contribute to gender differences in the pension accumulation phase. The aim of the current study is to find answers to these questions.

While there is abundant literature on the gender wage gap, the gender gaps in various other wealth components, including pension assets, have not been widely studied. The main reason for this is that while data on individual wages are readily available, wealth is usually measured at the household level. Since studying gender gaps requires individual data, it is seldom possible to do it for various wealth items. Pension assets are an exception, because DC pension accounts are individualised and the data on them are usually available at the personal level. In the current study we use the 2017 wave of the HFCS, which contains data on personal pension savings in twenty European countries. The advantages of these data are that they are harmonised across countries, are multiply imputed, and contain a rich set of covariates. To the best of our knowledge, ours is the first study to evaluate the gender gaps both in participation and in the value of the assets accumulated in DC pension plans for an extended group of countries.

We are able to look not only at total pension assets, but also at mandatory and voluntary pensions separately. Deciding to join a voluntary pension scheme is an active choice by the individual and so it is directly influenced by his/her preferences for saving and investment, while participation in mandatory pension schemes is either conditional on employment or is only one of the factors that a person considers when choosing an employer. Therefore the gender gaps and the underlying reasons for them may be different for voluntary and mandatory pensions, and it is relevant to analyse them separately.

We first study the unconditional or raw gender gap in pension assets. This arises from two components: the likelihood of holding pension assets and the mean value of the assets, conditionally on owning them. In most countries in the sample, the gap in asset values dominates the gap in ownership. Men are mostly more likely than women to have pension savings in the countries studied, but the difference is not statistically significant in the majority of cases. The likelihood of owning pension assets is significantly higher for men in seven countries (Cyprus, Germany, Ireland, Italy, Malta, the Netherlands and Poland) and

significantly higher for women in one country (Estonia). Conditional on ownership, men tend to have more pension assets than women do, but the difference between genders is again mostly not statistically significant. The median level of pension assets is significantly larger for men in three countries only (Germany, Italy and Poland).

The unconditional gender gaps in pension assets tend to be larger in the Western European countries and smaller or even insignificant in the Central and Eastern European countries covered by our study. The latter countries also have smaller employment gaps between the genders, a shorter history of DC pension systems, and wider prevalence of mandatory schemes, all of which contribute to lower pension inequality. The three countries with the smallest gender gaps in pensions in our sample – Slovakia, Lithuania and Slovenia – also have the lowest overall wealth inequality. Our study shows that the gender gaps in pension assets are on average larger than the gender income gaps are. Given the gradual shift from more redistributive pay-as-you-go pension systems towards pre-funded pension schemes in Europe, our results suggest that the gender gap in pension incomes will increase in the future.

As well as evaluating the unconditional gender gaps in pension assets, we also run regression analysis to assess the explanatory power of various individual and household characteristics and to see how large the unexplained gap is that remains after controlling for observable variables. We use the Heckman two-stage methodology, where we model the likelihood of owning pension assets in the first stage, and the current value of the assets in the second stage, correcting for selection bias. We estimate the gaps for total DC pension assets and for assets in voluntary and mandatory pension schemes, and provide these estimations for the cross section of all the countries as well as separately for each country.

We find that there is an unexplained gender gap in favour of men both in pension asset ownership and in the value of pension assets. About 41% of men and 37% of women in the cross-country sample on average have pension assets, i.e. men are four percentage points more likely to have pension assets than women are. Controlling for observable individual characteristics in the regression reduces this gap to one percentage point. The raw gap in the value of pension assets is 65% of the mean value of women's pension assets, which is considerably larger than the average gender wage gap in Europe. Controlling for observable characteristics reduces this gap to 9%.

The data indicate a large heterogeneity in Europe in the likelihood of people owning pension assets and in the average value of those assets. This variation stems from institutional differences across countries. Once all the available relevant characteristics have been controlled for, there remains a gap in pension asset ownership in favour of men in six countries: Cyprus, Ireland, Italy, Malta, Netherlands and Portugal. These are countries where a relatively small share of the population has pension assets and mostly where there is only a voluntary scheme available. The exception is Ireland, which has both types of scheme, and men have a higher probability to participate in both of them than women do. We find a statistically significant unexplained gap in favour of women in Estonia, Croatia and Poland. All three of these are CEE countries where the labour market participation of women is close to that of men and the participation in DC pension schemes (and mandatory schemes in particular) is relatively high.

The estimation results for the accumulated value of total pension assets point to a statistically significant unexplained gender gap once available characteristics have been controlled for in seven countries: Belgium, Estonia, Italy, Lithuania, the Netherlands, Poland and Slovenia. This number shrinks to two (Cyprus and Malta) for voluntary assets, and to one (Belgium) for mandatory assets. Men in Italy and the Netherlands are more likely than women to own pension assets and, correcting for selection into participation, they also have more

pension assets than women do. Women are more likely to have pension assets in Estonia than men are, but they have fewer such assets than men. In the rest of the countries, any unexplained gender gap that is statistically positive is either in participation or in the value of assets, but not in both. The magnitude of the gap in pensions in these countries is indeed economically significant and has the potential to worsen the livelihood of women in retirement relative to men.

The estimation results looking solely at voluntary pension assets suggest that given the individual choice, women tend to be less likely to save for retirement than men are, and the gap remains even after observable characteristics have been controlled for. In contrast, the gender gap for mandatory assets is rendered insignificant by including observable variables and this result mainly stems from adding income and labour market status to the model. These divergent patterns for voluntary and mandatory assets suggest that the gaps in the probability of owning pension assets are influenced by gender differences in personal traits. The earlier literature points to several behavioural reasons why men may accumulate more wealth than women do, including gender differences in risk aversion, investor optimism, financial literacy, and competitiveness. Differences in opportunities for men and women may also matter in this regard, such as differences in access to credit or access to jobs that provide pension rights. Studying these questions is an important avenue for future research.

Our analysis shows that both the probability of participating in DC pension schemes and the value of pension assets are strongly dependent on personal income, labour market participation and tenure. The finding that income and employment are important drivers of ownership and the value of pension assets implies that the subsidies typically attached to pension schemes are regressive and on average favour men.

Contents

1. Introduction

Declining birth rates and an ageing population have raised concerns in many European countries about how adequate and how sustainable the pension systems are. This has increased the prevalence of defined contribution (DC) retirement plans and lowered the reliance on defined benefit (DB) pension systems (Frerics et al. (2009)). These developments are shifting responsibility for financial security in retirement away from the public authorities and towards individuals (Neelakantan and Chang (2010)). Pre-paid pension schemes have much less room for redistribution by design than pay-as-you-go systems, and their growing prevalence increases the inequality of pension wealth. This also means that financial security depends greatly on how willing and able the individual is to accumulate enough wealth (Wolff (1998)). At the same time, it is becoming ever more important for women to have sufficient personal pension rights as marriages are becoming more unstable and the link between motherhood and marriage is loosening (Bonnet et al. (2012), Ginn (2003)). In the 2018 Pension Adequacy Report, the European Commission highlighted the fact that the gender gap in pension incomes stood at 37% in the European Union - at a much higher level compared to the gender pay gap – as one of the key challenges for policymakers (European Commission (2018)).

It is crucial to understand what contributes to gender differences in how pension assets are accumulated, as this will translate into gender gaps in pension incomes in the future. Although pension assets are personalised by definition, unlike total wealth, and so gender gaps in these assets can be studied, there are only a few papers that focus on this topic. Many of them cover only the gender gaps in owning pension assets, usually because there is no information on the value of those assets. Examples of such studies include Ginn (2003) for the UK, Dummann (2008) for Germany, Sundén and Surette (1998), Hardy and Shuey (2000), Agnew (2006), and Huberman et al. (2007) for the US, and papers by Garcia and Marquez (2017) and Fernandez-Lopez et al. (2015) that cover several European countries.[1] It is generally found in these papers that the likelihood of owning pension assets increases with labour income and consequently the gender gaps in labour force participation, working hours and wages lead to gender gaps in owning pension assets. There is no full consensus on the adjusted gender gap in pension asset ownership. Some studies find that men are more likely than women to own pension assets even after adjusting for available characteristics (e.g. Sundén and Surette (1998)), while others estimate the adjusted gap to be insignificant (Dummann (2008)) or even negative (e.g. Huberman et al. (2007), Agnew (2006)).

Gender differences in the value of the pension assets are studied by Warren (2006) and Gardiner et al. (2016) for the UK and Feng (2018) for Australia. All of them conclude that conditionally on observed characteristics, men have more pension wealth. The papers by Gardiner et al. (2016) and Feng (2018) use a similar approach to our study, correcting for the possible selection bias in pension asset participation.

The current study adds to the literature by analysing gaps in pension wealth for a wide group of European countries. To the best of our knowledge, this is the first multi-country study to evaluate the gender gaps in both participation and the value of the assets in DC pension plans. We also contribute to the literature by analysing separately the gaps in voluntary and mandatory pension assets. The decision to join a voluntary pension scheme requires the individual to make an active choice and so is directly influenced by his/her preferences for saving and investment, while participation in mandatory pension schemes is either conditional on employment or is

[1] A study by Garcia and Marquez (2017) covers Austria, Denmark, France, Germany, Italy, Netherlands, Spain and Sweden. The paper by Fernandez-Lopez et al. (2015) looks at France, Germany, Italy, the Netherlands, Poland, Spain, Sweden, and the United Kingdom.

only one factor among many that a person considers when choosing an employer. This means that the gender gaps and their underlying causes may be different for voluntary and mandatory pensions.

We use the 2017 wave of the Household Finance and Consumption Survey (HFCS) to investigate the gender differences in pension savings in 20 European countries. The advantages of these data are that they are harmonised across countries, are multiply imputed, and contain a rich set of covariates. This lets us account for factors that the earlier studies did not cover, such as the value of other assets and liabilities. The disadvantage is that the data are cross-sectional, enabling to study the conditional correlations between the variables and not the causal effects. The datasets of about half of the countries conducting the HFCS have a panel dimension, so it should be possible to employ this in the future, when the variables in the pension section that are used in the current study are covered in multiple waves.

Wealth is more unequally distributed than income, and the same holds for pension wealth. The distribution of net wealth is less equal for men than for women, and so the gender gap widens at the upper tail of the wealth distribution (e.g. Meriküll et al. (2020)). The evidence presented in this study shows that a similar pattern does not hold for pension wealth, for which the gender gaps, when present, are of similar size throughout the distribution.

We find statistically significant positive gender gaps in the probability of participating in DC pension schemes in seven countries out of twenty (Cyprus, Germany, Ireland, Italy, Malta, the Netherlands and Poland), while the gap is negative only in one country (Estonia). These differences are mainly driven by gender gaps in incomes and employment. Once we control for socio-economic and wealth-related variables, the unexplained participation gap remains statistically significant in our cross-country model for total pension assets (with men being 1.17% more likely to own pension assets than women are), and this result is driven by differences in participation in voluntary pensions. We find a positive unexplained participation gap in total pension assets for Cyprus, Ireland, Italy, Malta, the Netherlands and Portugal in the country-by-country regressions, while a negative one is found for Estonia, Croatia and Poland. The countries with a positive gender gap are those where the share of the population owning pension assets is mostly low and there is no mandatory system of accumulating DC pensions. On the other hand, all the countries with a negative gap have high overall rates of participation in DC pension systems and there is a mandatory scheme. These findings highlight how much institutional differences in the design of pension systems matter for gender equality.

The results from our study confirm that in addition to the probability of participation in pension schemes, the value of pension assets also increases with income and employment. The data in our disposal also show that the value of pension assets is positively related with other assets for a given level of income. We find evidence for several, but not for all, countries in our sample (Belgium, Estonia, Italy, Lithuania, the Netherlands, Poland and Slovenia) that controlling for a rich set of characteristics still leaves a statistically significant unexplained gender gap in pension assets in favour of men, indicating that behavioural reasons may drive the differences in the saving decisions between genders. The possible causes for that, including gender differences in personal preferences, financial literacy, etc., are discussed in the next section. The size of the unexplained gap in the value of pension assets in the cross-country model is about 9%.

This article proceeds as follows. Following the introduction, section 2 covers the pension wealth accumulation function and reviews the literature on the various reasons why men and women may accumulate pension wealth differently. Section 3 describes the data used and presents descriptive statistics for the outcome variables. Section 4 explains the estimation strategy, section 5 presents the empirical results, and finally, section 6 concludes the article.

2. Why do women have lower pension wealth? Literature review through the prism of the pension wealth accumulation function

The accumulation of pension wealth, its determinants and patterns, are similar to the accumulation of other wealth items or of net wealth in total. This literature review consequently covers not only studies on pension wealth but also studies that discuss various aspects of wealth accumulation in general.

Wealth tends to be highly concentrated, more so than income (e.g. HFCN (2013)), and the distribution of wealth is more unequal for men than for women (Meriküll et al. (2020)). The gender gaps in total net wealth tend to widen at the top of the distribution (Schneebaum et al. (2019), Meriküll et al. (2020)), but as we show in the current study, the gender gaps in pension wealth do not follow this pattern.

The pension wealth accumulation, similarly to the total wealth accumulation, follows a hump-shape pattern over the life cycle, as shown in the seminal work by Modigliani and Brumberg (1954). They developed the Lifecycle Model, which shows that individuals smooth their consumption over time by accumulating wealth during their active working lives and then decumulating assets starting from when they retire. This lifecycle savings motive implies that individuals in a cross-section from different birth cohorts hold different stocks of wealth. As women have a longer life expectancy, they should be more motivated to save for retirement and are on average older than men if the whole population is considered.[2] Longer life expectancy means that the gender pension gap should be in favour of women. However, there are other reasons why men accumulate more wealth than women do, and these are discussed below in the context of the pension wealth accumulation function.

2.1 The wealth accumulation function for pension assets

Equations (1) and (2) describe the wealth accumulation functions for pension assets:

$$P_{it}^{v} = \sum_{a=1}^{K}(1 + r_{at})P_{ai,t-1}^{v} + d_{it}^{v} + \gamma_{it}(S_{it} + H_{it}) \quad (1)$$

$$P_{it}^{m} = \sum_{a=1}^{K}(1 + r_{at})P_{ai,t-1}^{m} + d_{it}^{m} + \beta_{it}W_{it} \quad (2)$$

where P_{it} shows the value of pension assets for individual i at period t; v and m denote voluntary and mandatory pension assets accordingly; r_{at} is the return on asset a at time period t; d_{it}^{v} and d_{it}^{m} are possible matching contributions to pension assets from the government or an employer; γ_{it} is the portfolio allocation decision, i.e. the share of savings that is invested in pension assets; W_{it} is wage income; H_{it} are gifts and inheritances received; β_{it} is the share of wage income invested in pension assets; and S_{it} denote savings in a given period.
Savings are the difference between income and consumption:

$$S_{it} = Y_{it} - C_{it} \quad (3)$$

We include the government subsidy in these equations since it is common practice for governments to subsidise investments in pension funds. These subsidies are most commonly in the form of individual income tax deductions or favourable tax treatment for contributions by employers to pension funds, or in the form of matching contributions. The exact type of

[2] In the current study we focus on individuals who are 20-64 years old. The average ages of men and women in this age group are similar.

subsidization varies from country to country. There is no reason to assume though that these contributions are different for men and women once the other factors influencing them have been accounted for.

2.2 Why do men and women accumulate pension wealth differently?

The main reasons for different accumulation of pension assets between genders are differences in income and labour market behaviour of men and women. Pension savings are usually related to employee income and are often even determined as a share of wages received (especially in the case of mandatory pension schemes). They are less correlated with other types of income, e.g. entrepreneurial income. Men tend to have larger labour earnings than women because they are less likely to have interruptions in career when taking care of children or other family members (e.g. Blau and Kahn (2000)), and they tend to work longer hours and earn higher hourly pay (e.g. Huberman et al. (2007)). Men are also more likely to choose higher-paying occupations (e.g. Dolado et al. (2002)) or to work as entrepreneurs, which is associated with a higher level of wealth (Meriküll et al. (2020)). The labour market choices of men and women depend on differences in their personality traits, such as risk averseness or competitiveness, which are discussed below.

Earning less may also mean that women have worse investment opportunities or face more stringent credit constraints. There is little evidence in the literature for gender differences in access to various financial products. A rare example is a study by Alesina et al. (2013), which shows that women in Italy face more stringent conditions for obtaining business credit than men do. Access to financial opportunities may also be worse because of differences in financial literacy. Research by Annamaria Lusardi and Olivia Mitchell has shown that women are less knowledgeable in this area, while financial literacy plays an important role in long-term financial planning and investment behaviour, as well as in saving for retirement (Lusardi and Mitchell, 2007, 2008 and 2014).

Besides differences in income, gender gaps in asset accumulation can be driven by discrepancies in saving and consumption patterns. The evidence on gender gaps in savings is scarce and the existing studies yield inconclusive results. Studies focusing on gender differences in defined contribution (DC) pension plans in the US (401(k) plans) for example have provided evidence either that the contributions of men are larger (Sundén and Surette (1998)) or that those of women are (Agnew (2006)). There is insufficient research on this because data on savings are collected at the household level, but studying gender differences in savings patterns requires individual-level data. The few existing studies mostly focus on differences in retirement savings since these data exist at the individual level.

An additional source of wealth accumulation is intergenerational gifts and inheritances. If men and women inherit differently, then this may directly affect their savings in voluntary pension schemes and, indirectly through changes in income, their savings in both voluntary and mandatory schemes. However, the studies on this topic mainly indicate that there are no gender differences in inheriting in developed economies (e.g. Conley and Ryvicker (2004), Edlund and Kopczuk (2009)). This means that inheritances are not likely to cause gender gaps in pension holdings for the EU countries that the current study covers.

The decisions on how much to save out of income and what portfolio choices to make when investing pension assets also depend on personal traits or preferences. The coverage in the literature of gender differences in the personal traits that matter for asset accumulation is diverse – some traits are studied excessively while others are little discussed from the gender

perspective. In what follows, we will briefly describe what is known from the earlier literature about the following traits: risk preferences, time preferences, competitiveness, optimism, altruism and cooperation.

The topic about investment behaviour that has been researched most is the gender gap in risk taking. The existing evidence mostly shows that women are more risk averse and more conservative investors than men are (e.g. Jianakoplos and Bernasek (1998), Sundén and Surette (1998), Grable (2000), Hallahan et al. (2004)), though some recent studies using meta-analysis indicate that this question is still open (Niederle (2014), Nelson (2015)). The amount of risk an individual is willing to take has a direct impact on his/her long-term savings, since risk and return are positively related in the longer horizon. Due to compounding of returns, even modest differences in personal traits that lead to differences in risk-taking can cause substantial disparities in the pension savings accumulated over the life cycle.

The investment choices and the decision on how much to invest depend not only on risk preferences but also on optimism about future returns. Gender differences in expectations or in optimism have been studied less than differences in risk-taking. The few studies in this area indicate that men are more optimistic when making investment decisions (Dominitz and Manski (2007), Jacobsen et al. (2014)). People who have a more optimistic outlook about the future are also more willing to make risky investments, which may be an additional source of the gender gap in pension assets.

An additional trait that matters for asset accumulation is the personal discount rate, which shows how much of their current welfare a person is willing to sacrifice so as to have greater welfare in the future; this trait is often referred to as patience in psychology literature. There are only a few studies that focus on gender differences in time preferences and they yield contradictory results. The studies by Patnaik et al. (2020) and Dittrich and Leipold (2014) find men to be less patient than women, while the papers by Horn and Kiss (2019) and Wang et al. (2016) report no gender differences in patience, and Falk et al. (2018) report that women are less patient than men. The last two of these papers are multi-country studies covering more than 50 countries. Thus the evidence does not provide unanimous support for the existence of gender differences in personal discount rates.

There is abundant research on gender differences in competitiveness and the existing studies have mostly found that men are more competitive (see e.g. the literature review by Niederle (2014) and the references therein). Being more willing to compete matters for investment behaviour, since people who are more competitive are more likely to take risks. It also matters for occupational choices, since people who are more inclined to compete are also more likely to choose occupations that are exposed to competition (e.g. lawyer, entrepreneur) and that also tend to be better rewarded. The upshot of this is that men being more willing to compete leads to larger gender gaps in assets.

Altruism and the willingness to cooperate may have an impact on how assets are distributed within a household and through that on how much individual family members can save for retirement. They may impact the asset accumulation of people from all types of households, since it can be assumed that more altruistic people will contribute more to charity and donations and so have fewer resources for personal use. Studies by Niederle (2014) and Croson and Gneezy (2009) provide literature reviews of gender differences in preferences or personal traits. They find no conclusive evidence in the literature for either sex being more altruistic or cooperative.

It is likely that most of the personal traits described here are interlinked. If optimism, risk tolerance and competitiveness are pairwise positively correlated, then they have in combination a positive impact on asset accumulation and on widening the gender wealth gap. To the best of

our knowledge, the interlinkages of different personal traits have not been researched in the literature.

3. Data description

This paper employs data from the 2017 wave of the Household Finance and Consumption Survey (HFCS). The main purpose of this survey is to collect information on household wealth. It provides detailed data on household assets and liabilities together with additional information on incomes, consumption and demographic variables. The dataset of the 2017 HFCS covers 21 countries, which are 18 euro area members[3], Hungary, Poland and Croatia. Most of the countries participating in HFCS carried out the fieldwork for this wave in 2017 or 2018. For a detailed description of the survey, please see the reports by the European Central Bank (HFCN 2020a and HFCN 2020b). Most of the variables in the HFCS that we use in the current study are imputed to recover missing answers. We account for additional variation in the data stemming from imputation by employing Stata *mi estimate* commands.

The HFCS contains harmonised data on various components of wealth, most of which are collected at the household level. An exception is the data on pension assets, which are gathered at the individual level, making it possible to assess the gender gaps for this asset class. Pension wealth generally consists of two parts: the net present value of the future pension rights of DB plans, and the current value of the pension assets collected on the individual accounts of DC plans. The HFCS only collects information on DC pension assets, which are also the focus of the current study. The survey contains detailed data on individual pension plans, differentiating between holdings in public and occupational funds. Whole-life insurance funds are counted as pension savings in the HFCS and we include them among the pension savings in our analysis as well.[4] Relevantly for our study, voluntary and mandatory pension savings are collected separately, which lets us assess whether there are gender gaps across this dimension.

We restrict the sample to people who are 20–64 years old. Table 1 shows the sample sizes across countries, presenting the total number of individuals covered by the survey and the number of people who have pension savings. We leave Greece out of the following analysis because it has only a very few observations with DC pension assets. All the other countries covered have voluntary schemes for building up individual pension savings in one form or another, but only half of them have mandatory schemes for this.

[3] It covers all the euro area countries except Spain.

[4] People can save for pensions in various ways, via making various financial investments, buying real estate, etc. In the current study we only focus on assets accumulated on DC pension plans and whole life insurance funds. Since the latter make up only a minor part of the funds, we refer to these two asset classes in the analysis as "DC pension assets", or as "pension savings".

Table 1. Sample size by countries

Country	Total sample size	People having pension assets	People having voluntary pension assets	People having mandatory pension assets
AT	3901	444	444	-
BE	2964	1502	1346	499
CY	2612	385	356	46
DE	6162	3571	3571	-
EE	3980	3117	740	2998
FI	14171	5290	5290	-
FR	18215	7000	7000	-
GR	4412	5	3	2
HR	2204	1032	64	1000
HU	7996	1300	1300	-
IE	6899	1753	912	972
IT	9014	1006	1006	-
LT	2163	735	167	637
LU	2751	405	405	-
LV	1670	1533	992	746
MT	1514	201	201	-
NL	2973	618	618	-
PL	9029	8216	2804	8095
PT	8775	1206	1134	92
SI	3369	702	676	39
SK	3174	963	957	8
Total	117948	40984	29986	15134

Source: HFCS 2017.

Table 2 presents the shares of people who have pension savings across the countries covered by the HFCS 2017 survey. The participation rates are shown separately for men and women. These figures indicate wide differences across countries in the proportion of people who have DC pension plans or whole life insurance funds. The proportion is highest in Latvia and Poland, where about 90% of people have such assets, and lowest in Austria, Portugal and Luxemburg, where it is not much above 10%. Men are mostly more likely than women to have pension savings, but the difference is not statistically significant in the majority of the countries that this study covers. Participation rates in total pension assets are significantly higher for men in seven countries (Cyprus, Germany, Ireland, Italy, Malta, the Netherlands and Poland) and significantly higher for women in one country (Estonia).

There are only voluntary pension schemes in Austria, Germany, Finland, France, Hungary, Italy, Luxembourg, Malta, the Netherlands, and Slovakia. In the rest of the countries, the participation rates in voluntary and mandatory schemes are very heterogeneous, reflecting institutional differences. Like with total assets, the gender gaps in participation in voluntary and mandatory assets are mostly not statistically significant.

Table 2. Share of men and women having pension assets across countries

Country	Total assets					Voluntary assets					Mandatory assets				
	Men		Women		Sign.	Men		Women		Sign.	Men		Women		Sign.
	Value	SE	Value	SE	diff.	Value	SE	Value	SE	diff.	Value	SE	Value	SE	diff.
AT	0.129	0.010	0.102	0.008		0.129	0.010	0.102	0.008						
BE	0.530	0.018	0.490	0.018		0.469	0.018	0.440	0.017		0.216	0.014	0.143	0.014	*
CY	0.217	0.017	0.111	0.012	*	0.207	0.017	0.106	0.011	*	0.020	0.005	0.009	0.004	
DE	0.559	0.012	0.500	0.013	*	0.559	0.012	0.500	0.013	*					
EE	0.751	0.010	0.797	0.010	*	0.145	0.009	0.179	0.009	*	0.724	0.010	0.769	0.010	*
FI	0.289	0.007	0.295	0.006		0.289	0.007	0.295	0.006						
FR	0.300	0.007	0.295	0.007		0.300	0.007	0.295	0.007						
HR	0.508	0.017	0.464	0.017		0.026	0.006	0.033	0.007		0.497	0.017	0.447	0.017	
HU	0.145	0.007	0.142	0.006		0.145	0.007	0.142	0.006						
IE	0.251	0.010	0.194	0.011	*	0.127	0.007	0.093	0.007	*	0.138	0.008	0.110	0.008	
IT	0.156	0.007	0.098	0.007	*	0.156	0.007	0.098	0.007	*					
LT	0.334	0.031	0.367	0.028		0.090	0.014	0.084	0.026		0.273	0.033	0.316	0.026	
LU	0.129	0.010	0.103	0.010		0.129	0.010	0.103	0.010						
LV	0.889	0.014	0.927	0.011		0.458	0.019	0.531	0.019		0.530	0.012	0.521	0.009	
MT	0.185	0.012	0.112	0.010	*	0.185	0.012	0.112	0.010	*					
NL	0.247	0.012	0.166	0.012	*	0.247	0.012	0.166	0.012	*					
PL	0.925	0.005	0.891	0.006	*	0.329	0.011	0.315	0.010		0.917	0.005	0.877	0.006	*
PT	0.121	0.008	0.104	0.007		0.111	0.007	0.101	0.007		0.012	0.003	0.004	0.001	*
SI	0.204	0.012	0.218	0.011		0.195	0.012	0.212	0.011		0.014	0.003	0.009	0.003	
SK	0.345	0.017	0.338	0.015		0.345	0.017	0.333	0.015						
Total	0.414	0.004	0.372	0.004	*	0.324	0.004	0.286	0.004	*	0.571	0.004	0.527	0.004	*

Notes: The table presents the share of people who have pension assets and the standard errors of the estimated shares. Estimates are weighted using the survey weights. * shows that the difference between the shares of men and women is significant at the 95% level.

Table 3 shows the value of pension assets in different countries. It presents the mean, median and 95th percentile values of pension savings among people who have pension assets. These figures are given for total pension assets only. They show that men tend to have more in pension assets, but the difference between genders is mostly not statistically significant. The estimated mean value of pension assets is significantly in favour of men only in Belgium, Germany, Estonia, Finland, the Netherlands and Poland. When the ratio of men's pension assets over women's is significantly different from one, it is large in magnitude, ranging from 1.19 in Poland to 3.53 in Belgium. The gender gaps in pension assets are on average larger than the gender wage gaps or income gaps are.

Table 3. Estimated mean, median and 95th percentile values of pension assets across countries, conditional on participation

Country	Mean				Median				95th percentile			
	Men	Women	Ratio	Sign. diff.	Men	Women	Ratio	Sign. diff.	Men	Women	Ratio	Sign. diff.
AT	21058	14782	1.42		8064	6216	1.30		66456	60764	1.09	
BE	78482	22260	3.53	*	14522	11721	1.24		138040	66804	2.07	
CY	36602	24235	1.51		19547	16699	1.17		130000	65000	2.00	
DE	35895	23802	1.51	*	14814	10100	1.47	*	136800	95000	1.44	*
EE	7645	5684	1.34	*	4632	4180	1.11		21858	16248	1.35	*
FI	18362	15284	1.20	*	7286	7001	1.04		78769	59965	1.31	*
FR	34639	22205	1.56		6000	5368	1.12		111979	82734	1.35	*
HR	5825	5474	1.06		4882	4887	1.00		12023	12097	0.99	
HU	8437	6990	1.21		4532	4540	1.00		26105	21214	1.23	
IE	132488	105399	1.26		50200	33000	1.52		497995	479000	1.04	
IT	25326	18319	1.38		15000	10000	1.50	*	80000	50000	1.60	*
LT	13454	12839	1.05		11000	10200	1.08		47400	43600	1.09	
LU	30567	21434	1.43		16600	14000	1.19		116000	72400	1.60	
LV	3385	2957	1.14		1918	1803	1.06		11513	8839	1.30	
MT	30077	26907	1.12		21251	16845	1.26		69482	64267	1.08	
NL	74583	43956	1.70	*	33908	22791	1.49		261136	158589	1.65	
PL	4948	4143	1.19	*	2482	2115	1.17	*	15754	13844	1.14	*
PT	11152	6871	1.62		3113	3034	1.03		45258	23414	1.93	
SI	8615	9352	0.92		3492	3016	1.16		34938	35528	0.98	
SK	6514	6375	1.02		3951	3714	1.06		22476	22347	1.01	
Total	27844	16905	1.65	*	6920	5378	1.29	*	105294	64779	1.63	*

Notes: The table presents the estimated mean / median / 95th percentile values for total pension assets in EUR and their ratios (men / women). * denotes that the difference in estimated values for men and women is statistically significant at the 95% level.

There is evidence from the earlier literature that the gender gap in net wealth increases in the upper tail of the distribution (Schneebaum et al. (2018), Meriküll et al. (2020)) since the distribution of wealth is more unequal for men than it is for women (Meriküll et al. (2020)). We do not observe the same pattern for pension assets. The estimated ratios of men's assets over women's do not become larger or more significant at the 95th percentile than they are at the mean. Since the pension wealth gap does not increase for higher percentiles of the pension wealth distribution, we do not carry out quantile regressions and only estimate the gender gaps at the mean, using Heckman regressions. (The estimation methodology is explained in the next section).

The statistics above are provided separately for pension asset participation and asset value, conditional on participation. In what follows, we will assess gender inequality in pension wealth by looking at these two factors in combination. It is clear that women will be left worse off than men in retirement both from being less likely to own pension assets and from accumulating smaller savings in the pension schemes that they do have. The sum of these gaps is simply the overall unconditional (raw) gender gap in average pension savings, and it can be broken down into the participation and asset value effects. Although there is statistical uncertainty about both the probability of participation and the average value of assets in

pension schemes found from the HFCS sample, the decomposition based on point estimates still illustrates the heterogeneity across countries.

Equation (4) shows how the decomposition of the raw gap in pension assets is calculated:

$$GAP = mean(X_m) - mean(X_f) = pr(X_m > 0) * mean(X_m \mid X_m > 0) - pr(X_f > 0) * mean(X_f \mid X_f > 0) = pr(X_f > 0) * [mean(X_m \mid X_m > 0) - mean(X_f \mid X_f > 0)] + [pr(X_m > 0) - pr(X_f > 0)] * mean(X_f \mid X_f > 0) + [mean(X_m \mid X_m > 0) - mean(X_f \mid X_f > 0)] * [pr(X_m > 0) - pr(X_f > 0)] = pr(X_f > 0) * GAP_{Assets} + mean\left(X_f \mid (X_f > 0)\right) * GAP_{Own} + GAP_{Assets} * GAP_{own} \quad (4)$$

In this equation, X_f denotes the value of the pension assets of women and X_m that for men. The first term in the last line can be interpreted as the gain for women in their average pension assets if the gap in the asset values were to disappear. The second term measures the gain if the gap in ownership were to disappear. The last term is the multiple of the two gaps.

The decomposition of the raw gap in pension assets is shown in Figure 1. In this figure the total asset gap and its components are normalised by dividing them by the unconditional mean value of men's pension assets. It can be seen that the gap in asset values dominates the participation gap in most countries. The total gap tends to be larger in Western European countries and smaller in Central and Eastern European (CEE) countries, where voluntary pension schemes have been introduced relatively recently and there is often a mandatory scheme in place. The point estimate of the raw gap exceeds 40% in about half of the countries and is between 15% and 40% in seven countries, remaining below 15% in only four countries. This shows that the gender gap in pensions is large in magnitude, and larger than the gaps in incomes or wages. These estimates imply that women face worse conditions for retirement than men in most of the countries sampled, given also that they have longer life expectancy.

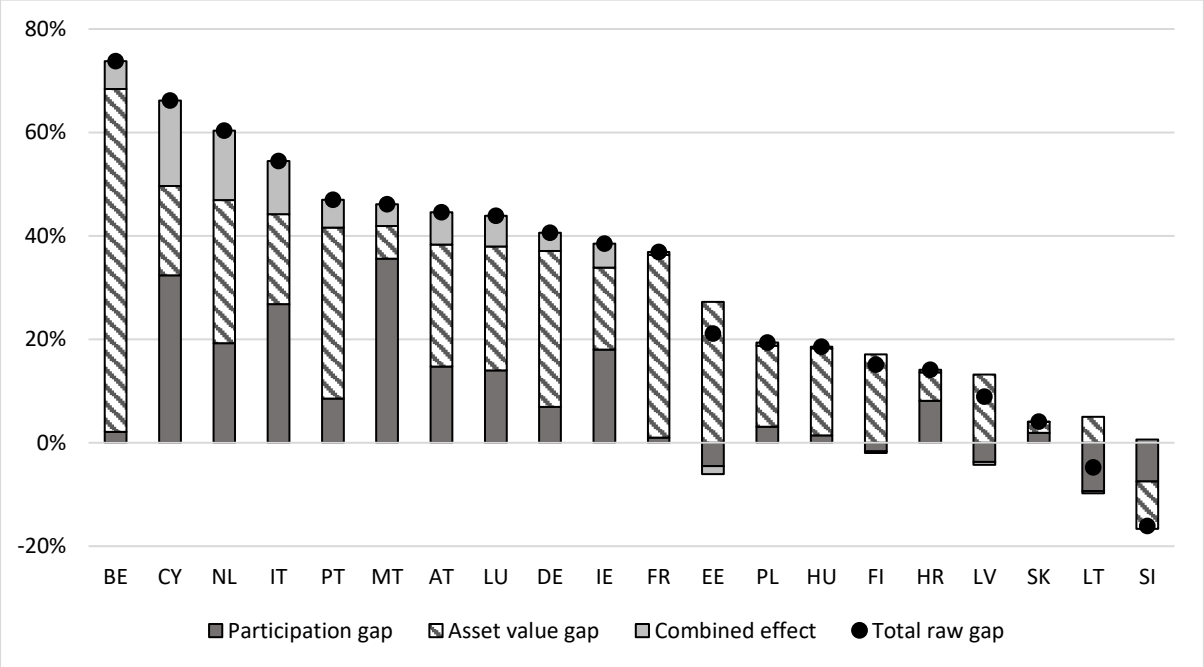

Figure 1. Decomposition of the raw gap in mean pension assets

Notes: The figure presents the unconditional gender gap in total pension assets and its decomposition, % of the average for men.

4. Estimation methodology

This section discusses the estimation methodology used in the multivariate analysis of the gender gap in pension assets. Since it is likely that the characteristics of men who own personal pension savings differ from those of women, we aim to explain the pension gap by controlling for various personal and household-level characteristics in the regressions. People who have DC pension assets may have systematically different characteristics from the total population, which could be a source of selection bias. We apply the Heckman selection model to account for differences between the characteristics observed for the group of people who have pension savings and those of the group who do not, and we estimate the following equations:

$$prob(P_i = 1) = F(\alpha Male_i + \sum_{k=1}^{K} \gamma_k x_{ik} + \sum_{s=1}^{S} \delta_s z_{is} + \varepsilon_i) \quad (5)$$

$$\ln(PW)_i = \beta Male_i + \sum_{k=1}^{K} \mu_k x_{ik} + \theta IMR_i + \varepsilon_i \quad (6)$$

where *prob* (P_i = 1) denotes the probability of having DC pension assets for individual i, $Male_i$ is a dummy indicator for being a man, x_{ik} denotes control variables and z_{is} is the set of exclusion restrictions (i.e. variables that are only included in Equation (5)). Since we estimate these equations in the multiple imputation (MI) regime, we apply the two-step approach by estimating the two equations sequentially and including the Inverse Mills Ratio (IMR) in the second equation to correct for selection.

The following control variables are included in the model:

- Education level measured as primary, secondary or tertiary
- Age and age squared
- Immigrant status defined by the country of birth
- Family status: single, cohabiting or married
- Total personal income during the last calendar year and its squared term, consisting of employment income, self-employment income, public pension income, occupational and private pensions income, and unemployment benefits. We include income/1000 and (income squared) / 1000000. (IHS-transformed income is used instead of the nominal measure and its square in the selection equation when the probit model does not converge.)
- Labour market status: employee, self-employed, unemployed or inactive
- Labour market tenure in years and its squared term
- The value of various items of assets and liabilities that the household owns. The following items are covered: business wealth, financial assets (excluding pension assets), household main residence, other real estate, vehicles, self-employment business assets, mortgage debt, and uncollateralised debt. The nominal values of all assets and liabilities are IHS-transformed and divided by the number of adult household members
- The set of country dummies (in the cross-country estimations)

The set of exclusionary restrictions is:

- Number of children: none, one, two, three or more
- An indicator for having small children aged 0–3.

The exclusionary restrictions were chosen based on the correlations of various control variables with the dependent variables in the regressions. The variables related to children were the best candidates since they were correlated with the probability of having pension savings but their correlation with the value of pension savings was weak.

Household assets and liabilities typically have skewed distributions and contain zero values. To account for that, we apply IHS transformation for various items of assets and liabilities:

$$\sinh^{-1}(w_i)=\ln(w_i + (w_i^2 + 1)^{½}) \quad (7)$$

where w_i is the wealth or liability item of individual *i*.

We add groups of control variables in the model sequentially to assess how each additional set of variables affects the gender gap in pension assets. The set of exclusionary restrictions is included in the selection equation for all the model versions estimated. The first specification, which we call M1 (also the "baseline model"), contains the controls for education, age, immigrant status, and family status. Then we start adding variables cumulatively. The second specification, M2, adds income and labour market status, the third specification, M3, adds the set of various assets and liabilities other than pension assets, and the fourth specification, M4 (also the "full model"), adds labour market tenure. We include labour market tenure in the last order since this is the only variable among the regressors that is not imputed for all countries and adding it reduces the number of observations in the regressions. Adding this variable has most impact in Finland, where it makes the number of observations fall from 14000 to about 700.

The gender gaps in pension assets may be different for voluntary and mandatory pension schemes. First, the selection into different schemes may occur in different ways, depending on whether the individual made an active decision of an individual (in the case of a voluntary scheme) or whether the scheme was only one of the factors that the individual considered when choosing an employer (as is the case with a mandatory scheme). Second, the availability of jobs that offer participation in various pension schemes may be different for men and for women. We provide separate estimations for voluntary and mandatory pension assets to see whether the difference in decisions leading to owning either type of these assets matters for the gender gap.

5. Estimation results

5.1 Cross-country results: Participation in DC pension schemes

Table 4 reports the results of the Heckman model, where the dependent variable is the dummy of pension asset ownership in the selection equation and the logarithm of the value of pension assets in the outcome equation. It presents the estimated average marginal effects for the male dummy for the selection (probit) equation, and the estimated coefficients for the same variable for the outcome (OLS) equation. The estimated coefficients for the Inverse Mills Ratio, which indicate the presence of a selection bias, are also shown.

The first four columns of Table 4 present the estimated marginal effects for the selection equation, i.e. for the probability of participation in a DC pension scheme. In the baseline model (M1) the probability of men owning pension assets is estimated to be 3.97 (SE 0.467) percentage points greater than the probability for women. To put this result into perspective, the share of people in the whole sample who have pension assets is approximately 41% for men and 37% for women (see Table 2). The gender gap in owning pension assets is greater for mandatory assets than for voluntary ones in model M1, but the difference is not statistically significant. (It should be noted that these two estimates are based on different samples, since only about half of the countries in our sample have a mandatory DC pension scheme). Adding the control variables for income, wealth and tenure (models M2, M3 and M4) reduces the

gender gap in participation, as expected. The participation gap in mandatory pension assets is fully explained by individual, income and wealth characteristics, while the gender gap in having voluntary pension assets is estimated to be 1.6 (SE 0.44) percentage points higher for men than for women in the full model (M4). This estimated marginal effect is statistically significant and drives the result for aggregate pension assets, which is 1.17 (SE 0.443) percentage points.

It can be seen from the figures presented in Table 4 that including variables controlling for income and labour market status renders the gender gap in participation in mandatory assets insignificant, while the gap is reduced but not completely eliminated for voluntary assets. Including other assets and liabilities seems to increase the gender participation gap in voluntary assets, though the difference is not statistically significant (model M2 vs model M3). There is a gender gap for voluntary assets but not for mandatory assets in the full model (M4), which includes all the available explanatory variables. This unexplained gap may stem from the control variables in the cross-sectional model having insufficient explanatory power. We are not able to control for gender differences in incomes in the past for example, but these matter for the current accumulated value of pension savings. Alternatively, the unexplained gap may stem from differences in personal traits between genders (see the discussion in Section 2). The finding that there is an unexplained gap for voluntary assets but not for mandatory ones implies that unobserved differences in personal traits may at least partly be behind this result, since participation in voluntary pension schemes involves an active decision by the individual, which depends on time and risk preferences as well as other personal traits.

The estimated effects of the other control variables included in the models (except the country fixed effects) are presented in Appendixes 1, 2 and 3. The effects are similar for total, voluntary and mandatory pension assets, so in the following we discuss these results together. The estimated results imply that the probability of owning pension assets increases with education and income, while it is concave over age and employment tenure. People with an immigrant background have a lower probability of participating in a DC pension scheme. Once we control for other wealth items, being married or cohabiting reduces the probability of owning pension assets. Having children also reduces the probability of having pension assets, and this effect gets stronger when we control for other assets and liabilities. Surprisingly, the dummy variable of having small children up to three years old is positively correlated with participation in pension assets. Employees have a higher probability of owning pension assets than do the self-employed, the unemployed or the inactive. The current value of other financial assets and the value of mortgage and non-mortgage wealth are positively related with the probability of participating in a DC pension scheme. However, the value of business wealth does not make a difference, nor does the value of other real assets, with the exception of the household main residence, which reduces the probability of having pension assets.

Table 4. Gender gaps in pension assets, Heckman regressions, cross-country estimates

	Heckman first stage (probit) regressions, marginal effects				Heckman second stage regressions			
Dependent variable	Dummy for having pension assets				Logarithm of the value of pension assets			
Model specification	M1	M2	M3	M4	M1	M2	M3	M4
				Total pension assets				
Male	0.0397***	0.00692	0.0148***	0.0117***	0.191***	0.0983***	0.131***	0.0933***
	(0.00467)	(0.00461)	(0.00419)	(0.00443)	(0.0333)	(0.0322)	(0.0321)	(0.0324)
IMR					-2.528***	-0.959	-0.00296	0.108
					(0.772)	(0.600)	(0.292)	(0.287)
No of obs.	113,478	113,476	113,476	97,991	40,948	40,947	35,337	35,337
				Voluntary pension assets				
Male	0.0371***	0.0103**	0.0189***	0.0162***	0.0301	-0.0124	0.133***	0.102***
	(0.00472)	(0.00469)	(0.00421)	(0.00440)	(0.0487)	(0.0391)	(0.0393)	(0.0394)
IMR					-7.866***	-5.895***	3.051***	3.965***
					(1.687)	(1.151)	(0.609)	(0.652)
No of obs.	113,478	113,476	113,476	97,992	29,955	29,954	29,954	24,519
				Mandatory pension assets				
Male	0.0429***	0.00485	0.00443	-0.000288	0.343***	0.197***	0.183***	0.135***
	(0.00461)	(0.00397)	(0.00394)	(0.00390)	(0.0345)	(0.0350)	(0.0339)	(0.0346)
IMR					1.427*	3.496***	-0.591	0.811
					(0.803)	(0.692)	(0.600)	(0.558)
No of obs.	43,659	43,657	43,657	43,282	15,118	15,117	15,117	14,893

Notes: Estimates for Heckman regressions on pension assets. The table presents the estimated marginal effects/ coefficients for the male dummy. Please see Section 4 for the description of the other control variables included in the regressions. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

The estimated effects for the control variables in models M1 and M2 are as expected, but the results that are related with the addition of various wealth items merit longer discussion. First, our estimations imply that people who have otherwise similar assets and liabilities are less likely to participate in DC pension schemes when they are married or cohabiting. This result stems from participation in voluntary pension schemes. It is likely that it picks up some selection effects that we fail to control for in a cross-section setting. Alternatively, it seems to imply that people who are married or cohabiting are more likely to save in other ways rather than having pension assets.

Second, the models yield both positive and negative marginal effects for other assets and liabilities. In a cross-sectional setting these results can pick up selection effects that are caused by unobservable characteristics. People who are more inclined to save do so by accumulating different types of assets simultaneously, and so the values of different assets may be positively correlated in cross-sectional data. Equally though, different components of wealth are substitutes for each other, so buying more of one asset means that less of another asset can be bought, given that resources are constrained. Therefore the values of different assets may be negatively correlated. The expected sign of the marginal effect for liabilities is also ambiguous. It can be positive, since having debt means that more resources are available for obtaining various assets, including pension assets. It can also be negative though, since people who are more indebted are also less likely to save.

5.2 Cross-country results: The value of accumulated assets in DC pension schemes

The last four columns of Table 4 present the estimates for the gender gap in the value of pension assets, conditional on participation. The figures presented show that the current value of the pension assets of men exceeds that of women by 19.1% (SE 3.33) on average when only the individual characteristics are included in the regression (model M1). The gap is reduced to 9.33% (SE 3.24) if the whole set of control variables is included in the full model (M4). The average raw pension asset gap in all countries in the sample is 65% relative to the female average (and 39% relative to the male average), suggesting that the set of personal characteristics already explains a large proportion of the asset gap.

The gender gap for voluntary pension assets is statistically insignificant if only the baseline set of explanatory variables is included in the regression. Adding controls for employment status and income does not change this, but adding other assets and liabilities renders it significant. The gap is 10.2% (SE 3.94) in the full model (M4), which is economically sizeable. This pattern suggests that women who have pension assets are better endowed than men in terms of other assets, and taking this into account widens the unexplained gender gap.

The situation is reversed for mandatory assets. The gender gap is as large as 34% in the baseline model. Including additional explanatory variables, especially income and tenure, reduces the gap, but it remains statistically significant and sizeable at 13.5% (SE 3.46) even with the full set of controls (model M4). When the full models are compared then the unexplained gaps in pension assets are not statistically significantly different for voluntary and mandatory pension assets.

The effects estimated for all the control variables in models M1 – M4 (except the country fixed effects) are presented in the last four columns of the tables in Appendixes 1, 2, and 3. We only discuss here the results for the model on total pension assets (Appendix 1). As with the selection equations, the estimated parameters for the Heckman model outcome regressions yield the results expected. The value of pension assets increases with education and income and is concave over age and tenure. Family status does not have a statistically significant effect on the current value of assets. The unemployed have less in pension assets than employees do and the self-employed have more, but this effect disappears when the value of other assets and liabilities is accounted for. The values of financial assets and real estate holdings are positively correlated with pension assets, while the value of uncollateralised debt is negatively related. The expected signs of the coefficients for other assets and liabilities could be positive or negative, similarly to pension asset participation.

5.3 Results for individual countries: Participation in DC pension schemes

Country by country estimations of the Heckman model are presented in Table 5 for the selection equation and Table 6 for the outcome equation. We discuss first the results for the selection equation, which show the difference in percentage points in the probabilities of men and women participating in pension assets. For a better understanding of the magnitude of these effects, they can be compared with the raw participation rates for pension assets for men and women across the countries sampled (see Table 2).

As the regression results presented in Tables 5 and 6 show, there is much heterogeneity across countries in the gaps in pension asset ownership and in the gaps in the current value of the assets. Looking at total pension assets and adjusted for the baseline set of characteristics

(model M1), men are more likely to have pension assets than women are in 12 of the 20 countries in the sample, and less likely in one (Estonia). After all the available relevant characteristics are controlled for, the number of countries with a positive gap shrinks to six: Cyprus, Ireland, Italy, Malta, the Netherlands and Portugal (model M4). These are the countries where a relatively small share of the population has pension assets and in most of them there is only a voluntary scheme available. The exception is Ireland, which has both types of scheme, and the probability of men participating is higher than the probability for women in both of them. The gap becomes significantly negative (i.e. in favour of women) in three countries in the full model (M4), these being Estonia, Croatia and Poland. All of these three are CEE countries and the participation in them in DC pension schemes, and mandatory schemes in particular, is relatively high.

The estimated marginal effects for the selection equation for voluntary and mandatory pension assets are presented in Appendixes 4 and 6, accordingly. The estimated effects for voluntary assets are similar to those for total assets, and the set of countries for which the effects are significant is almost the same as well. The estimated marginal effects for the male dummy with mandatory pension assets are significantly positive in five countries (Belgium, Croatia, Ireland, Poland and Portugal) and negative for two countries (Estonia and Lithuania) in the baseline regression. Adding the rest of the control variables renders the estimated effects insignificant for Portugal and negative for Croatia and Poland (see the results for model M4).

5.4 Results for individual countries: the value of accumulated assets in DC pension schemes

The regression results for the outcome equation of the Heckman model are presented in Table 6 for the total pension assets and in Appendixes 5 and 7 for voluntary and mandatory assets. When all the available characteristics are accounted for (model M4) then there is only a gender gap in the accumulated value of total pension assets in seven countries out of the twenty, these being Belgium, Estonia, Italy, Lithuania, the Netherlands, Poland and Slovenia. This number shrinks to two (Cyprus and Malta) for voluntary assets and one (Belgium) for mandatory assets.

Men in Italy and the Netherlands are more likely to own pension assets, and, correcting for selection into participation, they also have more pension assets than women do. Women are more likely to own pension assets than men are in Estonia, but they have fewer such assets than men. In the rest of the countries, there is a statistically significant gap in either participation or the value of assets, but not in both. In general, the gaps in pension asset participation are more likely to be significant and in favour of men than the gaps in asset value conditional on participation. However, when they are significant, the point estimates of the unexplained asset gaps are large in magnitude, as they are in excess of 20% in all the countries but Estonia. This implies that the unexplained gender gap in pensions is indeed economically significant and has the potential to worsen the livelihood of women in retirement, relative to that of men.

Table 5. Gender differences in the probability of having pension assets, estimated marginal effects from the selection equations of Heckman regressions

Baseline regression (M1)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.0173*	0.0393*	0.111***	0.0404**	-0.0419***	0.00960	0.0105	0.0492**	0.0144*	0.0679***	0.0680***	-0.0181	0.0140	-0.0168	0.0783***	0.0751***	0.0492***	0.0321***	0.00854	0.0184
SE	(0.00969)	(0.0204)	(0.0226)	(0.0176)	(0.0125)	(0.00698)	(0.00769)	(0.0205)	(0.00753)	(0.0121)	(0.00781)	(0.0219)	(0.0122)	(0.0180)	(0.0128)	(0.0162)	(0.00702)	(0.00887)	(0.0118)	(0.0167)
Obs	3,901	2,964	2,612	6,120	3,980	14,167	18,209	2,204	7,996	6,899	9,014	2,163	2,751	1,670	1,508	2,973	9,023	8,775	3,369	3,174

Baseline + income + labour market status (M2)

	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.00209	-0.00325	0.0788***	0.00272	-0.0427***	-0.0105	-0.00688	-0.0319*	0.00214	0.0311**	0.0284***	-0.0280	-0.0131	-0.0149	0.0111	0.0502***	-0.00319	0.0229***	-0.00956	-0.00125
SE	(0.0102)	(0.0201)	(0.0229)	(0.0168)	(0.0124)	(0.00755)	(0.00820)	(0.0163)	(0.00751)	(0.0123)	(0.00894)	(0.0223)	(0.0138)	(0.0202)	(0.0119)	(0.0167)	(0.00528)	(0.00887)	(0.0117)	(0.0173)
Obs	3,901	2,964	2,612	6,120	3,980	14,167	18,209	2,204	7,996	6,899	9,014	2,163	2,751	1,670	1,514	2,973	9,021	8,775	3,369	3,174

Baseline + income + labour market status + other assets and liabilities (M3)

	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.00860	0.0120	0.0797***	0.0232	-0.0430***	-0.00696	0.00256	-0.0322*	0.00507	0.0376***	0.0330***	-0.0358	0.000364	-0.0173	0.0206**	0.0479***	-0.00357	0.0227***	-0.0123	-0.00290
SE	(0.00852)	(0.0171)	(0.0203)	(0.0149)	(0.0120)	(0.00428)	(0.00632)	(0.0165)	(0.00714)	(0.0118)	(0.00892)	(0.0231)	(0.0105)	(0.0198)	(0.00839)	(0.0135)	(0.00518)	(0.00705)	(0.0107)	(0.0170)
Obs	3,901	2,964	2,612	6,120	3,980	14,167	18,209	2,204	7,996	6,899	9,014	2,163	2,751	1,670	1,514	2,973	9,021	8,775	3,369	3,174

Baseline + income + labour market status + other assets and liabilities + employment tenure (M4)

	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.0101	0.00878	0.0820***	0.0130	-0.0457***	-0.0102	0.00813	-0.0433***	0.00493	0.0321***	0.0304***	-0.0391	0.000217	-0.0173	0.0211**	0.0495***	-0.0110**	0.0230***	-0.0137	-0.0105
SE	(0.00851)	(0.0173)	(0.0206)	(0.0150)	(0.0119)	(0.0160)	(0.00655)	(0.0158)	(0.00719)	(0.0117)	(0.00886)	(0.0244)	(0.0109)	(0.0204)	(0.00869)	(0.0145)	(0.00507)	(0.00702)	(0.0106)	(0.0170)
Obs	3,901	2,964	2,610	6,120	3,980	673	16,741	2,201	7,976	6,899	9,012	2,163	2,751	1,670	1,514	2,973	8,764	8,775	3,369	3,150

Notes: Estimates for probit regressions, the dependent variable is the dummy indicator for having DC pension assets. The table presents the estimated marginal effects for the male dummy. Please see Section 4 for the description of the other control variables included in the regressions. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

Table 6. Gender gaps in the value of pension assets, estimates from the outcome equations of Heckman regressions

Baseline regression (M1)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.185	0.409***	0.0536	0.133	0.184***	0.149***	-0.0103	0.144	0.0780	0.323*	0.152	0.270	0.139	0.119	-0.590**	0.373	0.325***	-0.0385	0.404**	0.107
SE	(0.273)	(0.0935)	(0.352)	(0.0902)	(0.0696)	(0.0557)	(0.0625)	(0.139)	(0.105)	(0.183)	(0.300)	(0.171)	(0.156)	(0.0806)	(0.233)	(0.348)	(0.0369)	(0.319)	(0.163)	(0.104)
Obs	444	1,502	385	3,552	3,117	5,288	6,996	1,032	1,300	1,753	1,006	735	405	1,533	201	618	8,210	1,206	702	963

Baseline + income + labour market status (M2)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.0912	0.233***	0.336	0.0683	-0.0542	0.115*	-0.141**	-0.0245	0.0708	-0.0296	0.139	0.205	0.00336	-0.0447	-0.363***	0.152	0.0462	-0.133	0.283*	-0.0625
SE	(0.241)	(0.0878)	(0.292)	(0.108)	(0.0591)	(0.0642)	(0.0596)	(0.117)	(0.0999)	(0.135)	(0.144)	(0.144)	(0.182)	(0.0701)	(0.123)	(0.201)	(0.0331)	(0.210)	(0.149)	(0.126)
Obs	444	1,502	385	3,552	3,117	5,288	6,996	1,032	1,300	1,753	1,006	735	405	1,533	201	618	8,209	1,206	702	963

Baseline + income + labour market status + other assets and liabilities (M3)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.0836	0.266***	0.446	0.106	-0.0196	0.0520	-0.0846	-0.0216	0.0719	0.0727	0.218*	0.0814	0.0803	-0.0560	0.218**	0.299	0.0588*	0.0497	0.296**	-0.0491
SE	(0.240)	(0.0855)	(0.279)	(0.0869)	(0.0554)	(0.0546)	(0.0610)	(0.113)	(0.101)	(0.166)	(0.115)	(0.142)	(0.151)	(0.0705)	(0.0924)	(0.242)	(0.0331)	(0.198)	(0.151)	(0.109)
Obs	444	1,502	385	3,552	3,117	5,288	6,996	1,032	1,300	1,753	1,006	735	405	1,533	201	618	8,209	1,206	702	963

Baseline + income + labour market status + other assets and liabilities + employment tenure (M4)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	-0.0732	0.444***	0.605	0.0390	0.139*	-0.577	-0.0482	0.141	0.0327	-0.0140	0.255**	0.204*	0.253	-0.114	-0.130	0.606**	0.468**	-0.148	0.259*	0.122
SE	(0.280)	(0.0994)	(0.371)	(0.0750)	(0.0831)	(0.624)	(0.0583)	(0.159)	(0.124)	(0.122)	(0.119)	(0.118)	(0.214)	(0.0726)	(0.168)	(0.253)	(0.203)	(0.221)	(0.133)	(0.127)
Obs	194	1,039	221	2,657	1,194	72	7,023	459	682	907	1,007	548	161	1,531	126	307	358	835	522	354

Notes: Estimates for OLS regressions including the Inverse Mills Ratio to control for selection. The dependent variable is the logarithm of the value of DC pension assets. The table presents the estimated coefficients for the male dummy. Please see Section 4 for the description of the other control variables included in the regressions. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

6. Conclusion

The current paper assesses the unconditional and conditional gender gaps in DC pension assets using a large sample of households from 20 European countries. We find that there are unexplained gender gaps in favour of men in both pension asset ownership and the value of pension assets. On average about 41% of men and 37% of women own pension assets, i.e. men are about 4 percentage points more likely to have pension assets than women are. Controlling for observable individual characteristics in the regression reduces this gap to 1 percentage point. The raw gap in the value of pension assets is 65% of the mean value of women's pension assets, which is considerably larger than the average gender wage gap in Europe. Controlling for observable characteristics reduces this gap to 9%.

The situation varies at the country level, with a statistically significant positive gender gap in pension asset ownership estimated for seven of the twenty countries in the sample (Belgium, Estonia, Italy, Lithuania, the Netherlands, Poland and Slovenia). While there tend to be gaps in participation in favour of men in countries with low overall participation and no mandatory DC scheme, we find a gap in favour of women in three CEE counties with mandatory schemes. In contrast, both the raw and adjusted gaps in the value of pension assets are invariantly in favour of men when they are statistically significant. Given the gradual shift from more redistributive pay-as-you-go pension systems towards pre-funded pension schemes in Europe, our results suggest that the gender gap in pension incomes will widen in the future.

We use the rich dataset of the 2017 Household Finance and Consumption Survey, which is the first multi-country survey that is well suited for analysing not only the gender gap in owning individual pension assets, but also the gender gap in their value. We use the Heckman two-stage methodology, where we model the likelihood of owning pension assets in the first stage and the current value of the assets in the second stage, correcting for selection bias. We estimate the gaps for total DC pension assets and for assets in voluntary and mandatory pension schemes, and we provide these estimations for the cross section of all the countries and also separately for each country.

The results of the estimations point to a large heterogeneity in the likelihood of people owning pension assets and, for those who do own them, in the average value of those assets in Europe. The differences stem from institutional differences across countries. The unconditional gender gaps in pension assets tend to be larger in the Western European countries and smaller or even insignificant in the Central and Eastern European countries covered by our sample. The second group also generally have lower employment gaps between the genders, and have a shorter history of DC pension systems and a wider prevalence of mandatory schemes, all of which help reduce pension inequality. The three countries with the smallest gender gaps in pensions in our sample – Slovakia, Lithuania and Slovenia – also have the lowest overall wealth inequality as measured by the Gini coefficient (HFCS (2020)).

The estimation results looking solely at voluntary pension assets suggest that given the individual choice, the probability of women saving for retirement tends to be lower than that for men, and the gap remains even after observable characteristics are controlled for. In contrast, the gender gap for mandatory assets is rendered insignificant by including observable variables, and this result stems mainly from adding income and labour market status to the model. These divergent patterns for voluntary and mandatory assets suggest that the gaps in the probability of owning pension assets are influenced by gender differences in personal traits. The earlier literature points to several behavioural reasons why men may accumulate more wealth than women do, including gender differences in risk aversion, investor optimism, financial literacy, and competitiveness. Differences in opportunities for men and women may

also matter in this regard, such as differences in access to credit or access to jobs that provide pension rights. Studying these questions is an important avenue for future research.

Our analysis shows that both the probability of participating in DC pension schemes and the value of pension assets are strongly dependent on personal income, labour market participation and tenure. The finding that income and employment are important drivers of ownership and the value of pension assets implies that the subsidies typically attached to pension schemes are regressive and on average favour men.

The main limitation of our study is that it is based on a cross-section of households, rather than on a panel. This means we are unable to separate the life-cycle effects of saving from, say, cohort differences. In the absence of the time dimension, we are also unable to determine whether the gender gaps are increasing or decreasing. These topics are also left for future studies.

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Appendix 1. Estimations for Heckman regressions, cross-country estimates, total pension assets

	Heckman first stage (probit) regressions, marginal effects				Heckman second stage regressions			
Dependent variable	**Dummy of having pension assets**				**Logarithm of the value of pension assets**			
Model specification	M1	M2	M3	M4	M1	M2	M3	M4
Gender (control group: female)								
Male	0.0397***	0.00692	0.0148***	0.0117***	0.191***	0.0983***	0.131***	0.0933***
	(0.00467)	(0.00461)	(0.00419)	(0.00443)	(0.0333)	(0.0322)	(0.0321)	(0.0324)
Education level (control group: primary)								
Secondary	0.108***	0.0712***	0.0268***	0.0217***	0.246***	0.275***	0.216***	0.185***
	(0.00745)	(0.00742)	(0.00637)	(0.00657)	(0.0719)	(0.0613)	(0.0548)	(0.0567)
Tertiary	0.198***	0.129***	0.0373***	0.0421***	0.581***	0.530***	0.399***	0.437***
	(0.00817)	(0.00805)	(0.00668)	(0.00698)	(0.0969)	(0.0760)	(0.0670)	(0.0692)
Age	0.0408***	0.0220***	0.0182***	0.0100***	0.105***	0.124***	0.133***	0.0961***
	(0.00180)	(0.00195)	(0.00166)	(0.00203)	(0.0176)	(0.0125)	(0.0129)	(0.0176)
Age squared	–0.0424***	–0.0205***	–0.0174***	–0.0112***	–0.0671***	–0.0889***	–0.102***	–0.0874***
	(0.00202)	(0.00222)	(0.00192)	(0.00230)	(0.0190)	(0.0140)	(0.0144)	(0.0195)
Immigrant	–0.133***	–0.114***	–0.0342***	–0.0315***	–0.227**	–0.330***	–0.278***	–0.259***
	(0.0113)	(0.0105)	(0.00802)	(0.00813)	(0.105)	(0.0934)	(0.0850)	(0.0878)
Number of children (control group: no children)								
One	–0.00924	–0.00890	–0.0193***	–0.0228***				
	(0.00757)	(0.00743)	(0.00595)	(0.00618)				
Two	0.00102	0.00292	–0.0137**	–0.0185***				
	(0.00874)	(0.00889)	(0.00626)	(0.00647)				
Three or more	–0.0416***	–0.0262**	–0.0204**	–0.0234***				
	(0.0119)	(0.0118)	(0.00853)	(0.00866)				
Has children <3 years old	0.0226**	0.0140	0.0308***	0.0316***				
	(0.0107)	(0.0102)	(0.00742)	(0.00756)				
Married	0.0251***	0.0214***	–0.0177***	–0.0176***	0.0434	0.0623	–0.0253	–0.0187
	(0.00693)	(0.00679)	(0.00530)	(0.00540)	(0.0430)	(0.0410)	(0.0409)	(0.0417)
Cohabiting	–0.00417	0.00321	–0.0400***	–0.0379***	0.0462	0.0474	–0.0276	–0.0189
	(0.00997)	(0.00960)	(0.00724)	(0.00752)	(0.0629)	(0.0620)	(0.0585)	(0.0601)
Income						0.0104***	0.00920***	0.00906***
						(0.00182)	(0.00159)	(0.00178)
Income squared						–4.84e-06	–4.33e-06	–4.26e-06
						(4.17e-06)	(3.72e-06)	(4.40e-06)
IHS(income)		0.0261***	0.0171***	0.0148***				
		(0.00181)	(0.00133)	(0.00134)				
Labour market status (control group: employees)								
Self-employed		–0.00760	–0.0216***	–0.0237***		0.207***	0.0748	0.0702
		(0.00986)	(0.00791)	(0.00804)		(0.0509)	(0.0557)	(0.0559)
Unemployed		–0.142***	–0.0873***	–0.0700***		–0.439***	–0.463***	–0.361***
		(0.00973)	(0.00781)	(0.00822)		(0.0888)	(0.0813)	(0.0818)
Inactive		–0.160***	–0.132***	–0.114***		0.102	–0.0393	0.0937
		(0.00754)	(0.00657)	(0.00708)		(0.0772)	(0.0661)	(0.0652)
Tenure				0.00759***				0.0450***

				(0.000911)				(0.00875)
Tenure squared				–0.0103***				–0.0392**
				(0.00191)				(0.0177)
Business wealth			–0.00144	–0.00192			–0.00837	–0.0134
			(0.00216)	(0.00258)			(0.0192)	(0.0233)
Financial assets			0.0352***	0.0351***			0.0695***	0.0723***
			(0.000322)	(0.000328)			(0.00548)	(0.00547)
Household main residence			–0.00129**	–0.00108*			0.0193***	0.0180***
			(0.000559)	(0.000576)			(0.00446)	(0.00457)
Other real estate			3.79e-05	0.000302			0.0186***	0.0191***
			(0.000476)	(0.000489)			(0.00360)	(0.00362)
Vehicles			0.000666	0.000143			0.00656	0.00232
			(0.000714)	(0.000746)			(0.00641)	(0.00654)
Self-employment businesses			–0.000751	–0.000323			0.0140	0.0175
			(0.00208)	(0.00250)			(0.0192)	(0.0232)
Mortgage debt			0.00125**	0.000948*			–0.000734	–0.000330
			(0.000506)	(0.000522)			(0.00370)	(0.00378)
Uncollateralized debt			0.00235***	0.00222***			–0.0202***	–0.0212***
			(0.000529)	(0.000537)			(0.00471)	(0.00490)
IMR					–2.528***	–0.959	–0.00296	0.108
					(0.772)	(0.600)	(0.292)	(0.287)
No of observations	113,478	113,476	113,476	97,991	40,948	40,947	35,337	35,337

Notes: Estimates for Heckman regressions on total pension assets. Regressions include a set of country dummies in addition to variables shown. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

Appendix 2. Estimations for Heckman regressions, cross-country estimates, voluntary pension assets

	Heckman first stage (probit) regressions, marginal effects				Heckman second stage regressions			
Dependent variable	**Dummy of having pension assets**				**Logarithm of the value of pension assets**			
Model specification	M1	M2	M3	M4	M1	M2	M3	M4
Gender (control group: female)								
Male	0.0371***	0.0103**	0.0189***	0.0162***	0.0301	–0.0124	0.133***	0.102***
	(0.00472)	(0.00469)	(0.00421)	(0.00440)	(0.0487)	(0.0391)	(0.0393)	(0.0394)
Education level (control group: primary)								
Secondary	0.103***	0.0748***	0.0230***	0.0197***	–0.135	0.0164	0.281***	0.277***
	(0.00744)	(0.00765)	(0.00671)	(0.00692)	(0.131)	(0.0921)	(0.0687)	(0.0709)
Tertiary	0.207***	0.149***	0.0348***	0.0397***	–0.150	0.00204	0.465***	0.545***
	(0.00815)	(0.00830)	(0.00690)	(0.00719)	(0.221)	(0.138)	(0.0811)	(0.0851)
Age	0.0376***	0.0221***	0.0174***	0.0114***	–0.0359	0.0395**	0.166***	0.141***
	(0.00184)	(0.00200)	(0.00167)	(0.00210)	(0.0405)	(0.0200)	(0.0176)	(0.0227)
Age squared	–0.0381***	–0.0199***	–0.0160***	–0.0120***	0.0765*	–0.0128	–0.135***	–0.137***
	(0.00206)	(0.00227)	(0.00193)	(0.00238)	(0.0424)	(0.0210)	(0.0192)	(0.0251)
Immigrant	–0.141***	–0.125***	–0.0304***	–0.0273***	0.256	0.0788	–0.311***	–0.297***
	(0.0123)	(0.0116)	(0.00849)	(0.00858)	(0.159)	(0.120)	(0.0884)	(0.0903)
Number of children (control group: no children)								
One	–0.00126	–0.00183	–0.0159***	–0.0180***				
	(0.00808)	(0.00794)	(0.00599)	(0.00622)				
Two	0.0122	0.0137	–0.00754	–0.0105				
	(0.00897)	(0.00909)	(0.00617)	(0.00639)				
Three or more	–0.0289**	–0.0158	–0.00822	–0.00905				
	(0.0130)	(0.0129)	(0.00879)	(0.00897)				
Has children <3 years old	0.0193*	0.0140	0.0271***	0.0269***				
	(0.0109)	(0.0105)	(0.00737)	(0.00753)				
Married	0.0189***	0.0147**	–0.0286***	–0.0292***	–0.0483	0.0119	–0.0997**	–0.106**
	(0.00725)	(0.00711)	(0.00543)	(0.00560)	(0.0571)	(0.0502)	(0.0486)	(0.0491)
Cohabiting	0.00360	0.00764	–0.0403***	–0.0378***	0.0448	0.0596	–0.0983	–0.116
	(0.0108)	(0.0105)	(0.00765)	(0.00803)	(0.0798)	(0.0777)	(0.0765)	(0.0781)
Income						0.0103***	0.0101***	0.0102***
						(0.00151)	(0.00144)	(0.00159)
Income squared						–8.28e-06**	–8.48e-06**	–9.01e-06**
						(3.29e-06)	(3.39e-06)	(3.98e-06)
IHS(income)		0.0221***	0.0114***	0.00932***				
		(0.00194)	(0.00136)	(0.00138)				
Labour market status (control group: employees)								
Self-employed		–0.0285***	–0.0288***	–0.0315***		0.417***	0.0544	0.0330
		(0.00973)	(0.00786)	(0.00796)		(0.0730)	(0.0713)	(0.0731)
Unemployed		–0.146***	–0.0766***	–0.0649***		0.455***	–0.380***	–0.307**
		(0.0101)	(0.00778)	(0.00838)		(0.147)	(0.124)	(0.126)
Inactive		–0.136***	–0.0994***	–0.0854***		0.812***	–0.166**	–0.0871
		(0.00770)	(0.00658)	(0.00710)		(0.138)	(0.0839)	(0.0796)

Tenure				0.00540***				0.0410***
				(0.000942)				(0.0124)
Tenure squared				–0.00614***				–0.0237
				(0.00198)				(0.0236)
Business wealth			–0.00278	–0.00349			–0.0146	–0.0260
			(0.00258)	(0.00316)			(0.0239)	(0.0319)
Financial assets			0.0389***	0.0389***			0.175***	0.207***
			(0.000301)	(0.000306)			(0.0225)	(0.0241)
Household main residence			–0.00199***	–0.00183***			0.0214***	0.0188***
			(0.000555)	(0.000576)			(0.00523)	(0.00531)
Other real estate			–0.000654	–0.000392			0.0175***	0.0173***
			(0.000486)	(0.000499)			(0.00438)	(0.00443)
Vehicles			9.45e-05	–0.000327			0.00924	0.00651
			(0.000732)	(0.000760)			(0.00817)	(0.00833)
Self-employment businesses			2.78e-05	0.000767			0.0170	0.0256
			(0.00254)	(0.00311)			(0.0238)	(0.0319)
Mortgage debt			0.00213***	0.00190***			–0.00102	0.000385
			(0.000499)	(0.000517)			(0.00427)	(0.00435)
Uncollateralized debt			0.00249***	0.00235***			–0.0204***	–0.0189***
			(0.000549)	(0.000556)			(0.00556)	(0.00562)
IMR					–7.866***	–5.895***	3.051***	3.965***
					(1.687)	(1.151)	(0.609)	(0.652)
No of observations	113,478	113,476	113,476	97,992	29,955	29,954	29,954	24,519

Notes: Estimates for Heckman regressions on voluntary pension assets. Regressions include a set of country dummies in addition to variables shown. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

Appendix 3. Estimations for Heckman regressions, cross-country estimates, mandatory pension assets

	Heckman first stage (probit) regressions, marginal effects				Heckman second stage regressions			
Dependent variable	**Dummy of having pension assets**				**Logarithm of the value of pension assets**			
Model specification	M1	M2	M3	M4	M1	M2	M3	M4
Gender (control group: female)								
Male	0.0429***	0.00485	0.00443	–0.000288	0.343***	0.197***	0.183***	0.135***
	(0.00461)	(0.00397)	(0.00394)	(0.00390)	(0.0345)	(0.0350)	(0.0339)	(0.0346)
Education level (control group: primary)								
Secondary	0.0776***	0.0306***	0.0273***	0.00878	0.397***	0.269***	0.181***	0.115*
	(0.00947)	(0.00699)	(0.00716)	(0.00675)	(0.0818)	(0.0715)	(0.0687)	(0.0692)
Tertiary	0.122***	0.0471***	0.0395***	0.0270***	0.789***	0.466***	0.325***	0.344***
	(0.0103)	(0.00795)	(0.00820)	(0.00769)	(0.0954)	(0.0893)	(0.0853)	(0.0848)
Age	0.0307***	0.0128***	0.0126***	–0.000765	0.161***	0.125***	0.105***	0.0309*
	(0.00185)	(0.00165)	(0.00163)	(0.00175)	(0.0182)	(0.0134)	(0.0128)	(0.0179)
Age squared	–0.0350***	–0.0134***	–0.0133***	–0.00148	–0.133***	–0.0874***	–0.0681***	–0.0210
	(0.00207)	(0.00191)	(0.00189)	(0.00198)	(0.0205)	(0.0151)	(0.0147)	(0.0205)
Immigrant	–0.0596***	–0.0455***	–0.0393***	–0.0376***	–0.261*	–0.380**	–0.185	–0.243
	(0.0108)	(0.00911)	(0.00908)	(0.00893)	(0.155)	(0.158)	(0.150)	(0.152)
Number of children (control group: no children)								
One	–0.0133*	–0.00155	–0.00265	–0.00904				
	(0.00755)	(0.00655)	(0.00659)	(0.00654)				
Two	–0.0286***	–0.0175**	–0.0199***	–0.0274***				
	(0.00830)	(0.00727)	(0.00732)	(0.00713)				
Three or more	–0.0639***	–0.0408***	–0.0414***	–0.0457***				
	(0.0122)	(0.0109)	(0.0108)	(0.0105)				
Has children <3 years old	0.0337***	0.0218**	0.0215**	0.0238***				
	(0.0104)	(0.00896)	(0.00901)	(0.00876)				
Married	0.0393***	0.0270***	0.0229***	0.0216***	0.150***	0.0935*	0.0272	0.0300
	(0.00652)	(0.00579)	(0.00595)	(0.00579)	(0.0524)	(0.0496)	(0.0582)	(0.0567)
Cohabiting	–0.0373***	–0.0217**	–0.0252***	–0.0182**	–0.0489	–0.0971	–0.0678	–0.0370
	(0.0106)	(0.00893)	(0.00899)	(0.00851)	(0.0761)	(0.0728)	(0.0741)	(0.0726)
Income						0.0224***	0.0192**	0.0190**
						(0.00772)	(0.00796)	(0.00773)
Income squared						–6.50e-06	–5.64e-06	–5.54e-06
						(2.97e-05)	(2.96e-05)	(2.79e-05)
IHS (income)		0.0163***	0.0163***	0.0140***				
		(0.00103)	(0.00103)	(0.000988)				
Labour market status (control group: employees)								
Self-employed		–0.0274***	–0.0224***	–0.0224***		0.00756	–0.00779	–0.0325
		(0.00722)	(0.00794)	(0.00806)		(0.0537)	(0.0641)	(0.0645)
Unemployed		–0.103***	–0.0988***	–0.0730***		–1.076***	–0.702***	–0.657***
		(0.00963)	(0.00953)	(0.00890)		(0.128)	(0.106)	(0.100)
Inactive		–0.184***	–0.183***	–0.150***		–0.661***	–0.236**	–0.189*
		(0.00840)	(0.00827)	(0.00726)		(0.116)	(0.0953)	(0.0990)

Tenure				0.0146***				0.0832***
				(0.000896)				(0.00963)
Tenure squared				–0.0277***				–0.106***
				(0.00186)				(0.0202)
Business wealth			0.000866	0.00130			–0.00140	–0.00238
			(0.00197)	(0.00193)			(0.0251)	(0.0257)
Financial assets			0.00152**	0.00148**			0.00142	–0.000703
			(0.000729)	(0.000735)			(0.00505)	(0.00487)
Household main residence			0.00171***	0.00183***			0.00144	0.000452
			(0.000625)	(0.000612)			(0.00484)	(0.00519)
Other real estate			0.000234	0.000282			0.00956**	0.00931**
			(0.000536)	(0.000526)			(0.00467)	(0.00444)
Vehicles			–5.52e-07	–0.000405			0.00495	–0.00240
			(0.000814)	(0.000796)			(0.00634)	(0.00630)
Self-employment businesses			–0.00208	–0.00261			0.00718	0.00555
			(0.00206)	(0.00203)			(0.0254)	(0.0255)
Mortgage debt			0.000924	6.93e-05			0.00942*	0.00878*
			(0.000643)	(0.000639)			(0.00529)	(0.00501)
Uncollateralized debt			0.000635	0.000520			0.00972*	0.00694
			(0.000684)	(0.000660)			(0.00570)	(0.00623)
IMR					1.427*	3.496***	–0.591	0.811
					(0.803)	(0.692)	(0.600)	(0.558)
No of observations	43,659	43,657	43,657	43,282	15,118	15,117	15,117	14,893

Notes: Estimates for Heckman regressions on mandatory pension assets. Regressions include a set of country dummies in addition to variables shown. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

Appendix 4. Gender differences in the probability of having pension assets, estimates from the selection equations of Heckman regressions, voluntary assets

Baseline regression (M1)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.0173*	0.0302	0.105***	0.0404**	–0.00765	0.00960	0.0105	–0.00571	0.0144*	0.0389***	0.0680***	0.0244*	0.0140	–0.0300	0.0783***	0.0751***	0.0399***	0.0240***	0.00526	0.0242
SE	(0.00969)	(0.0200)	(0.0228)	(0.0176)	(0.0126)	(0.00698)	(0.00769)	(0.00692)	(0.00753)	(0.00895)	(0.00781)	(0.0143)	(0.0122)	(0.0222)	(0.0128)	(0.0162)	(0.00824)	(0.00859)	(0.0115)	(0.0166)
Obs	3,901	2,964	2,612	6,120	3,980	14,167	18,209	2,069	7,996	6,899	9,014	2,163	2,751	1,670	1,508	2,973	9,023	8,775	3,369	3,174

Baseline + income + labour market status (M2)

	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.00209	-0.00462	0.0747***	0.00272	–0.0173	–0.0105	–0.00688	–0.00616	0.00214	0.0116	0.0284***	0.0231	–0.0131	–0.0405*	0.0106	0.0502***	0.0117	0.0144*	–0.0120	0.00656
SE	(0.0102)	(0.0202)	(0.0231)	(0.0168)	(0.0128)	(0.00755)	(0.00820)	(0.00723)	(0.00751)	(0.00877)	(0.00894)	(0.0147)	(0.0138)	(0.0227)	(0.0120)	(0.0167)	(0.00865)	(0.00859)	(0.0114)	(0.0171)
Obs	3,901	2,964	2,612	6,120	3,980	14,167	18,209	2,069	7,996	6,899	9,014	2,163	2,751	1,670	1,514	2,973	9,021	8,775	3,369	3,174

Baseline + income + labour market status + other assets and liabilities (M3)

	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.00860	0.0146	0.0759***	0.0232	–0.0272***	–0.00696	0.00256	–0.00530	0.00507	0.0193**	0.0330***	0.0157	0.000364	–0.0422*	0.0205**	0.0479***	0.0107	0.0134**	–0.0148	0.00541
SE	(0.00852)	(0.0151)	(0.0206)	(0.0149)	(0.0100)	(0.00428)	(0.00632)	(0.00821)	(0.00714)	(0.00766)	(0.00892)	(0.0104)	(0.0105)	(0.0215)	(0.00839)	(0.0135)	(0.00695)	(0.00662)	(0.0105)	(0.0166)
Obs	3,901	2,964	2,612	6,120	3,980	14,167	18,209	2,069	7,996	6,899	9,014	2,163	2,751	1,670	1,514	2,973	9,021	8,775	3,369	3,174

Baseline + income + labour market status + employment tenure + other assets and liabilities (M4)

	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.0101	0.0132	0.0783***	0.0130	–0.0283***	–0.0102	0.00813	–0.00666	0.00493	0.0166**	0.0304***	0.0164	0.000217	–0.0427*	0.0211**	0.0495***	0.00413	0.0134**	–0.0160	–0.00198
SE	(0.00851)	(0.0153)	(0.0211)	(0.0150)	(0.0102)	(0.0160)	(0.00655)	(0.00843)	(0.00719)	(0.00775)	(0.00886)	(0.0109)	(0.0109)	(0.0219)	(0.00869)	(0.0145)	(0.00732)	(0.00658)	(0.0103)	(0.0166)
Obs	3,901	2,964	2,610	6,120	3,980	673	16,741	2,066	7,976	6,868	9,012	2,081	2,751	1,670	1,514	2,871	8,764	8,775	3,369	3,150

Notes: Estimates for probit regressions, the dependent variable is the dummy indicator of having DC pension assets. The table presents the estimated coefficients for the male dummy. Please see Section 4 for the description of the other control variables included in the regressions. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

Appendix 5. Gender gaps in the value of pension assets, estimates from the outcome equations of Heckman regressions, voluntary assets

Baseline regression (M1)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	SI	IE	IT	LT	LU	SK	LV	MT	NL	PL	PT
Male	–0.0432	0.172**	–0.0162	0.205***	0.187	0.165***	–0.00981	–0.222	0.0609	0.478***	0.0719	0.137	0.351	0.238	0.303**	0.167	–0.590**	0.758*	0.559**	0.272
SE	(0.354)	(0.0876)	(0.438)	(0.0773)	(0.287)	(0.0574)	(0.0637)	(0.454)	(0.122)	(0.136)	(0.221)	(0.309)	(0.367)	(0.220)	(0.140)	(0.139)	(0.233)	(0.443)	(0.235)	(0.292)
Obs	444	1,346	356	3,552	740	5,288	6,996	64	1,300	912	1,006	167	405	992	201	618	2,801	1,134	676	957

Baseline + income + labour market status (M2)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	–0.103	0.0881	0.145	0.263***	0.0483	0.147**	–0.138**	–0.572	0.0670	–0.157	0.204	0.191	0.247	0.0111	–0.167	0.549**	0.486**	0.131	0.342**	0.142
SE	(0.271)	(0.0875)	(0.355)	(0.0858)	(0.319)	(0.0671)	(0.0604)	(1.098)	(0.129)	(0.172)	(0.194)	(0.339)	(0.210)	(0.129)	(0.115)	(0.257)	(0.201)	(0.237)	(0.144)	(0.130)
Obs	444	1,346	356	3,552	740	5,288	6,996	64	1,300	912	1,006	167	405	992	201	618	2,801	1,134	676	957

Baseline + income + labour market status + other assets and liabilities (M3)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.0836	0.0351	0.512*	0.104	–0.345*	0.0520	–0.0846	–0.421	0.0881	–0.0409	0.218*	0.314	0.0794	–0.101	0.285***	0.299	0.0410	0.0936	0.277*	–0.0655
SE	(0.240)	(0.0748)	(0.287)	(0.0867)	(0.193)	(0.0546)	(0.0610)	(0.399)	(0.100)	(0.189)	(0.115)	(0.340)	(0.152)	(0.105)	(0.0954)	(0.242)	(0.0512)	(0.174)	(0.145)	(0.106)
Obs	444	1,346	356	3,552	740	5,288	6,996	64	1,300	912	1,006	167	405	992	201	618	2,801	1,134	676	957

Baseline + income + labour market status + employment tenure + other assets and liabilities (M4)

Country	AT	BE	CY	DE	EE	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SI	SK
Male	0.110	0.0312	0.571**	0.0394	–0.313	–0.685	–0.0461	–0.394	0.0885	–0.0258	0.154	0.416	0.0738	–0.0972	0.306***	0.279	0.0293	0.0839	0.276*	–0.0760
SE	(0.231)	(0.0734)	(0.291)	(0.0852)	(0.192)	(0.521)	(0.0593)	(0.449)	(0.101)	(0.183)	(0.110)	(0.337)	(0.154)	(0.103)	(0.0891)	(0.238)	(0.0529)	(0.181)	(0.142)	(0.107)
Obs	444	1,346	356	3,552	740	80	6,828	64	1,300	911	1,006	167	405	992	201	612	2,749	1,134	676	956

Notes: Estimates for OLS regressions including the Inverse Mills Ratio to control for selection. The dependent variable is the logarithm of the value of DC pension assets. The table presents the estimated coefficients for the male dummy. Please see Section 4 for the description of the other control variables included in the regressions. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

Appendix 6. Gender differences in the probability of having pension assets, estimates from the selection equations of Heckman regressions, mandatory assets

Baseline regression (M1)

Country	BE	CY	EE	HR	IE	LT	LV	PL	PT	SI
Male	0.0733***	0.0128	–0.0472***	0.0570***	0.0355***	–0.0389*	0.00757	0.0549***	0.00905***	0.00523
SE	(0.0164)	(0.00813)	(0.0124)	(0.0205)	(0.00878)	(0.0208)	(0.0126)	(0.00714)	(0.00319)	(0.00334)
Obs	2,964	2,612	3,980	2,204	6,899	2,163	1,670	9,023	8,775	3,369

Baseline + income + labour market status (M2)

	BE	CY	EE	HR	IE	LT	LV	PL	PT	SI
Male	0.0484***	0.00727	–0.0460***	–0.0247	0.0192**	–0.0481**	0.00685	–0.00625	0.00935***	0.00406
SE	(0.0169)	(0.00677)	(0.0122)	(0.0162)	(0.00923)	(0.0201)	(0.0123)	(0.00541)	(0.00331)	(0.00326)
Obs	2,964	2,612	3,980	2,204	6,899	2,163	1,670	9,021	8,775	3,369

Baseline + income + labour market status + other assets and liabilities (M3)

	BE	CY	EE	HR	IE	LT	LV	PL	PT	SI
Male	0.0482***	0.00738	–0.0446***	–0.0252	0.0195**	–0.0492**	–0.00418	–0.00730	0.00926	0.00382
SE	(0.0169)	(0.00695)	(0.0120)	(0.0161)	(0.00926)	(0.0199)	(0.0132)	(0.00543)	(0.00723)	(0.00311)
Obs	2,964	2,612	3,980	2,204	6,899	2,163	1,670	9,021	8,775	3,369

Baseline + income + labour market status + employment tenure + other assets and liabilities (M4)

	BE	CY	EE	HR	IE	LT	LV	PL	PT	SI
Male	0.0450***	0.00740	–0.0471***	–0.0353**	0.0179**	–0.0542***	–0.00218	–0.0172***	0.00981	0.00355
SE	(0.0170)	(0.00703)	(0.0119)	(0.0156)	(0.00895)	(0.0204)	(0.0137)	(0.00535)	(0.00774)	(0.00308)
Obs	2,964	2,610	3,980	2,201	6,868	2,081	1,670	8,764	8,775	3,369

Notes: Estimates for probit regressions, the dependent variable is the dummy indicator of having DC pension assets. The table presents the estimated marginal effects for the male dummy. Please see Section 4 for the description of the other control variables included in the regressions. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations.

Appendix 7. Gender gaps in the value of pension assets, estimates from the outcome equations of Heckman regressions, mandatory assets

Baseline regression (M1)										
Country	BE	CY	EE	HR	IE	LT	LV	PL	PT	SI
Male	1.008**	–1.177*	0.197***	0.150	0.148	0.386*	0.205**	0.351***	2.904	–0.238
SE	(0.473)	(0.693)	(0.0731)	(0.155)	(0.198)	(0.228)	(0.0938)	(0.0387)	(1.852)	(1.300)
Obs	499	46	2,998	1,000	972	637	746	8,089	92	39

Baseline + income + labour market status (M2)										
Country	BE	CY	EE	HR	IE	LT	LV	PL	PT	SI
Male	0.619	0.368	–0.0403	0.00569	0.104	0.131	–0.0565	0.0609*	–0.776	–0.0635
SE	(0.398)	(0.511)	(0.0597)	(0.113)	(0.204)	(0.288)	(0.0946)	(0.0355)	(1.251)	(1.118)
Obs	499	46	2,998	1,000	972	637	746	8,088	92	39

Baseline + income + labour market status + other assets and liabilities (M3)										
Country	BE	CY	EE	HR	IE	LT	LV	PL	PT	SI
Male	0.600*	–0.306	–0.0117	0.00825	0.0705	0.328	–0.0950	0.0641*	–1.326	–0.0407
SE	(0.336)	(0.571)	(0.0569)	(0.110)	(0.221)	(0.286)	(0.0943)	(0.0361)	(1.256)	(1.207)
Obs	499	46	2,998	1,000	972	637	746	8,088	92	39

Baseline + income + labour market status + employment tenure + other assets and liabilities (M4)										
Country	BE	CY	EE	HR	IE	LT	LV	PL	PT	SI
Male	0.615**	–0.175	–0.0674	–0.0214	0.0985	0.408	–0.141	0.00724	–1.334	–0.232
SE	(0.307)	(0.663)	(0.0547)	(0.118)	(0.202)	(0.327)	(0.0903)	(0.0386)	(1.311)	(1.087)
Obs	499	46	2,998	1,000	972	637	746	7,864	92	39

Notes: Estimates for OLS regressions including the Inverse Mills Ratio to control for selection. The dependent variable is the logarithm of the value of DC pension assets. The table presents the estimated coefficients for the male dummy. Please see Section 4 for the description of the other control variables included in the regressions. Standard errors in parentheses. ***,* and * denote significance at the 99%, 95% and 90% levels. The number of observations may vary across imputations. Note that the results for CY, PT and SI are based on small samples with fewer than 100 observations.