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THE GENDER WEALTH GAP IN EUROPE: A COMPARATIVE STUDY USING A MODEL AVERAGING METHODOLOGY

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The gender wealth gap in Europe: A comparative study using a model averaging methodology

Merike Kukk, Jaanika Meriküll and Tairi Rõõm*

Abstract

There is abundant evidence on the gender wage gaps across countries, but much less is known about the gender differences in personal wealth. This paper provides comparative estimates of the gender wealth gaps for 21 European countries, employing data from the Household Finance and Consumption Survey. A common problem for studies focusing on this topic is that the data on wealth are usually provided at the household level and not at the individual level. This means it is only possible to estimate gender wealth gaps for single-person households. To overcome this constraint, we propose a novel approach using a model averaging methodology to predict individualised wealth data for multi-person households. We find that the gender wealth gaps tend to be in favour of men in the whole population, especially when estimated at the top of the wealth distribution. In contrast, the estimated gaps in the subset of single-person households tend to be statistically insignificant. The country-level gender wealth gaps are correlated with overall wealth inequality but not with gender gaps in pay and employment.

JEL Codes: D31, G51, J16, J71

Keywords: gender gap, imputation, model averaging, wealth distribution, inequality, intra-household allocation of wealth, household finance, Europe

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Non-technical summary

Since Thomas Piketty published *Le Capital au XXIe siècle* (*Capital in the Twenty-First century*) in 2013, wealth inequality has become increasingly topical for both academics and policy makers. However, little is currently known about the gender inequality in wealth in 2020, since the data on wealth are mostly collected at the household level and not at the individual level. As a result, there is evidence on the gender wealth gap from the data on single-person households, but only a few studies have had access to individual-level wealth data for all household types from which to estimate the gender wealth gaps for the whole population. The scarce existing evidence on this topic shows that the gender wealth gap tends to be the widest among couple-headed households, but smaller and usually insignificant among single-person households. This implies that all household types should be covered in studies that focus on wealth inequality between men and women.

This paper estimates the gender wealth gap for an extended group of European countries. The contribution of the paper is twofold. First, we provide comparable evidence on gender wealth gaps among single-person households using the most recent Household Finance and Consumption Survey (HFCS) data from 2017. This survey contains harmonised data on household assets and liabilities, together with information on incomes, consumption, demographic variables and household composition. Given that the wealth data are provided at the household level in the HFCS, this is the only subgroup of people for whom we can obtain the survey estimates of individual-level wealth. We estimate unconditional and conditional gender wealth gaps between single-person households for 21 European countries and find that they are mostly negative, i.e. in favour women, in the middle of the wealth distribution, while turning positive, i.e. in favour of men, at the top of the distribution in several countries. However, the estimated gaps are statistically insignificant in most countries.

Second, we propose a novel approach to calculating the gender wealth gap in multi-member households. We predict the net wealth for individuals in all household types using the relationships between wealth and individual-level characteristics based on the estimations for the subsample of single-person households. We use a set of observed explanatory variables in this prediction, including labour market status and experience, individual income, education level, age, and immigration status. We apply the weighted average least squares (WALS) model averaging technique to take account of uncertainty in the choice of explanatory variables for the imputation model. This method, like Bayesian model averaging, incorporates the uncertainty that arises from the estimation and from the model selection. Both Bayesian and WALS model averaging methods allow some regressors to be in the model for certain, while letting the number of auxiliary covariates vary. The variables that are included in all specifications in our estimations are income, age and education, since they are relevant in explaining net wealth in all countries.

Our approach yields a variation in the within-household division of net wealth and computes it so that household members who have characteristics that are related to higher net wealth own more of the wealth. As a result, the unconditional gender wealth gap can be estimated for the whole adult population, covering all household types. We validate our results by comparing them with the findings of the few studies that have had access to wealth data at the individual level. Our results show strong similarities between the gender wealth gaps predicted by our imputed data and the survey data from the studies that we compare with. In addition, we run a number of robustness tests to predict individual-level net wealth from simple OLS models, adding or removing various interaction terms and combining the individual-level predictions with the data on household-level wealth collected in the survey. The results demonstrate the

superiority of our approach, since the predictions from model averaging provide more stable estimates of the gender wealth gap, especially for countries where the sample size is small.

The gender wealth gaps estimated from the imputed wealth data for the whole population tend to be larger than those estimated for the subgroup of single-person households. The mean gender wealth gaps found with this method are significantly positive for 17 countries. They are also economically large for most countries, ranging from 13% in Portugal and Greece to 72% in Cyprus. The gaps tend to be the largest in countries where wealth is in general less equally distributed, such as Cyprus, Germany and the Netherlands, while they are insignificant in countries that also have relatively low wealth inequality such as Lithuania, Slovakia and Slovenia.

Like some previous studies, we find that the wealth gaps increase at the upper end of the wealth distribution. The estimated median gaps are insignificant in eight countries and smaller than 20% in five countries. The gaps tend to be larger at the 95th percentile than at the median in most of the countries. The wealth gaps are significantly in favour of men at the top of the distribution in 18 countries. The results show that it is misleading to draw inferences about the gender wealth gap by looking only at single-person households and it is important to understand the distribution of wealth in multi-member households to get a comprehensive picture of the inequality of wealth between genders.

Although the pattern of the increasing gender wealth gap in the upper tail of the wealth distribution can be observed for most of the countries, there are substantial differences in the mean level of the gap. To shed some light on what causes these differences, we estimated the cross-country correlations between the unconditional mean gender gaps in net wealth and several other variables that might be expected to be related with gender wealth inequality. As could be expected, the gender gaps in net wealth were strongly correlated with indicators of general wealth inequality such as the Gini coefficient and the share of wealth owned by the top 10% of households. However, the correlation coefficients between gender gaps in wealth and most relevant labour market indicators, such as gender pay gap and labour force participation gap, were weak and statistically insignificant.

We also looked at the correlations of the gender wealth gap with various measures of the wealth structure. The only indicator that turned out to be strongly and statistically significantly related with the gender wealth gap was the home ownership rate. The higher this is, the lower the gender wealth inequality is. This finding is in line with earlier studies that show that real estate is the most equally distributed asset class. Greater prevalence of home ownership reduces wealth inequality, which in turn is associated with a lower gender wealth gap.

We looked as well at the cross-country relationships between the gender wealth gaps and various indicators of gender-related social norms, since earlier studies have shown that they are strongly related with gender gaps in employee incomes and pension incomes. We found their correlations with gender wealth gaps to be insignificant, however. This is not a surprising result, given that labour income is the outcome of negotiations between the employee and the employer, while wealth accumulation depends only on the individual's own choices. Therefore the gender gaps in wealth depend mainly on individual preferences and less on gender-related social norms.

We discussed in the context of the wealth accumulation function what the causes of the gender wealth gap may be. Differences between genders in the level of wealth may first and foremost stem from differences in incomes and labour market behaviour, but may also come from differences in individual preferences or personal traits that affect saving and investment choices, such as risk and time preferences, optimism, altruism, etc. Further research in this area

is needed to study the role of various opportunity-related and preference-related factors in explaining the disparities between the genders in how wealth is accumulated.

Contents

1. Introduction

There is abundant research on gender gaps in wages and incomes (e.g. Blau and Kahn (2000), Bertrand (2010), and Ponthieux and Meurs (2015)), but less is known about the gender gap in wealth. The main reason for this is that data on wealth are mostly collected at the household level and not at the individual level. As a result, there is research on the gender wealth gap among single-person households, but evidence for the whole population is much scarcer. Only a few studies have had access to individual-level wealth data for all household types from which to estimate gender wealth gaps. Sierminska et al. (2010, 2017) provide such analysis for Germany, Bonnet et al. (2013) do so for France, d'Alessio (2018) does so for Italy, and Meriküll et al. (2020) for Estonia. The scarce evidence that there is shows that the gender wealth gap tends to be largest in couple-headed households, while it is smaller and usually insignificant in single-person households. This implies that all household types should be covered in studies on this topic.

Although wealth is often considered to be a common endowment in a family as all the household members may use the home or a car that the household owns, the individual ownership of various assets may affect the bargaining position of family members, and their relative power in decision-making and consumption (Atkinson and Bourguignon (2014)). Therefore it is as relevant to investigate the gender wealth gap, considering also the distribution of wealth within a household, as to study the gender pay gap. Wealth inequality has received a lot of attention recently, especially since the publication of *Le Capital au XXIe siècle* (*Capital in the Twenty-First century*) by Thomas Piketty in 2013, but the problem of household-level wealth studies is that they underestimate inequality (Sauer et al. (2020)), and many aspects of inequality, including gender wealth gaps, are still underexplored.

This paper estimates the gender wealth gap in 21 European countries using imputation techniques. The contribution of the paper is twofold. First, we provide evidence on the unconditional and conditional gender wealth gaps in single-person households using the most recent Household Finance and Consumption Survey (HFCS) data from 2017. There are several papers that derive gender wealth gaps for this subset of households, e.g. Schmidt and Sevak (2006) for the US, Ravazzini and Chesters (2018) for Australia and Switzerland, and Schneebaum et al. (2018) for eight EU countries. We add to this literature by providing comparable evidence on these gaps for an extended group of European countries using harmonised recent data.

The second and the main contribution of our paper is that we propose a novel approach to calculating the gender wealth gap among multi-member households. We use multiply imputed data from single-person households to predict the wealth of people in other household types. A model averaging technique is applied to take account of the uncertainty about the choice of the imputation model. As a result, the unconditional gender wealth gap can be estimated for the whole adult population including all household types.

There are different approaches for how to use household-level wealth data for individual-level estimates of the gender wealth gap. Ponthieux and Meurs (2015) identify two ways, suggesting either assigning the gender of the household reference person to the whole household, or distributing the household-level assets between household members following some common rule. The first approach has obvious disadvantages, since households with a male reference person tend to be different from those with a female reference person, and estimates of gender differences in wealth that are based on household-level data can be misleading. The second option has been used so far by applying a simple rule for dividing the assets such as splitting household-level wealth items 50/50 in couple-headed households.

Our approach builds on the second option, but instead of 50/50 splits we predict the wealth of individuals in multi-member households using the relationship between wealth and the individual-level characteristics of single-person households. We use a set of observed explanatory variables in this prediction, including labour market status and experience, individual income, education level, age and immigration status. To account for model uncertainty, we use the model averaging method (weighted average least square, WALS) to predict net wealth. Our approach yields a variation in the within-household division of net wealth and computes it so that household members who are predicted to have a higher level of net wealth own a proportionately larger share of household wealth.

The paper is related to the literature that estimates the gender wealth gap for the whole population or for particular household types. The mean gender wealth gap is usually in favour of men, and it was found to be 45% in Germany and Estonia (Sierminska et al. (2010), Meriküll et al. (2020)), 25% in Italy (D'Alessio (2018)) and 12% in France (Bonnet et al. (2018)). The gap also tends to be in favour of men in single-person households, but it is often statistically insignificant (Schmidt and Sevak (2006), Schneebaum et al. (2018), Ravazzini and Chesters (2018)). Another common finding in the literature is that the gap in the mean originates mostly from the gap in the upper end of the wealth distribution (Schneebaum et al. (2018), Ravazzini and Chesters (2018), Meriküll et al. (2020)). This is related to men having more business assets than women do, especially at the top of the distribution (Meriküll et al. (2020)).

We find that the gender wealth gaps among single-person households are mostly negative, i.e. in favour of women, in the middle of the wealth distribution, but that they turn positive, i.e. in favour of men, at the top of the distribution in several countries. The estimated mean gaps are insignificant for single people in most countries. The picture is different though when the gender wealth gap is estimated for all household types. The wealth gap estimated from the imputed wealth using the model averaging technique tends to be in favour of men in the middle and widens at the upper tail of the wealth distribution. The results show that it is misleading to draw inferences about the gender wealth gap from single-person households alone and it is important to understand how wealth is distributed in multi-member households to get a comprehensive picture of the inequality of wealth between genders.

The paper is organised as follows. The second section introduces the wealth accumulation function and discusses why wealth could be different for men and women. The third section presents the data and provides descriptive statistics. The fourth section describes the methods for deriving the conditional gender wealth gap among single-person households and for imputing individual-level wealth for the members of multi-member households. The fifth section presents the estimation results and provides robustness tests and validation. The sixth section shows country-level correlations of the gender wealth gaps with gender gaps in the main labour market indicators, measures of wealth inequality, and various measures of the wealth structure. Finally, the last section focuses on discussion and summary.

2. Differences in wealth accumulation between genders and their possible causes

2.1 Pooling of wealth in partner-headed households

Surveys commonly collect wealth data at the household level, since a household is considered as one economic unit. However, there is a strand of literature that investigates the intra-household allocation of time to paid and unpaid work, money management within households, the division of income and savings, and joint and individual consumption. A comprehensive overview of these topics is provided by Chiappori and Meghir (2014) in the Handbook of Income Distribution. A common conclusion reached by these studies is that households do not share their resources fully, but rather allocate them within the family as the outcome of intra-household bargaining.

Another strand of the literature provides evidence that the rise in the labour force participation of women in Europe has coincided with an increase in their independence not only in society but also within the family. Their autonomy in decisions about consumption and saving gives them more independence in money management (e.g. Burgoyne et al. (2007), Sonnenberg (2008)). Partners can sign marital agreements to determine how they accumulate assets. The assets owned before the marriage and inherited wealth are generally considered to be separate but ownership of wealth obtained during the marriage can be divided in several different ways. Joint ownership of assets has been the most conventional solution, but spouses can also choose other options, including partial joint ownership or separate ownership. The exact conditions may vary across countries but the overall aim is to provide flexibility by permitting different types of financial arrangement between spouses.

Important trends in European countries over the last decades have been the decline in the relevance of marriage and increase in the divorce rate, as shown in the studies by Chester (2012), Gubernskaya (2010), Kalmijn (2007), and Kasearu and Kutsar (2011) among others. In most European countries cohabitation is either not regulated at all or is regulated to a lesser extent than marriage is (Sánchez, Gassen and Perelli-Harris (2015), Perelli-Harris and Gassen (2012)). Cohabitants usually do not have property rights after separation or inheritance rights after death.

The changing role of women in society and the trend towards forming families with less regulated financial relationships have led to individual family members, whether men or women, having more independence in money management. Gender differences in wealth exist not only between households but also within them, and ignoring that dimension leads to inequality being underestimated (Sauer et al. (2020)). Since women usually earn less than men do, the increase in independence in money management within families has probably been accompanied by an increase in within-household wealth inequality in recent decades.

2.2 Gender differences in the wealth accumulation function

Following from this discussion, we use the wealth accumulation function at the individual level to explain the gender differences in net wealth. Following Meriküll et al. (2020) the wealth accumulation function can be expressed as:

$$W_{i,t} = \sum_{a=1}^{n}\left(1 + r_{i,a,t}\right)w_{i,a,t-1} + S_{i,t} + H_{i,t} \quad (1)$$

where $W_{i,t}$ denotes the net wealth of individual *i* at period *t*; α is a subscript for different types of assets, $r_{i,a,t}$ denotes the return of a particular asset in period *t*, and $w_{i,a,t-1}$ is the accumulated value of this asset at the end of the previous period, $S_{i,t}$ is savings, and $H_{i,t}$ is gifts or inheritances received in period *t*. Equation (1) shows that the net wealth of an individual in a particular period comes from the value of the assets accumulated in previous periods multiplied by the return on those assets plus any additional increase in wealth from savings or inherited property. The savings of individual *i* are the difference between total disposable income $Y_{i,t}$ and consumption $C_{i,t}$ in period *t*:

$$S_{i,t} = Y_{i,t} - C_{i,t} \tag{2}$$

As the capacity to save, preferences, financial knowledge and investment opportunities may all be different across genders, men and women may accumulate wealth differently. In what follows we discuss the various reasons for the gender wealth gap in the context of the wealth accumulation function.

Men and women accumulate wealth differently first and foremost because of differences in income. The existence of the gender pay gap is well documented in the literature (e.g. Blau and Kahn (2000)), but the gap in lifetime earnings comes not only from differences in pay but also from differences in labour market attachment and in the careers of men and women. Women are more likely to become inactive when they have children or have to take care of other family members, leaving them fewer years of work experience and fewer opportunities for advancement at work (e.g. Bertrand (2010)). Women are also more likely to work part-time than men are. All of this means in total that they generally have lower earnings.

Income differences can also arise because men and women make different occupational choices. Men are more risk tolerant and more willing to compete, and so they are more likely to choose riskier occupations and to be self-employed than women are (e.g. Niederle (2014), and Koellinger et al. (2013)). Riskier occupations and entrepreneurial activity are generally better rewarded. Occupational segregation, both vertical and horizontal, is an important source of the gender gap in labour incomes (e.g. Dolado et. al. (2002)). However, there are also gender pay differences in favour of men even between male and female-dominated occupations with similar occupational risk. Non-linear remuneration schemes where extra work or unconventional hours are rewarded disproportionally highly lead to large gender pay gaps within specific occupations (Goldin (2014)).

The gender gap in wealth can be caused not only by income differences, but also by differences in saving patterns. Relatively few studies have examined this. The probable reason why there is a lack of research in this area is that data on savings, like wealth data, are usually collected at the household level, while the estimation of gender differences should be based on individual-level data. The few studies that there are provide inconclusive evidence on this topic. Sunden and Surette (1998) for example found that women were less likely to have defined contribution (DC) pension plans than men were, while a study by Agnew (2005) found the opposite. Kukk and van Raaij (2020) investigate the distribution of financial assets within a family using bank account data from the Netherlands. They find that the assets are indeed unequally distributed between the partners but they do not find any systematic differences between the genders.

Wealth is a function of the saving rate, which depends on income and the marginal propensity to consume (MPC). As the MPC as a share of income tends to decline when income increases, the saving rate is an exponential function of earnings. Consequently, men tend to accumulate more wealth not only because they earn more, but also because they save a larger

proportion of their income. A question that is not much explored in the literature, though, is whether there are differences between the genders in the saving rate (or alternatively in the MPC) once differences in observable characteristics such as income, education or labour market status have been controlled for.

Differences in earnings may have additional implications for the composition of wealth. Credit constraints are negatively related with the level of income (HFCN (2016)), and as women have lower earnings, they may be denied mortgage loans more often than men are. There are only a few studies that aim to estimate differences between the genders in their access to credit or their loan conditions. Pahl (2008) shows that women have less access to credit in the UK than men do, and this is mainly explained by gender differences in employment.[1] A study by Alesina et al. (2013) shows that women also face more stringent conditions for obtaining business credit than men do. If women are more credit constrained then they are less able to benefit by building wealth from owning businesses or from the long-term rises in house prices that accrue from home ownership.

Men and women may also invest differently because of gaps in financial literacy. There is evidence that women tend to be less financially knowledgeable than men (e.g. Lusardi and Mitchell (2014)) and that financial literacy affects how well people manage their long-term investments and plan for retirement (Lusardi and Mitchell (2007)), and whether they invest in riskier assets such as stocks (see Lusardi and Mitchell (2014) and the references therein).

Additionally, the gender wealth gap in favour of men may be caused by men inheriting more than women do. Empirical evidence shows that inheritances form a significant part of wealth (e.g. Fessler et al. (2018)). However, studies on this mostly show that the probability of inheriting does not depend on gender in developed countries (e.g. Edlund and Kopczuk (2009)).

2.3 Gender differences in preferences and personal traits

The choices of how much to save from current income and what kind of investments to make depend on individual preferences. Various preferences or personal traits are discussed in the literature on economic decision-making. To reflect what might be relevant for our study, we focus on the following traits: risk preferences, time preferences, competitiveness, optimism, altruism and cooperation. Here we discuss what is known from the earlier literature about the gender differences that there may be in these personal traits and how they relate to wealth accumulation.

The personal trait for which gender differences have received the most attention in the economic literature is the willingness to take risks. A majority of the studies on this topic conclude that women are more risk averse in their financial decisions than men are (e.g. Jianakopolos and Bernasek (1998), Sunden and Surette (1998), Grable (2000), Hallahan et al. (2004)), though some meta-analyses indicate that the evidence is still inconclusive (Niederle (2014), Nelson (2015)). Risk preferences affect portfolio choices. If women make more conservative investments than men do, then they earn a lower return on their assets in the long term, which contributes to widening the gender wealth gap. Due to compounded returns, even modest differences in risk-taking can translate into large differences in financial assets over the life cycle.

[1] Pahl (2008) interprets the use of credit cards as access to credit. Credit cards are more commonly used in the UK and the US than in continental Europe.

Portfolio choices depend not only on risk preferences but also on the expectations of the returns on various assets. The expectations for future returns are subjective and can vary with personality traits. People who have a more optimistic outlook are also more willing to make risky investments. This question has not been much researched from a gender perspective, but there are a few studies that indicate that differences in optimism may also be a source of the gender wealth gap. A study by Jacobsen et al. (2014) investigates gender differences in this personal trait. They find that men are more optimistic about the economic outlook and future stock market returns. Women's portfolio choices are more risk-averse, but when differences in optimism are accounted for then they make similar investment decisions to men. Dominitz and Manski (2007) also study the heterogeneity of beliefs about future stock returns and find men to be considerably more optimistic and therefore more likely to invest in stocks.

While the willingness to take risks and optimism are the main traits that determine the choice of investment assets, the decision of how much to save out of income depends mainly on individual impatience, i.e. on how much an individual values current utility relative to delayed utility. Studies on gender differences in time preferences offer conflicting evidence. The studies by Patnaik et al. (2020) and Dittrich and Leipold (2014) find men to be more inpatient 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), using data from 76 countries, find that women are less patient than men, though the difference is significant in only about a third of the countries.

The literature has also shown that men are more competitive (see e.g. the literature overview by Niederle (2014) and the references therein). This may influence their portfolio choices, since people who are more competitive may be less likely to shy away from risky investments. The willingness to compete also plays an important role when people make occupational choices. Occupations that require competition and that tend to be better rewarded, such as lawyer or entrepreneur, are more likely to be chosen by people with high levels of competitiveness.

Personal traits that are related to the willingness to share resources, such as altruism and cooperation, may affect how wealth is distributed within families. Studies by Niederle (2014) and Croson and Gneezy (2009) provide literature reviews of differences in preferences between genders. According to these studies, the evidence on altruism and cooperation is mixed and the results for these two traits are inconsistent. This apparent inconsistency may arise because the behaviour of women is more context-dependent than that of men (Croson and Gneezy (2009)).

This literature review indicates that there are several reasons why men may accumulate more wealth than women do, including gender gaps in incomes, in access to financing, and in personal preferences that matter for saving and investment behaviour. The coverage of these alternative causes in the literature is unequal. Some subjects, such as gender pay gaps or differences in risk aversion between men and women, are extensively covered, while the evidence for several others is still scarce and inconclusive.

3. Data

We use data from the 2017 wave of the Household Finance and Consumption Survey (HFCS). The HFCS is a harmonised survey coordinated by the European Central Bank and conducted by the national central banks in the EU. The main purpose of the 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 2017 wave

covers data from 22 countries, of which 21 are analysed in this paper[2]. The data are mostly collected from interviews, and missing observations are imputed using multiple imputation techniques.[3] The HFCS data are imputed by the data providers and all five implicates are employed in the following analysis. More information about the survey methodology and descriptive results can be found on the ECB's HFCS website.[4]

We omit children and dependent members of the household who are younger than 24, and we employ survey weights in the analysis. This implies that the results are generalisable to the whole adult population of the countries covered. The HFCS usually collects wealth components at the household level, and only defined contribution pension assets are collected at the individual level. The data on the rest of the wealth items, such as real estate, business assets, vehicles, valuables, deposits, stocks, bonds and other financial assets, and those on mortgages and uncolletarised debt, are collected at the household level. This means that wealth is only observed at the individual level for single-person households. As described in the following section, we use individual-level characteristics to estimate wealth accumulation functions separately for men and women in single-person households and use these behavioural relationships to predict wealth for individuals in multi-member households.

The sample size of single-person households is crucial for our prediction exercise. Table A.1 in the Appendix presents the distribution of people in different family types at the individual and household levels. On average 20% of men and 30% of women are single in the countries covered by our study. The share of single women is higher because women have longer life expectancy, which means that there are more widowed women than men. The shares of single people are substantially lower in some Central and Eastern European countries and Mediterranean countries, such as Croatia, Cyprus, Greece, Malta, Poland, Portugal and Slovakia. The imputation exercise that we conduct is challenging for countries where the sample size is small or the fraction of single-person households is low. Examples of such countries include Croatia, Cyprus, Latvia and Malta, where the unconditional sample size of single men approaches 100, but this sample size can shrink further in the regressions. We present the results for these countries, as the imputation exercise provides quite feasible estimates, but they should be interpreted with more caution than the estimates based on larger sample sizes.

Roughly 50% to 60% of individuals in our sample are married or cohabiting and the rest are in other types of households (with more than two adults or two adults who are not partners) or else they are single. The structure of households is heterogeneous across countries. The share of single-person households ranges from 9% in Slovakia to 34% in Lithuania, while the share of households with more than two adults or two adults who are not partners ranges from 6% in Finland to 46% in Poland.

There are noticeable differences in the level and distribution of net wealth across countries. Table 1 presents summary statistics of this variable over the household types. The descriptives are presented at the individual level, using the naïve split of net wealth for multi-member households, i.e. dividing the net wealth by the number of adult household members. Single people are the wealthiest in 13 countries and the poorest in one country only (Cyprus), while couple-headed households are the wealthiest in six countries and the poorest in three countries,

[2] The country excluded is Spain, since the Spanish data from the 2017 wave were not yet available for the researchers at the time of this study was conducted.

[3] Some countries conducting the HFCS use also various registers for data collection, e.g. Finland, Estonia, France, Latvia and Ireland. The extent and coverage of the register-based data varies across these countries.

[4] https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

and other types of households are the poorest in 17 countries but the wealthiest in (Austria and Belgium).

Table 1. Descriptives of net wealth by household type

	Mean	p25	Median	p75	p95	Gini
Austria, singles	142.2	4.2	19.3	114.6	417.8	0.823
Austria, couples	136.8	14.0	74.9	170.1	468.6	0.639
Austria, other	177.4	35.7	80.8	162.4	497.7	0.645
Belgium, singles	220.2	5.9	115.7	294.2	670.6	0.668
Belgium, couples	203.2	52.7	139.7	257.1	633.4	0.548
Belgium, other	241.3	43.8	105.3	192.5	1470.4	0.669
Croatia, singles	65.6	9.7	40.2	80.2	213.1	0.607
Croatia, couples	59.5	15.1	33.2	61.1	169.1	0.617
Croatia, other	36.3	10.6	23.1	42.3	99.9	0.542
Cyprus, singles	202.0	4.9	71.2	249.6	604.1	0.757
Cyprus, couples	284.2	22.1	112.9	252.4	1004.4	0.732
Cyprus, other	218.8	40.2	75.2	169.4	881.7	0.722
Estonia, singles	47.1	2.3	22.5	59.0	168.3	0.680
Estonia, couples	82.9	12.0	34.1	67.8	240.9	0.704
Estonia, other	42.3	13.6	26.6	43.8	135.7	0.535
Finland, singles	120.4	1.3	49.0	166.5	449.9	0.712
Finland, couples	136.3	22.5	81.7	168.1	434.6	0.609
Finland, other	116.3	45.7	89.0	153.5	348.4	0.477
France, singles	144.2	5.9	38.5	171.0	554.4	0.740
France, couples	155.9	22.0	93.6	187.9	475.7	0.612
France, other	100.2	6.9	53.3	115.5	351.1	0.659
Germany, singles	137.0	2.0	18.5	147.9	554.2	0.796
Germany, couples	151.0	12.1	66.6	181.3	521.5	0.678
Germany, other	120.8	5.6	56.8	118.1	500.2	0.711
Greece, singles	62.3	4.3	32.7	78.6	244.6	0.686
Greece, couples	49.2	9.8	34.5	65.3	166.1	0.571
Greece, other	38.5	10.9	25.2	47.5	137.0	0.548

	Mean	p25	Median	p75	p95	Gini
Hungary, singles	49.6	9.7	26.2	51.8	148.0	0.639
Hungary, couples	42.4	7.8	20.2	42.8	134.2	0.658
Hungary, other	23.5	6.2	14.3	24.0	65.0	0.587
Ireland, singles	241.7	3.6	107.4	271.3	800.6	0.709
Ireland, couples	204.6	30.4	111.0	232.1	726.5	0.647
Ireland, other	145.1	20.0	73.9	168.3	639.0	0.632
Italy, singles	144.1	8.0	79.9	193.1	509.0	0.642
Italy, couples	126.1	25.4	79.1	151.3	374.7	0.585
Italy, other	79.3	19.9	51.7	98.0	259.9	0.557
Latvia, singles	26.6	0.7	12.4	33.0	72.2	0.690
Latvia, couples	24.4	3.6	12.4	25.6	80.7	0.658
Latvia, other	22.6	4.5	12.7	27.4	59.2	0.593
Lithuania, singles	71.0	20.1	39.5	68.4	301.1	0.605
Lithuania, couples	46.6	15.1	28.2	46.8	116.5	0.561
Lithuania, other	38.3	12.7	23.6	38.6	115.7	0.527
Luxemburg, singles	565.6	32.4	316.0	681.8	1910.5	0.658
Luxemburg, couples	548.3	71.7	310.0	560.6	1580.3	0.646
Luxemburg, other	341.0	103.6	200.5	383.7	990.3	0.570
Malta, singles	347.2	48.4	141.6	327.8	941.2	0.701
Malta, couples	215.6	65.3	122.1	200.8	575.0	0.592
Malta, other	116.4	46.7	87.4	156.7	327.0	0.468
Netherlands, singles	112.1	4.2	24.0	108.8	459.1	0.847
Netherlands, couples	115.6	11.4	60.2	138.7	390.7	0.733
Netherlands, other	96.0	14.5	51.3	109.7	315.6	0.645
Poland, singles	53.6	4.8	33.4	67.0	152.4	0.615
Poland, couples	46.3	13.1	30.6	58.5	131.2	0.542
Poland, other	38.8	14.3	26.3	42.9	94.0	0.505
Portugal, singles	102.2	6.3	50.3	114.2	338.4	0.685
Portugal, couples	89.8	14.8	41.5	89.2	276.9	0.669
Portugal, other	61.4	12.9	28.2	57.0	182.2	0.670
Slovakia, singles	56.1	15.1	40.1	71.3	154.9	0.555
Slovakia, couples	53.5	15.8	36.3	61.9	152.5	0.538
Slovakia, other	38.3	15.5	25.5	40.8	102.6	0.491
Slovenia, singles	86.7	7.5	52.6	112.9	281.1	0.612
Slovenia, couples	75.3	24.5	51.3	92.7	204.9	0.547
Slovenia, other	67.9	21.8	37.1	66.2	200.2	0.581

Source: Authors' calculations from the HFCS using five imputed datasets.

Notes: The table presents the values of net wealth in thousand EUR. The individual-level net wealth in multi-member households is computed by dividing the net wealth at the household level by the number of adults in the household.

Net wealth is generally very unequally distributed and this applies to the countries covered in this study as well. The lowest quartile of households have only small sums of net wealth, while the mean is much higher than the median – it is at roughly the level of the 75th percentile of net wealth. Although there is sizable variation between countries in the Gini coefficients that capture inequality within the household types, they are relatively high in all the countries. The Gini coefficients of the multi-member households are probably underestimated as they do not take into account the unequal distribution of wealth within households, but the ones for single-person households are correctly measured. The Gini coefficients of net wealth for single-person households are the largest in the Netherlands, Austria and Germany, where they are around 0.8 or higher; and they are lowest in Slovakia, Lithuania and Croatia, at around 0.6 or lower.

4. Methods

The empirical section consists of two parts. First, we present evidence on the unconditional and conditional gender wealth gaps in 21 European countries using the data for single-person households. Second, we impute personal-level wealth to all the other individuals in the sample and estimate the gender wealth gaps for all household types.

4.1 Gender gap in single-person households

The gender gap in the net wealth of single-person households is estimated at different parts of the net wealth distribution. We provide unconditional or raw gaps for the mean, and both unconditional and conditional gaps for the median, and the 90th and 95th quantiles of the net wealth distribution. The gap at the top tail is estimated because the gender wealth gap at the mean usually originates from the gender differences in wealth among the richest, while the gaps in the lower parts of the wealth distribution tend to be insignificant (Schneebaum et al. (2018), Ravazzini and Chesters (2018), Meriküll et al. (2020)).

We use the unconditional quantile regressions by Firpo et al. (2009) to compute the conditional gender gaps for the different quantiles. The unconditional quantile regression is based on a recentered influence function, where the dependent variable is transformed into the probability of being in a particular quantile and is then reweighted so that the mean of the transformed variable is equal to the value of the quantile. The OLS method can be used to estimate the model with this transformed dependent variable.[5]

The advantage of the method of unconditional quantile regressions is that it offers intuitive interpretation of the results in terms of the unconditional distribution of the dependent variable and not the conditional distribution, which is used with conventional quantile regressions. The dependent variable, net wealth, is transformed by inverse hyperbolic sine (IHS) transformation.[6] This is a standard approach in wealth studies as wealth distributions are usually right-skewed and net wealth can have sizeable negative values in the lower deciles of its distribution. The following specification is estimated for both single men and single women and for each country separately:

[5] The Stata command rifreg by Nicole Fortin is applied in this paper to estimate the specification. The command is fitted for the imputed data by using the cmdoc option that pools estimates of individual implicates by using Rubin's combination rules.

[6] Net wealth w_i is transformed as: $\sinh^{-1}(w_i)=\ln(w_i + (w_i^2 + 1)^{½})$.

$$w_{i,\tau}^{g} = \alpha_{0,\tau}^{g} + \sum_{k=1}^{K} \alpha_{k,\tau}^{g} x_i^{g,k} + \varepsilon_{i,\tau} \quad if\ i \in singles \qquad (3)$$

where *g* denotes gender, indicating that the relationship between net wealth and the explanatory variables is estimated separately for men and women; $w_{i,\tau}^{g}$ denotes the IHS-transformed net wealth of individual *i*; τ expresses the τ^{th} quantile in the unconditional quantile regression; and $\alpha_{0,\tau}^{g}$ is the constant term of the specification for a particular quantile. The term $x_i^{g,k}$ denotes a k^{th} explanatory variable; $\alpha_{k,\tau}^{g}$ is its effect on net wealth; and $\varepsilon_{i,\tau}$ is an error term with conventional properties. The equation is estimated for the individuals in single-person households only. Taking the separate estimates of the wealth regressions for each gender, the following Oaxaca-Blinder (OB) decomposition is implemented for each country:

$$\bar{w}_{\tau}^{M} - \bar{w}_{\tau}^{W} = (\bar{X}^{M} - \bar{X}^{W})\alpha_{\tau}^{M} + \bar{X}^{W}(\alpha_{\tau}^{M} - \alpha_{\tau}^{W}) \qquad (4)$$

where $\bar{w}_{\tau}^{M}$ and $\bar{w}_{\tau}^{M}$ denote the net wealth of men and women at a particular quantile; $\bar{X}^{M}$ and $\bar{X}^{W}$ denote vectors with average values of explanatory variables for men and women; and α_{τ}^{M} and α_{τ}^{W} show the vector of the coefficients for men and women at a particular quantile. The decomposition is made over the base of male coefficients. The first term on the right-hand side captures how much of the gender wealth gap can be explained by the differences in the characteristics observed when women had the same coefficients or returns on characteristics that men had. The second term on the right-hand side (which is often called the wage structure term in the wage gap decompositions) is the part of the gap that is caused by the different returns on characteristics for men and women, given the characteristics of women.

As the IHS transformation proxies a log transformation for larger values of net wealth, which is the case for the median or higher quantiles, the unconditional gender wealth gap is measured as the difference between the IHS transformed wealth of men and that of women. It can be interpreted as the gender gap in percentages. Positive values show how much more wealth men have in percentages and negative values show how much more wealth women have. The set of explanatory variables, *k=1, ... K*, covers:

- Labour market status: employee, self-employed, unemployed or inactive;
- Labour market experience in years and its squared term; [7]
- 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;
- Education level: primary, secondary or tertiary level;
- Age and age squared;
- Immigrant status defined by the country of birth.[8]

The intuition behind this choice of explanatory variables is to control for observable factors that are related to the wealth accumulation function given in Section 2, i.e. the factors that may explain the differences in wealth accumulation. Labour market status and income capture the capacity to save in the current period and also in previous periods, since they are correlated with earlier labour market participation and income levels. Labour market tenure reflects the saving capacity in the past. Education can be used as a proxy for financial literacy, which is related to investment preferences and through that influences long-term saving behaviour. In addition, better educated people tend to have less myopic preferences, which has a positive impact on their saving rate and accumulation of assets.

[7] Labour market experience is not used for Finland, where the data are missing.

[8] Immigrant status is not used for Slovakia as there are very few immigrants in the sample of single people in this country.

Age captures two aspects in the wealth function: the wealth accumulation period and differences between cohorts in the preferences for saving and investment choices. Immigrant status can affect access to various financial products that may impact wealth accumulation. In addition, people with different cultural backgrounds may have different financial behaviour, even after characteristics such as income, education and demographics have been controlled for (Haliassos et al. (2014)). Therefore, controlling for immigration adds explanatory power in regressions with wealth as a dependent variable. [9]

The demographic variables that are used in gender wage gap regressions, such as marital status or the number of children, are not employed for two main reasons. First, there are very few single men with children in the sample and so the effects for this variable are estimated imprecisely. Second, the intuition in estimating the conditional gender wealth gap is different to that in estimating the conditional gender wage gap. Wage gap studies usually introduce as many controls as possible, and often assign the unexplained gap to discrimination. The un-explained gender wealth gap cannot be directly linked to discrimination, as it instead shows whether men and women accumulate wealth differently after the observable factors that are related to wealth accumulation have been controlled for. The differences in some of these observable factors, such as income and the composition of existing assets, may be influenced by discrimination, but they may equally be related to gender differences in personal traits, as discussed in Section 2.

We cannot investigate the preferences or personal traits like risk and time preferences, competitiveness, optimism, altruism and cooperation that are related to wealth accumulation, since these data are not available for all the household members.[10] As explained in sub-section 2.3, there is a lack of studies on gender differences in personal traits other than risk preferences and it is not clear to what extent those traits affect wealth accumulation, conditional on observed socio-economic characteristics.

4.2 Imputing net wealth for the members of multi-member households

As we explained in Section 3, the wealth of multi-member households is collected in the HFCS at the household level and the division of wealth within households cannot be observed. Therefore we use behavioural relationships between wealth and the observed personal characteristics of people from single-person households to predict wealth for all other individuals.

We use the same set of explanatory variables as in the conditional analysis of single-person households explained in the previous sub-section. The behavioural relationship is estimated separately for single men and single women and the predicted values are then calculated for men and women in multi-member households. The estimations follow the concept of Oaxaca-Blinder (OB) decomposition, which is that women and men may have different observed characteristics as well as different returns for the characteristics. We estimate the following regression separately for men and women in each country:

$$w_i^g = \alpha_0^g + \sum_{k=1}^{K} \alpha_k^g \, x_i^{g,k} + \varepsilon_i \quad if \; i \in singles \tag{5}$$

[9] There is evidence on racial wealth inequality in the US (Oliver and Shapiro 2006, Campbell and Kaufman 2006, Krivo and Kafman 2004), and that immigrant populations have lower wealth in Europe (Ferrari (2020)).

[10] Questions on risk-aversion and expectations refer to the whole household and are asked only from the reference person, which means that they are missing for other household members in the HFCS.

where g denotes gender (men or women); w_i^g denotes non-transformed net wealth;[11] the term $x_i^{g,k}$ is a set of explanatory variables; α_0^g is a constant term; and α_k^g shows the effect of the k^{th} explanatory variable on wealth. ε_i is an error term with conventional properties. Equation (5) is estimated only for the individuals, i, from single-person households.

The set of explanatory variables k=1, ..., K covers the same variables as does the model for single-person households shown in the previous sub-section. Instead of age and age squared, we use three age groups: 1) up to 30 years, 2) 30–59, and 3) 60 and older. Using discrete age groups makes it easier to interpret the effects on interaction terms with age. We also add interaction terms with age groups for the following variables: self-employment status, income, squared income, and level of education.

Age group interactions capture differences in wealth accumulation that arise from income, education and self-employment across different cohorts, as saving preferences and the options available for saving and investment may have changed over time. We also observe empirically that using interaction terms improves the imputation of net wealth at the top. We do not extend the list of interactions further, otherwise the small sample sizes of some subgroups of single people will start to reduce the precision of the estimations.

The individual-level wealth of multi-member households in each country is obtained by using the behavioural relationships in single-person households:

$$\widehat{w}_i^g = \hat{\alpha}_0^g + \sum_{k=1}^{K} \hat{\alpha}_k^g \, x_i^{g,k} \quad if\ i \in multi-member\ hhs \tag{6}$$

where $\widehat{w}_i^g$ denotes the predicted wealth for men or women in multiple-member households using the estimated coefficients of $\hat{\alpha}_0^g$ and $\hat{\alpha}_k^g$ from single-person households and the individual characteristics of the members of multiple-member households, $x_i^{g,k}$.

We use an extensive set of explanatory variables to capture as many predictors of net wealth as possible. However, we do not want to select one model only and to estimate the parameters for just that chosen model since different sets of covariates may explain and predict the net wealth best in different countries. To account for the uncertainty around the choice of the explanatory variables, we use a model averaging technique – the weighted-average least squares (WALS) method developed by Magnus et al. (2010). This method, like Bayesian model averaging, incorporates the uncertainty that arises from estimation and model selection. Both the Bayesian and WALS model averaging methods allow some regressors to be in the model for certain, while the selection applies to less certain covariates. The variables that are included in all the specifications for our estimations are income, age and education, since they are relevant in explaining net wealth in all countries, while we are less certain about the importance of the other variables in the model. In the model averaging terminology these variables are called auxiliary regressors, implying that there is more flexibility across the countries about whether to include these variables.

The WALS estimator combines Bayesian and frequentist methods. With the number of auxiliary regressors k, 2^k models are estimated with all the possible combinations of these variables resulting in 2^k different sets of estimators. The WALS estimator of each regressor b_k is the weighted average of all the estimators over all the models $b_k = \sum_{i=1}^{2^k} \lambda_i \, \hat{\beta}_{k,i}$ where the model weights are computed so that they sum up to one and they depend on the relative performance, or importance, of the models; see further details in Magnus and Luca (2014). The

[11] We do not use IHS transformation in the imputation exercise as it seems not to be suitable for predicting net wealth in absolute terms. The re-transformed predicted values of IHS wealth had many outliers, especially with the negative sign, and these often provided non-plausible estimates of the gender wealth gap.

semiorthogonal transformation of the auxiliary regressors allows the weights to be computed without all the possible models needing to be estimated, but the transformation reduces the number of models to the order *k*, meaning the computational burden is less than for the Bayesian model averaging method.

As the next step, we use the behavioural relationships between net wealth and observed characteristics for people in single-person households to predict the net wealth of each household member in multi-member households. We predict net wealth for all individuals using the WALS model averaging estimators from the sub-group of single men and single women, as given in Equation (5). Magnus et al. (2016) show that using the estimated α_k^g from one sub-sample with (w_i^g, $\sum_{k=1}^{K} x_i^{g,k}$) lets us predict the new values of $\widehat{w}_i^g$ in another sub-sample that are associated with the values of the covariates $\sum_{k=1}^{K} x_i^{g,k}$ in this sub-sample. One critical assumption is of course that the data generating process is the same, meaning that the relationship of the covariates $\sum_{k=1}^{K} x_i^{g,k}$ to w_i^g is the same in both sub-groups for each gender, i.e. among single men and men in multi-member households, as well as among single women and women in multi-member households. The prediction methodology assumes that the gendered wealth accumulation functions do not differ between household types.

5. Results

5.1 The gender wealth gap in single-person households

The estimated gender wealth gaps for single people are presented in Table 2. We show the unconditional mean gap and both the unconditional and unexplained gaps estimated at the 50th, 90th and 95th percentiles of the wealth distribution. We focus on the differences at the upper tail of the wealth distribution, following the findings in the earlier literature. The estimated unexplained wealth gaps in each quantile are obtained from the OB decomposition specified in Equation (4). The unexplained gap is the second term in the right-hand side of this equation.

The mean unconditional gender wealth gap among people in single-person households is negative but statistically insignificant in five countries, while it is positive but mostly insignificant in the rest of the sample countries (Table 2 column 1). The gap is statistically significant and in favour of men only in Hungary (27%), Poland (23%) and Italy (14%). These results confirm the earlier findings on the HFCS data that the mean gender wealth gap in single-person households is rarely statistically significant (Schneebaum et al. (2018)).

Three regularities can be identified for the results of the OB decomposition shown in Table 2. First, both raw gaps and unexplained gaps mostly tend to be insignificantly different from zero at the top of the wealth distribution and only about one third of the estimates are statistically significant at the median. Second, the gaps that are significant are about as likely to be negative (i.e. in favour of women) as they are to be positive in the middle of the distribution, while they are more likely to be positive than negative at the top of the wealth distribution. This result is similar to the earlier findings in the literature (e.g. Shneebaum et al. (2018) and Bonnet et al. (2013)), which also showed that the gender gaps in wealth are mostly present only at the top of the distribution. However, most of the gaps are statistically insignificant both at the median and at the top. Third, the comparison of the raw and unexplained gaps implies that the characteristics observed do not have much explanatory power for gender differences in wealth, implying that the returns to the characteristics or wealth accumulation functions are different for men and for women. On some occasions, the gaps are

rendered insignificant when the observed characteristics are controlled for, but the results are quite heterogeneous across countries in this respect.

The upshot of these estimates is that the wealth gaps for single people are mostly statistically insignificant, and even tend to be in favour of women in the middle of the distribution. These results are different from the findings of studies that have been based on data from households of all types. Such studies usually find the gaps to be in favour of men, especially at the top of the distribution (Sierminska et al. (2010), Bonnet et al. (2013), Meriküll et al. (2020)). The gaps are usually largest for households with married couples and smallest among single-person households (e.g. Meriküll et al. (2020)).

5.2 Gender wealth gaps in all household types

As the few country-specific studies that have been done imply that the gender wealth gaps differ markedly between household types (Sierminska et al. (2010), Bonnet et al. (2013), Meriküll et al. (2020)), we reach the main aim of our paper, which is to derive a measure of the gender wealth gap that is representative of all households and individuals. As explained in sub-section 4.2, we predict net wealth for each adult household member using the behavioural relationships between the characteristics related to the wealth function that we observed at the individual level. We take the different behavioural characteristics of men and women into account, and so the predicted net wealth captures differences between genders both in their characteristics and in the wealth accumulation function.

We perform a number of validation tests for our predicted net wealth. First, we compare our estimates of individual-level wealth with the estimates of total household-level wealth that were collected by the survey. For each multi-member household we sum up the predicted individual-level wealth of all the adult household members. We contrast the mean of the predicted net wealth to the wealth data collected by the survey for the households in each wealth percentile.[12] This lets us compare the distribution of the predicted and actual household wealth over the wealth distributions.

The distributions of predicted household wealth and the wealth reported from the survey are shown in Figure 1. The predicted net wealth tends to be larger than the survey-based estimate for the observations in the middle of the wealth distribution and smaller at the very top of the wealth distribution. This implies that the prediction model provides a flatter distribution and does not capture the extreme positive values of wealth very well. The predicted wealth for more than half of the countries is lower than the wealth reported by the survey at the 95th percentile or higher of the wealth distribution, which is where the amounts of wealth reported in the survey increase rapidly. Even though we have added interaction terms for the main predictors of net wealth, and those interactions are expected to capture the extremes better, it is still challenging to capture the top tail. We experimented by adding more interactions into the WALS weighted averaging model, but this did not improve the fit of the predictions at the tails. The issue cannot be addressed by including more interactions as single-person households have fewer extreme values than multi-member households do, making the prediction exercise off-support at the upper tail.

[12] In this exercise we assume that dependent children do not own any wealth in a household.

Table 2. Gender wealth gap in single-person households, male base

	Mean	Median		90th quantile		95th quantile	
	(1) Unconditional gender gap (untransformed)	(2) Raw gap (IHS)	(3) Unexplained gap (IHS)	(4) Raw gap (IHS)	(5) Unexplained gap (IHS)	(6) Raw gap (IHS)	(7) Unexplained gap (IHS)
Austria, n=1277	0.136	0.448***	0.237	0.225	0.127	0.306*	0.222
Belgium, n=906	0.192	0.143	–0.032	0.232*	0.064	0.214	0.090
Croatia, n=347	0.256	–0.073	–0.212	0.034	0.019	0.209	0.307
Cyprus, n=212	0.052	0.273	–0.290	–0.144	–0.788	–0.018	–0.541
Estonia, n=794	–0.289	–0.903***	–0.080	–0.164	0.369	0.096	0.586
Finland, n=2765	0.003	–0.494	0.368**	0.037	0.281***	0.141*	0.298***
France, n=4583	–0.002	–0.261	–0.127	0.060	0.008	0.034	–0.020
Germany, n=1335	0.215	0.861***	0.573*	0.301	0.169	0.172	0.030
Greece, n=762	–0.181	–0.519**	–0.815	–0.074	–0.367	0.148	–0.295
Hungary, n=1990	0.272*	–0.145	–0.169	0.056	0.042	0.177	0.230
Ireland, n=1465	0.091	–0.187*	–0.213*	0.179*	0.146	0.147	0.080
Italy, n=2736	0.137*	–0.137	–0.344	0.286***	0.198**	0.408***	0.277**
Latvia, n=464	0.159	0.147	0.277	0.333	0.441	0.329*	0.398
Lithuania, n=653	–0.278	0.021	0.082	–0.135	–0.180	–0.855**	–0.888**
Luxembourg, n=441	0.063	–0.665**	–1.036***	0.188	–0.105	0.346	0.269
Malta, n=210	0.480	0.009	–0.492	0.414	–0.345	0.325	–0.008
Netherlands, n=1024	0.252	0.608***	0.484**	0.010	–0.145	0.035	–0.182
Poland, n=1594	0.228***	–0.191	–0.127	0.132	–0.054	0.461***	0.160
Portugal, n=1453	0.163	0.022	0.226	0.122	–0.061	0.265	–0.009
Slovakia, n=643	0.219	0.060	–0.063	0.214	0.151	0.288	0.224
Slovenia, n=436	–0.218	–0.391	0.024	–0.144	–0.117	–0.069	–0.066

Source: Authors' calculations from the HFCS using five imputed datasets.

Notes: The unconditional mean gap is based on untransformed net wealth, the rest of the gaps are estimated on IHS transformed net wealth and can be interpreted as log differences between the wealth of men and that of women.

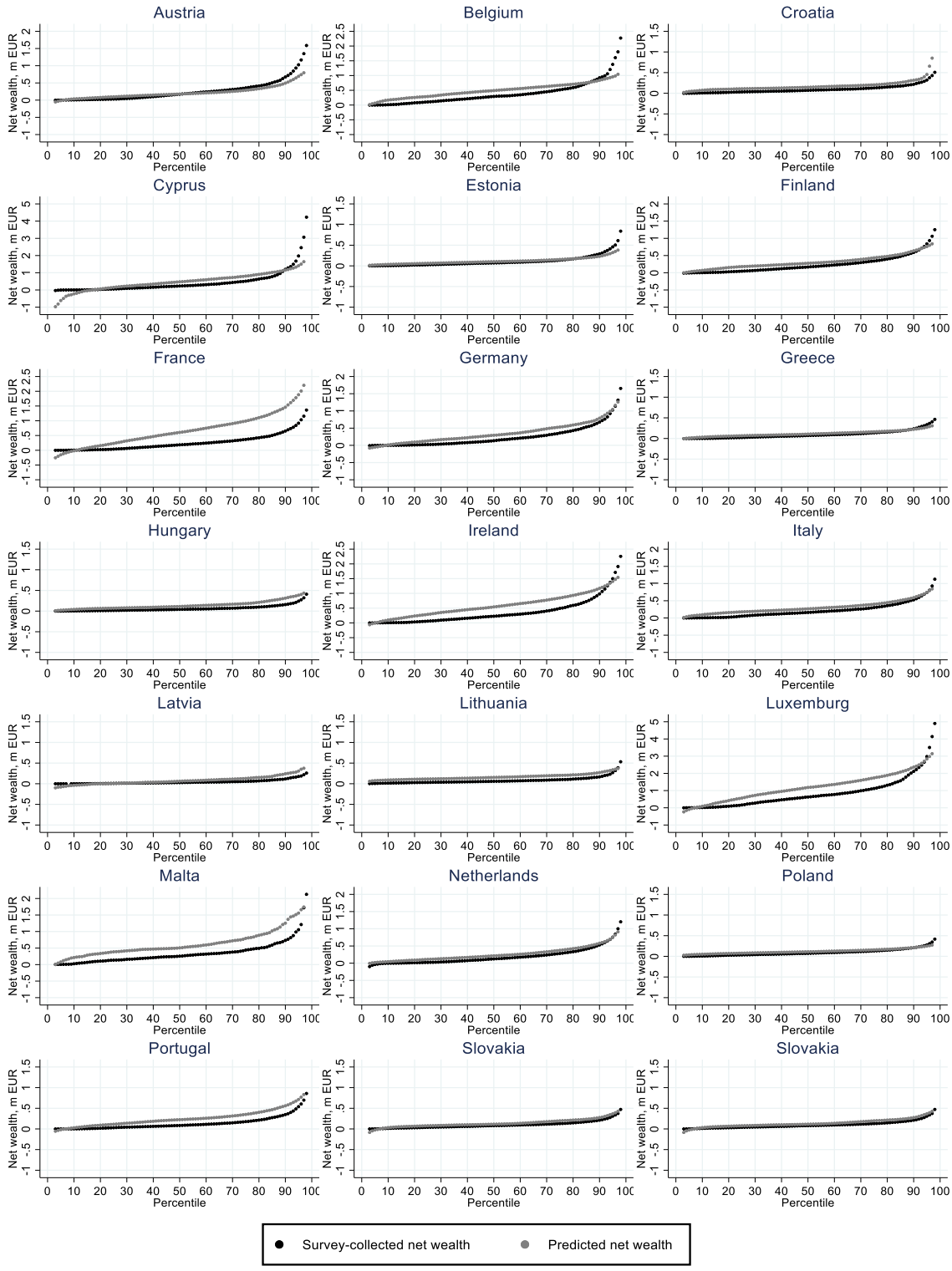

Figure 1. Distributions of survey-based and predicted net wealth at the household level, multiple-member households only.

Source: Authors' calculations from the HFCS using five imputed datasets.

Notes: The figure presents the mean net wealth of households at each percentile. Two per cent of the lowest and the highest observations are excluded.

Next we calculate the prediction error for each household. These errors are calculated as the difference between predicted values and the values from the survey, standardised by the mean net wealth of each country. We present the mean prediction errors for each percentile over the distribution of the net wealth reported in the survey in Figure 2. The prediction errors are only presented for multi-member households and are slightly positive throughout most of the distribution with no systematic divergences from this pattern, except at the very top. This implies that the predicted household wealth is slightly larger than the survey-reported wealth, and this pattern is seen for most countries.

Negative prediction errors at the top suggest that our methodology under-predicts the wealth of the richest, starting from the 80^{th} or 90^{th} quantile. The reason for this is that the top of the distribution is off-support, as noted previously, meaning that there are fewer super-rich people among single-person households than among multiple-member households. Another possible explanation for this is that it is difficult to explain the wealth of the super-rich using observable characteristics such as labour-market activity, education and age. People may be in the top tail of the wealth distribution because of other factors explained in sub-section 2.3, such as preferences and personal traits, or even luck, that we cannot capture with our data. The under-prediction of net wealth at the top may lead to the gender wealth gap at the top being under-predicted as well if there are more men than women among the very rich.

Table 3 presents the estimated gender wealth gaps using the data from the survey on net wealth for single-person households and the predicted individual-level net wealth for other households. The predictions are based on the behavioural relationships estimated using the model given in Equation (5) and the predicted wealth values from the model described by Equation (6). Our baseline method is the WALS model averaging method taking account of model uncertainty. We provide these estimations for the gaps at the mean and the median gap and for the quantiles at the upper part of the wealth distribution (the 75^{th}, 90^{th} and 95^{th} quantile). The method estimates the total wealth gap, which can be interpreted as the unconditional or raw gap.

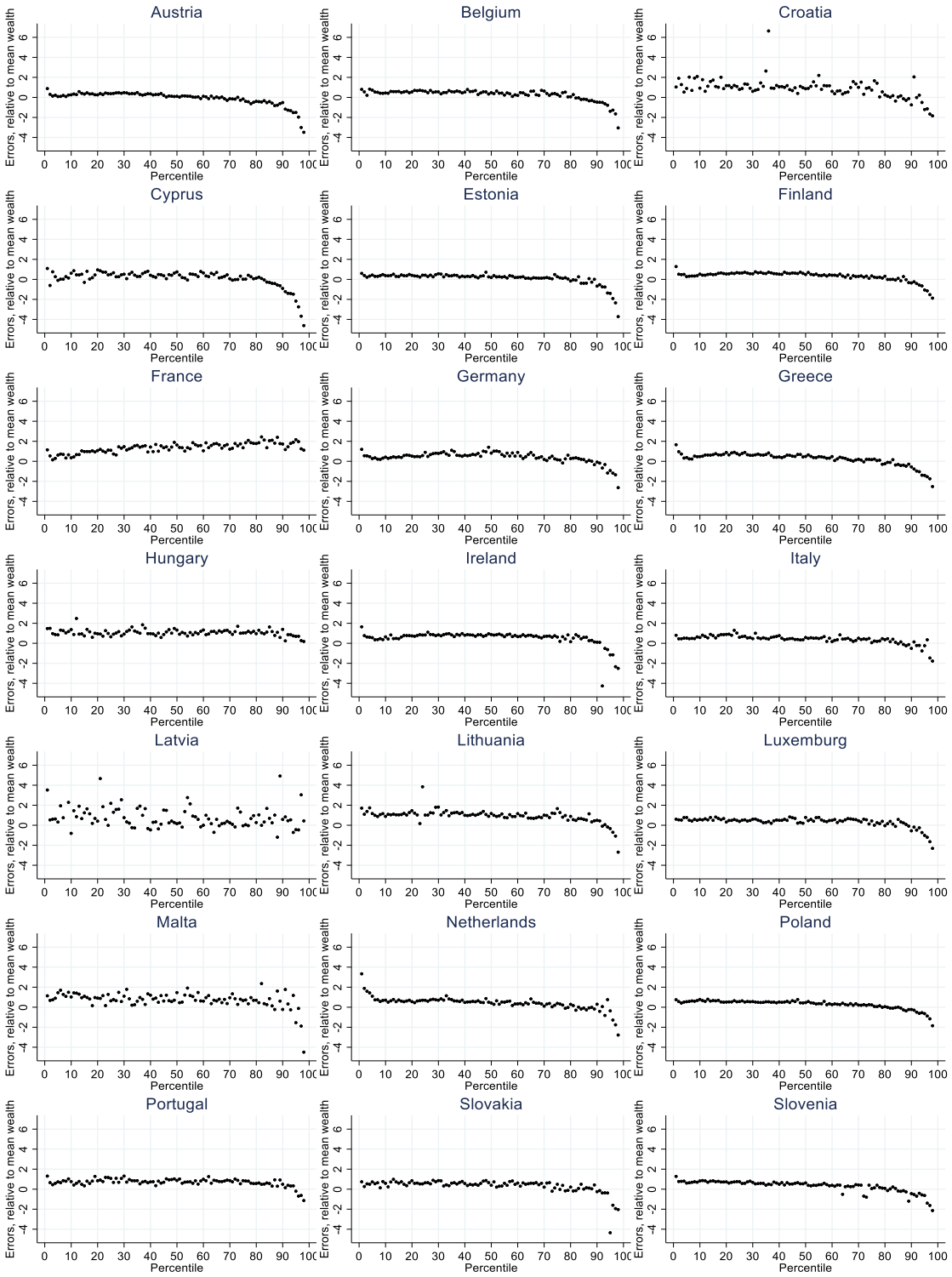

Figure 2. Distribution of prediction errors for multiple-member households

Source: Authors' calculations from the HFCS using five imputed datasets.

Notes: The prediction errors are calculated as the difference between predicted wealth and survey-reported wealth and standardised by the mean net wealth of each country. They are computed at the household level and the mean prediction error is presented for each percentile of survey-reported net wealth. Two per cent of the highest observations are excluded.

Table 3. Predicted gender wealth gaps in all households using the WALS model averaging method

	(1) Mean gap	(2) Median gap	(3) p75 gap	(3) p90 gap	(4) p95 gap
Austria	0.484***	0.507***	0.591***	0.628***	0.616***
Belgium	0.266**	0.151***	0.207**	0.201***	0.245**
Croatia	0.428***	0.128***	0.226***	0.350***	0.591**
Cyprus	0.718*	0.622**	0.563	0.569*	0.585**
Estonia	0.137**	0.004	0.073	0.211***	0.273**
Finland	0.333***	0.293***	0.380***	0.347***	0.330***
France	0.165***	–0.109*	0.106***	0.303***	0.350***
Germany	0.494***	0.552***	0.565***	0.520***	0.470***
Greece	0.131***	0.198***	0.184***	0.218***	0.237***
Hungary	0.242***	0.300***	–0.110	0.401***	0.438***
Ireland	–0.055	0.137	0.410***	0.420***	0.433***
Italy	0.234***	0.292***	0.300***	0.266***	0.298***
Latvia	0.576***	0.556***	0.591***	0.668***	0.623***
Lithuania	–0.138	–0.075	–0.053	–0.131	–0.350
Luxembourg	0.155*	0.030	0.194***	0.383***	0.405***
Malta	0.435***	0.162***	0.146***	0.535***	0.619***
Netherlands	0.451***	0.132	0.313***	0.490***	0.575***
Poland	0.269***	0.174***	0.258***	0.275***	0.290***
Portugal	0.127**	–0.074	0.164**	0.400***	0.354***
Slovakia	0.019	–0.063	0.351**	0.446**	0.307
Slovenia	–0.083	0.172	0.027	0.066	–0.054

Source: Authors' calculations from the HFCS using five imputed datasets.

The estimates presented in Table 3 imply that unlike the gender wealth gap among single-person households, the mean gender wealth gap for the whole adult population is mostly significantly positive, i.e. in favour of men. It is economically large for most countries, ranging from 13% in Portugal and Greece to 72% in Cyprus (Table 3 column 1). The gap is also relatively large in Latvia, Austria, Germany, and the Netherlands, where it is around 50–60%. It is statistically insignificant in only four of the 21 countries: Ireland, Lithuania, Slovakia and Slovenia.

Our methodology provides estimates of the gender wealth gap that are smaller at the median and increase towards the top of the wealth distribution. This pattern is similar to the findings from the earlier studies that used individual-level wealth data (Sierminska et al. (2010), Bonnet et al. (2013), Meriküll et al. (2020)). As Table 3 shows, no significant gap is found in eight countries in the middle of the wealth distribution and the gap is less than 20% in five countries. The gaps tend to be larger at the 95th percentile than at the median in most of the countries. The wealth gaps are significantly in favour of men at the top of the distribution in all the countries studied except Slovenia, Slovakia and Lithuania, where the estimated wealth gap is insignificant. The largest gaps at the 95th percentile are estimated for Latvia, Malta and Austria (62%), Cyprus (59%) and the Netherlands (58%).

The sample sizes for Cyprus, Croatia, Latvia and Malta are relatively small and we might not be able to predict the top levels of wealth accurately. Figure 2 indicated that the prediction error for net wealth is largest at the top of the wealth distribution, implying that the gender gaps at the top might be underestimated. Table 4 shows that the estimated gender wealth gap is similar at the 90th and 95th percentiles in most countries, though it would be expected to have become larger at the 95th percentile. Comparing the estimates at the 75th and the 90th percentiles

reveals the gap to be increasing for half of the sample countries but to have already reached a high level at the 75th percentile for the rest and not to be increasing further at higher percentiles. However, we can still argue that the overall pattern of the gaps estimated with predicted wealth is well in line with what we know from the earlier literature – it is smaller at the median and increases in the upper part of the wealth distribution.

Next we analyse the gender wealth gaps for different household types. The estimated net wealth that is based on predicted individual-level net wealth for multi-member households over the wealth distribution is given in Table A.2 in the Appendix and the estimated gaps are presented in Table 4. The estimates in this table show that the mean gender wealth gap is largest in couple-headed households in half of the sample countries, while the gap in single-person households is usually the smallest (except in Hungary and Malta). The estimated mean gap for couples is 13% in France, which is comparable to the level found by Bonnet et al. (2013), who estimated the mean gap for couples to be around 10% (business assets were not included in these estimates).[13] Sierminska et al. (2010) calculated the wealth gap in Germany to be around 40% for couples, while our estimated gap for couples is somewhat larger at 57%. Our study uses data from 2017, while Sierminska et al. (2010) used 2002 data. There is evidence that wealth inequality in European countries has been trending upwards in recent decades (Pikkety and Saez (2014)). Increasing overall inequality is likely to be accompanied by a widening gender gap in wealth as well.

Meriküll et al. (2020) estimate the gender wealth gap to be 47% for married couples and 38% for co-habiting couples using the register data for Estonia, while we obtain gaps of 30% and 16%, respectively. This difference may arise from using survey data rather than register data. There is evidence that the survey data underestimate the inequality of net wealth relative to register data (Vermeulen (2016), Vermeulen (2018), and Meriküll and Rõõm (2020)).

The estimates in Table 4 show that gender wealth gaps for single-person households are insignificant in most countries, like in the estimates presented in sub-section 5.1 and in Table 1. The gaps for couple-headed households are mostly significant over the wealth distribution for all countries except Lithuania, Slovakia and Slovenia. The results for other multi-member households are more heterogeneous, as might be expected. A common pattern for all multi-member households is that the gender wealth gaps increase towards the upper tail of the distribution. This pattern seems to be even stronger for other types of households than for partner-headed households and it indicates that the wealth in such households is more unequally distributed among men than among women. The gap in the whole population originates from the gap in multi-member households. This emphasises the importance of the whole-population-based estimates for the gender wealth gap.

[13] The studies cited here report the gap relative to women's wealth, which is the difference between the wealth of men and that of women divided by the wealth of women. We have recalculated the gaps for these studies, so that it is assessed relative to men's wealth, which is the standard method used for estimates of the gender pay gap: $\frac{(w^{men}-w^{women})}{w^{men}}$.

Table 4. Predicted gender wealth gaps across different household types using the WALS model averaging method

	Mean	Median	p75	p90	p95
Austria, singles	0.136	0.360**	0.285	0.200*	0.245
Austria, couples	0.620***	0.536***	0.602***	0.691***	0.744***
Austria, other	0.606***	0.435***	0.638***	0.738***	0.782***
Belgium, singles	0.191	0.145	–0.010	0.211	0.201
Belgium, couples	0.276***	0.185*	0.239***	0.221***	0.204**
Belgium, other	0.352	0.020	0.058	0.249**	0.363
Croatia, singles	0.256	–0.074	0.112	0.023	0.165
Croatia, couples	0.362*	0.117*	0.215***	0.294***	0.263
Croatia, other	0.508***	0.154**	0.276***	0.547***	0.868***
Cyprus, singles	0.011	0.203	–0.194	–0.205	–0.261
Cyprus, couples	0.732**	0.647	0.591	0.598*	0.608**
Cyprus, other	0.964	0.669*	0.586	0.590	0.626**
Estonia, singles	–0.284	–1.453***	–0.577***	–0.190	0.070
Estonia, couples	0.253***	0.142	0.156**	0.330***	0.398**
Estonia, other	0.013	–0.147	–0.017	0.116	0.173
Finland, singles	0.001	–0.597***	–0.083	0.028	0.125
Finland, couples	0.409***	0.382***	0.475***	0.403***	0.382***
Finland, other	0.331***	0.137**	0.407***	0.307***	0.292***
France, singles	–0.004	–0.317	–0.116	0.044	0.033
France, couples	0.130***	–0.384***	0.163***	0.328***	0.349***
France, other	0.132	–0.055	0.012	0.242***	0.341***
Germany, singles	0.215	0.575**	0.477***	0.264	0.168
Germany, couples	0.568***	0.510***	0.611***	0.574***	0.565***
Germany, other	0.540***	0.384*	0.518***	0.608***	0.559***
Greece, singles	–0.184	–0.703**	–0.130	–0.073	0.144
Greece, couples	0.197***	0.283***	0.187***	0.198***	0.227***
Greece, other	0.175*	0.087	0.252***	0.332***	0.386***
Hungary, singles	0.272*	–0.214*	0.064	0.165	0.124
Hungary, couples	0.234***	0.259***	–0.142*	0.487***	0.405***
Hungary, other	0.196***	0.332***	–0.130	0.336***	0.455***
Ireland, singles	0.091	–0.158	0.006	0.078	0.173
Ireland, couples	–0.230	0.261***	0.433***	0.428***	0.441***
Ireland, other	0.262	0.044	0.505***	0.490***	0.536***
Italy, singles	0.137*	–0.151	0.116	0.251***	0.333
Italy, couples	0.296***	0.373***	0.367***	0.316***	0.352***
Italy, other	0.214***	0.186***	0.324***	0.351***	0.319***
Latvia, singles	0.159	0.123	0.067	0.242	0.288
Latvia, couples	0.438***	0.543***	0.565***	0.556***	0.580***
Latvia, other	0.809***	0.697***	0.761***	0.771***	0.786
Lithuania, singles	–0.277	–0.005	–0.025	–0.114	–1.042**
Lithuania, couples	–0.114	–0.210	–0.052	–0.109	0.037
Lithuania, other	–0.161	–0.174	–0.220	–0.144	–0.060
Luxemburg, singles	0.065	–0.940**	–0.232	0.178	0.265
Luxemburg, couples	0.212**	0.153*	0.302***	0.420***	0.435***
Luxemburg, other	0.075	0.073	0.196	0.347**	0.404***
Malta, singles	0.480*	0.003	0.251	0.287	0.258
Malta, couples	0.472***	0.101	0.249***	0.681***	0.611***
Malta, other	0.344***	0.314***	-0.048	0.326**	0.568***
Netherlands, singles	0.252	0.451**	0.275*	0.028	0.068
Netherlands, couples	0.484***	0.091	0.357***	0.540***	0.642***
Netherlands, other	0.594***	0.301	0.361***	0.529***	0.594**

	Mean	Median	p75	p90	p95
Poland, singles	0.228***	–0.234***	-0.109	0.109	0.351*
Poland, couples	0.360***	0.265**	0.352***	0.374***	0.386***
Poland, other	0.181***	0.106	0.174***	0.212***	0.244***
Portugal, singles	0.163	0.019	–0.100	0.113	0.233
Portugal, couples	0.156***	–0.026	0.265***	0.414***	0.380***
Portugal, other	–0.000	–0.462**	–0.012	0.437***	0.355**
Slovakia, singles	0.219	0.057	0.101	0.194	0.234
Slovakia, couples	0.067	0.058	0.446**	0.473***	0.210
Slovakia, other	–0.085	–0.220	0.138	0.425*	0.232
Slovenia, singles	–0.218	–0.483*	–0.033	–0.163	–0.079
Slovenia, couples	0.022	0.139	0.023	0.118	–0.026
Slovenia, other	–0.183	0.186**	0.066	0.049	0.111

Source: Authors' calculations from the HFCS using five imputed datasets.

5.3 Robustness tests

As the gender wealth gap estimations rely heavily on predicted individual wealth, we provide robustness tests for these estimates. The advantage of the WALS model averaging methodology is that it takes model uncertainty into account in the selection of the covariates for the imputation model by weighting the covariates, with the weights depending on the importance of the model. The result is that less significant covariates have a smaller role when the predicted values are calculated. This approach provides more stable predicted values than the OLS predictions, which can be affected by economically large but statistically insignificant coefficients.

As an additional robustness check, we calculate the estimates of the mean gender wealth gap for six different model specifications, using four WALS-based models and two OLS-based ones. Figure 3 presents these estimates. In addition to the baseline WALS model that we used in the analysis above, we provide the estimates for the mean gap for a model without age group interactions (WALS wo interactions) and one where all the variables are defined as uncertain variables (WALS all auxiliary). In the fourth specification (WALS adjusted) the individual wealth levels for multi-member families are rescaled so that their sum is equal to the household-level wealth obtained from the survey. The first three WALS model specifications provide very similar estimates of the mean gap for most of the countries covered, with only a few exceptions. The fourth specification provides more disparate results, with the estimated gap being lower than the other WALS-based estimates for several countries (Croatia, France, Ireland, Latvia, Lithuania and Slovakia). The lower mean estimates originate from the estimated wealth gap being smaller at the top (not reported). We conclude from this exercise that adjusting the predicted wealth to match the survey-reported wealth does not help to capture the wealth differences at the top. This is why we chose to report the results of the baseline WALS model as our main set of estimates.

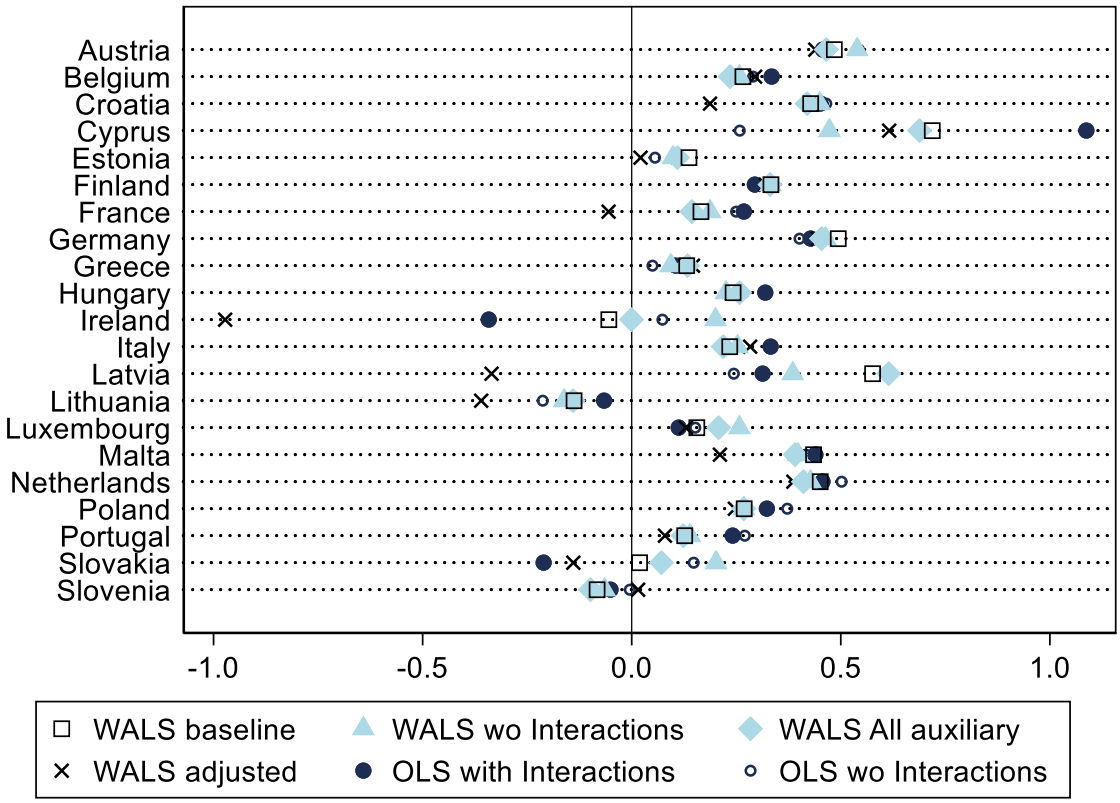

Figure 3. Gender wealth gap estimates at the mean based on various estimation methods and models.

Source: Authors' calculations from the HFCS.

We also compare the WALS model averaging estimations with the OLS models with the same covariates included as in the baseline WALS model (OLS with interactions) and the model excluding the interaction terms (OLS wo interactions). The results for the different specifications of the OLS models are quite dissimilar. It is apparent from this comparison that the estimates for different WALS-based specifications are more stable and depend less on the specific choice of model.

The upshot of the robustness tests is that the predictions using various specifications of the WALS model averaging method provide wealth gap estimates that are close to each other for the majority of countries. Adjusting the predicted wealth to match the household wealth reported in the survey does not work for some countries, while the OLS estimates vary substantially depending on the set of covariates used. The results using the WALS model averaging method remain very similar with a smaller or larger set of covariates, indicating that the estimates are stable.

6. Gender wealth gaps: Is there a story?

Although the pattern of an increasing gender wealth gap over the wealth distribution is identified for most of the sample countries, we still observe quite large differences in the mean level of the gap. It is insignificant in Ireland, Lithuania, Slovakia and Slovenia, while it is about 60–70% in Latvia and Cyprus. In this sub-section we seek to provide some country-level explanations for the large variation in the mean gender wealth gaps in Europe. We correlate the wealth gap estimates across countries with various country-level indicators to see which indicators could help to explain the wealth inequality between genders.

We discussed in Section 2 possible differences in the wealth function of men and women, and here we try to understand whether the country-level differences in the wealth function are related to the factors that determine the accumulation of wealth. The most obvious explanation for the gender differences in wealth is the differences in labour market outcomes. Figure 4 presents the correlations between the gender gap in wealth and the gender gaps in some key labour market indicators, such as hourly wages and the labour force participation rate. The figure demonstrates that while the correlations between the labour market indicators and the wealth gap are positive as expected, they are weak and statistically insignificant (the Pearson correlation coefficients and the significance are provided in Table A.5 in the Appendix). These results highlight that wealth gaps and wage gaps are not explicitly related to each other and the wage gap does not feed directly into the wealth gap, even though labour income is an important determinant of wealth. There is evidence that women can gain more in terms of wealth from marriage and cohabitation than men do (Meriküll et al. (2020)), which may be one explanation for this finding.

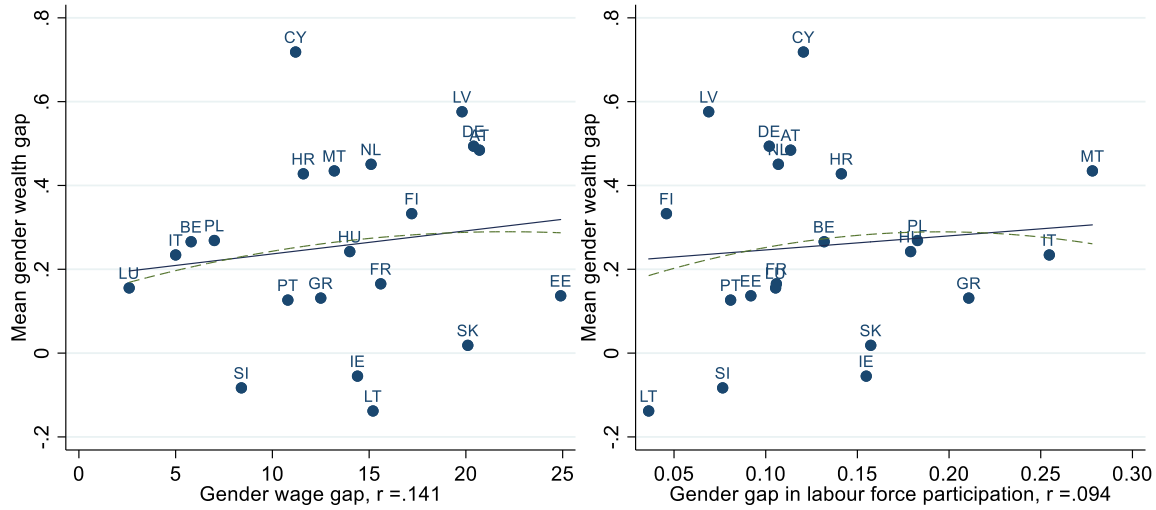

Figure 4. Correlation between country-level mean gender wealth gaps and labour market gaps.

Source: Authors' calculations from the HFCS and Eurostat series TESEM180 and LFSI_EMP_A in 2017. The data are provided in Table A.3 in the Appendix.

Notes: The solid line is a linear fit prediction and the dashed line is a quadratic prediction for the gender wealth gap.

Next we look at whether gender wealth gaps are related to the overall wealth inequality in a country. Figure 5 presents the correlations of the gender wealth gap with the Gini coefficient of wealth and the share of wealth owned by the richest 10% of the households. There is a strong positive and statistically significant correlation between the gender wealth gap and both of these indicators of wealth inequality. The countries with the largest wealth inequality in Europe, such as the Netherlands, Cyprus, Germany and Austria, have the widest gender wealth gaps, while the countries with the lowest wealth inequality, such as Slovakia, Slovenia and Lithuania, have the smallest gender wealth gaps.

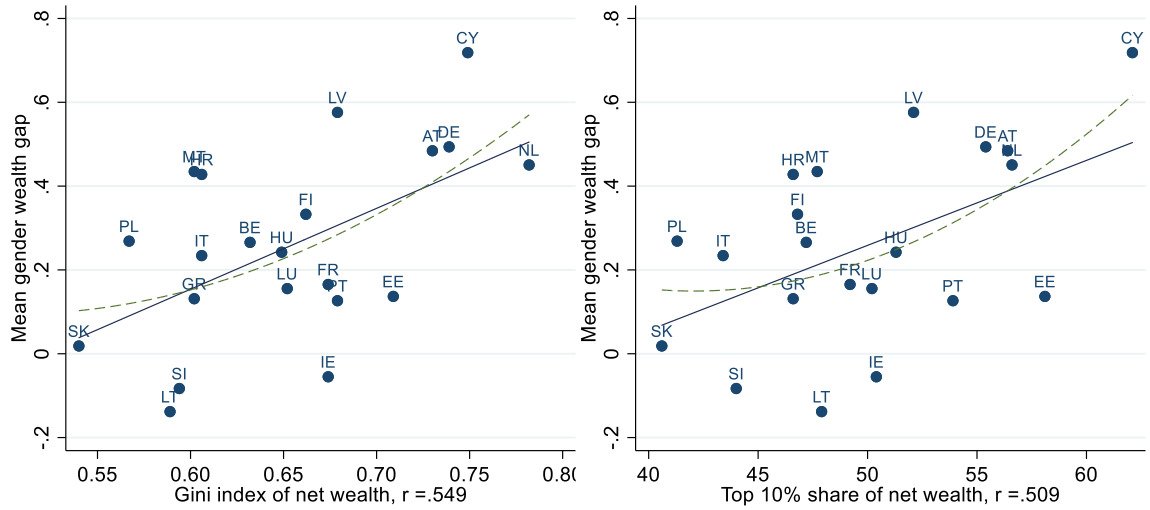

Figure 5. Correlation between country-level mean gender wealth gaps and indicators of wealth inequality.

Source: Authors' calculations from the HFCS and country-level statistics from HFCN (2020). The data are provided in Table A.3 in the Appendix.

Notes: The solid line is a linear fit prediction and the dashed line is a quadratic prediction for the gender wealth gap.

Several studies on European countries show that real estate is the most equally distributed asset class (Sierminska et al. (2010), Bonnet et al. (2013), D'Alessio (2018), Meriküll et al. (2020)), while some other classes, such as business assets, tend to be the main source of wealth inequality between the genders (Meriküll et al. (2020)). This leads us to investigate the relationship between the country-level composition of wealth and the gender wealth gap. It can be expected that the home ownership rate is negatively related with overall wealth inequality and also with the gender wealth gap. We tested whether there is a negative correlation between the home ownership rate and the gender wealth gap across the sample countries. As shown in the upper left panel in Figure 6, these two variables are indeed strongly and statistically significantly negatively related at the country level.

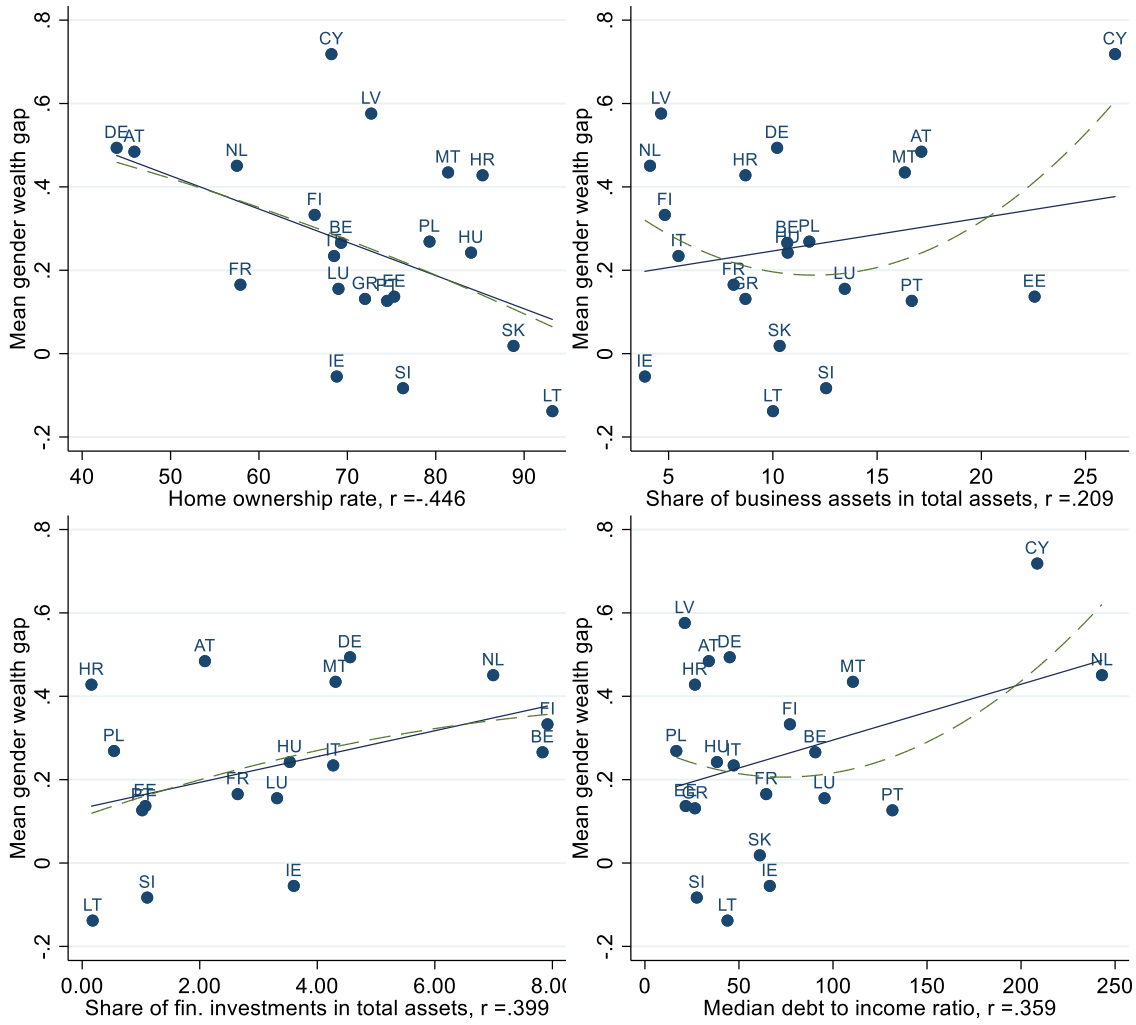

Figure 6. Correlation between country-level mean gender wealth gaps and the wealth structure.

Source: Authors' calculations from the HFCS and country-level statistics from HFCN (2020). The data are provided in Table A.3 in the Appendix.

Notes: The solid line is a linear fit prediction and the dashed line is a quadratic prediction for the gender wealth gap.

Next we assessed the correlation between the importance of business assets and the gender wealth gaps at country level (upper right panel in Figure 6). This assessment did not imply any strong relationship between the mean wealth gap and the share of business assets in total assets for the European countries. We also tested the correlation with the share of participation in business assets but the result was the same (not shown). Similarly, no clear relationship was found between the wealth gap and the share of financial investments (stocks, bonds and mutual funds) in total assets, as the correlation coefficient of 0.399 is not statistically significant (lower left panel in Figure 6).

We also tested the relationship between the gender wealth gap and the indebtedness of the households. Indebtedness can be measured as the debt participation rate, the average debt level, the debt-to-income ratio or the debt-to-asset ratio. We found the strongest correlation between

the wealth gap and the median debt-to-income ratio, for which the correlation coefficient is 0.359, but this is not statistically significant.

The upshot of this analysis is that although there is substantial variation in how extensively various financial products like stocks or business assets are used in a country, this is not important for the gender wealth gap. The only asset that matters is the household main residence, since homeownership seems to be an equalising factor in the gender wealth differences. The overall distribution of wealth is also important for the gender wealth gap.

The gender gap in wealth can also depend indirectly on softer institutional factors, such as gender attitudes and cultural dimensions. There is evidence that more egalitarian attitudes to gender are related to a higher labour force participation rate for women, a smaller gender pay gap (Fortin (2005)), and a smaller gender pension income gap (Veremchuk (2020)). We tested the relationship of the gender wealth gap with the gender attitudes indicated by the questions in the World Value Survey and the European Values Survey on male priority in jobs[14] and with the cultural dimension of masculinity from Hofstede[15]. The related correlation coefficients were weak and statistically insignificant and so are not reported.

Although gender attitudes have been shown to be related with gender income differences, they may be less related with wealth gaps because of differences in how pay is determined and how wealth accumulates. Labour income is the result of negotiations between the employee and the employer, either at the individual or at the collective level, and so it is affected by the attitudes of people other than the one whose pay is being decided. Wealth accumulation, on the other hand, depends only on the individual's own choices. While the gender gaps in pay and in labour force participation can therefore be directly affected by (possibly discriminatory) gender norms, the gender gaps in wealth can only indirectly depend on them through how they impact individual incomes, and occupational or educational choices. Instead, gender wealth gaps depend mainly on individual preferences for saving and investment, as discussed in Section 2.

7. Conclusion

This paper provides comparative estimates of the gender wealth gaps for 21 European countries. We employ the data from the 2017 wave of the Household Finance and Consumption Survey (HFCS). This survey contains harmonised data on household assets and liabilities, together with additional information on incomes, consumption, demographic variables and household composition.

In the first part of the paper we provide estimations of the gender wealth gaps among single-person households. As the wealth data in the HFCS are provided at the household level, this is the only subgroup of people for whom we can obtain the survey estimates of individual-level wealth. The estimated gender gaps between single-person households are mostly statistically insignificant at the mean and median levels of net wealth. They tend to get wider towards the

[14] The exact question is "If jobs are scarce: Men should have more right to a job than women". The share agreeing is used to quantify the answers for the statistical analysis. The data are downloaded from the World Value Survey online analysis tool: http://www.worldvaluessurvey.org/WVSOnline.jsp.

[15] Haliassos et al. (2014) use Hofstede cultural dimensions to show that individuals with different cultural backgrounds have different financial behaviour. The Hofstede masculinity dimension data used in this paper originate from https://geerthofstede.com/research-and-vsm/dimension-data-matrix/

upper end of the wealth distribution, but remain insignificant for most of the countries at the 90th and 95th percentiles as well.

In the second part of this study we impute the individual-level net wealth for people in multi-member households and use the imputed estimates to assess the extent of the gender gap in net wealth for the whole adult population. We predict the net wealth of individuals in all household types using the relationship between wealth and the individual-level characteristics of single-person households. The weighted average least squares (WALS) model averaging technique is applied to take account of uncertainty in the choice of the imputation model. This method, like Bayesian model averaging, incorporates the uncertainty that arises from estimation and model selection. Both the Bayesian and WALS model averaging methods allow some regressors to be in the model for certain, while the number of auxiliary covariates can vary. The variables that are included in all the specifications in our estimations are income, age and education, since they are relevant in explaining net wealth in all countries.

The gender wealth gaps for the whole adult population that are based on the WALS weighted average estimates of net wealth tend to be larger than those estimated for the subgroup of single-person households. The mean gender wealth gaps found with this method are statistically significantly positive for 17 of the 21 countries. They are also economically large for most countries, ranging from 13% in Portugal and Greece to 72% in Cyprus. The gaps tend to be the largest in countries where wealth is in general less equally distributed, such as Cyprus, Germany, and the Netherlands, while they are insignificant in countries that also have relatively low wealth inequality such as Lithuania, Slovakia and Slovenia.

Like some previous studies, we find that the wealth gaps found from WALS model averaging estimates of net wealth increase towards the upper end of the wealth distribution. The estimated median gaps are insignificant in eight countries and smaller than 20% in five countries. The gaps tend to be larger at the 95th percentile than at the median in most of the countries. The wealth gaps are significantly in favour of men at the top of the distribution in 18 countries.

Although the pattern of increasing gender wealth gap over the wealth distribution can be observed in most of the countries, there are substantial differences in the mean level of the gap. To shed some light on what causes this variation, we estimated the cross-country correlations between the unconditional mean gender gaps in net wealth and several other variables that might be expected to be related with gender wealth inequality. As could be expected, the gender gaps in net wealth were correlated with indicators of general wealth inequality such as the Gini coefficient and the share of wealth owned by the top 10% of households. However, the correlation coefficients between gender gaps in wealth and those in the most relevant labour market indicators such as pay and labour force participation were weak and statistically insignificant.

We also looked at the correlations of the gender wealth gap with various measures of the wealth structure. The only indicator that turned out to be significantly related with the gender wealth gap was the home ownership rate. The higher this is, the lower the gender wealth inequality is. This finding is in line with earlier studies that show that real estate is the most equally distributed asset class. Greater prevalence of home ownership reduces wealth inequality, which in turn is associated with a lower gender wealth gap.

We also looked at the cross-country relationships between the gender wealth gaps and various indicators of gender-related social norms, such as gender attitude indexes based on the World Values Survey or some of the cultural dimensions developed by Hofstede. Earlier studies

have shown that gender attitude indexes are related with gender gaps in employee income and pension income. We found their correlations with gender wealth gaps to be insignificant, however. This is not a surprising result, given that labour income is the outcome of negotiations between the employee and the employer at either the individual or the collective level, and so it is affected by the attitudes of people other than the one whose pay is being decided. Wealth accumulation, however, depends only on the individual's own choices. Therefore the gender gaps in wealth depend mainly on individual preferences and less on gender-related social norms.

The current paper showed that men have more wealth than women in most of the countries that our study covered. We discussed in the context of the wealth accumulation function what the causes of the gender wealth gap may be. Differences between the genders in their levels of wealth may first and foremost stem from differences in incomes and labour market behaviour, but also from differences in individual preferences or personal traits that affect saving and investment choices, such as risk and time preferences, optimism, altruism, etc. Further research in this area is needed to study the role of various opportunity-related and preference-related factors in explaining the disparities between the genders in how wealth is accumulated.

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Appendix

Table A.1. Household structure and sample size

	Number of individuals (adults only)	Number of men (adults only)	Number of women (adults only)	Number of households
Austria, observations	5,207	2,443	2,764	3,072
Austria, fraction single	0.235	0.195	0.270	0.404
Austria, fraction couples	0.586	0.609	0.565	0.504
Austria, fraction other	0.180	0.196	0.165	0.092
Belgium, observations	3,981	1,957	2,024	2,329
Belgium, fraction single	0.242	0.218	0.266	0.414
Belgium, fraction couples	0.580	0.584	0.576	0.496
Belgium, fraction other	0.177	0.197	0.158	0.090
Croatia, observations	2,856	1,353	1,503	1,357
Croatia, fraction single	0.129	0.085	0.168	0.272
Croatia, fraction couples	0.455	0.462	0.449	0.478
Croatia, fraction other	0.416	0.452	0.383	0.250
Cyprus, observations	2,864	1,413	1,451	1,303
Cyprus, fraction single	0.135	0.116	0.153	0.263
Cyprus, fraction couples	0.612	0.619	0.607	0.595
Cyprus, fraction other	0.252	0.266	0.240	0.142
Estonia, observations	5,068	2,352	2,716	2,679
Estonia, fraction single	0.252	0.190	0.304	0.434
Estonia, fraction couples	0.529	0.564	0.501	0.454
Estonia, fraction other	0.218	0.247	0.195	0.112
Finland, observations	18,452	9,207	9,241	10,210
Finland, fraction single	0.289	0.257	0.319	0.457
Finland, fraction couples	0.653	0.676	0.631	0.514
Finland, fraction other	0.057	0.066	0.049	0.029
France, observations	23,674	11,408	12,266	13,685
France, fraction single	0.254	0.207	0.296	0.420
France, fraction couples	0.627	0.654	0.603	0.518
France, fraction other	0.119	0.140	0.100	0.062
Germany, observations	9,111	4,542	4,569	4,942
Germany, fraction single	0.278	0.269	0.287	0.451
Germany, fraction couples	0.602	0.600	0.604	0.488
Germany, fraction other	0.120	0.131	0.109	0.061
Greece, observations	5,952	2,898	3,054	3,007
Greece, fraction single	0.141	0.113	0.167	0.277
Greece, fraction couples	0.548	0.561	0.536	0.538
Greece, fraction other	0.311	0.326	0.297	0.185
Hungary, observations	11,136	5,074	6,062	5,968
Hungary, fraction single	0.179	0.136	0.216	0.335
Hungary, fraction couples	0.539	0.557	0.524	0.505
Hungary, fraction other	0.282	0.306	0.260	0.160
Ireland, observations	8,904	4,303	4,601	4,791
Ireland, fraction single	0.177	0.146	0.206	0.332
Ireland, fraction couples	0.565	0.572	0.559	0.531
Ireland, fraction other	0.258	0.282	0.235	0.137
Italy, observations	13,689	6,458	7,231	7,420
Italy, fraction single	0.199	0.158	0.236	0.368
Italy, fraction couples	0.506	0.516	0.498	0.468
Italy, fraction other	0.295	0.326	0.266	0.164

Latvia, observations	2,242	973	1,269	1,249
Latvia, fraction single	0.233	0.143	0.302	0.410
Latvia, fraction couples	0.531	0.588	0.487	0.467
Latvia, fraction other	0.236	0.269	0.211	0.124
Lithuania, observations	2,888	1,215	1,673	1,664
Lithuania, fraction single	0.340	0.220	0.422	0.535
Lithuania, fraction couples	0.494	0.575	0.438	0.389
Lithuania, fraction other	0.166	0.205	0.139	0.077
Luxemburg, observations	3,057	1,538	1,519	1,616
Luxemburg, fraction single	0.217	0.217	0.217	0.383
Luxemburg, fraction couples	0.577	0.570	0.584	0.509
Luxemburg, fraction other	0.206	0.213	0.198	0.109
Malta, observations	2,162	1,063	1,099	1,004
Malta, fraction single	0.134	0.124	0.143	0.269
Malta, fraction couples	0.528	0.520	0.536	0.530
Malta, fraction other	0.338	0.355	0.320	0.201
Netherlands, observations	4,338	2,132	2,206	2,556
Netherlands, fraction single	0.262	0.241	0.282	0.435
Netherlands, fraction couples	0.602	0.615	0.590	0.500
Netherlands, fraction other	0.136	0.144	0.128	0.066
Poland, observations	11,672	5,544	6,128	5,853
Poland, fraction single	0.119	0.086	0.149	0.259
Poland, fraction couples	0.426	0.434	0.418	0.465
Poland, fraction other	0.456	0.480	0.433	0.276
Portugal, observations	11,636	5,411	6,225	5,924
Portugal, fraction single	0.141	0.094	0.182	0.275
Portugal, fraction couples	0.561	0.584	0.541	0.547
Portugal, fraction other	0.298	0.323	0.277	0.177
Slovakia, observations	4,222	1,923	2,299	2,179
Slovakia, fraction single	0.093	0.054	0.130	0.203
Slovakia, fraction couples	0.494	0.498	0.491	0.538
Slovakia, fraction other	0.412	0.448	0.379	0.258
Slovenia, observations	4,242	2,077	2,165	2,014
Slovenia, fraction single	0.182	0.155	0.207	0.350
Slovenia, fraction couples	0.479	0.484	0.473	0.457
Slovenia, fraction other	0.340	0.361	0.320	0.193

Source: Authors' calculations from the HFCS.

Table A.2. Descriptives of predicted individual-level net wealth by household type

	Mean	p25	Median	p75	p95
Austria, singles	142.2	4.2	19.3	114.6	417.8
Austria, couples	109.8	37.7	69.7	131.1	382.1
Austria, other	90.8	21.0	54.1	105.5	380.8
Belgium, singles	220.2	5.9	115.7	294.2	670.6
Belgium, couples	250.3	137.0	238.0	336.6	496.4
Belgium, other	198.1	32.0	119.1	260.8	449.1
Croatia, singles	65.6	9.7	40.2	80.2	213.1
Croatia, couples	79.3	50.0	61.5	84.8	135.7
Croatia, other	88.2	38.0	59.2	88.2	227.9
Cyprus, singles	202.0	4.9	71.2	249.6	604.1
Cyprus, couples	237.3	62.4	197.7	403.7	920.4
Cyprus, other	142.8	-44.4	152.7	325.5	803.2
Estonia, singles	47.1	2.3	22.5	59.0	168.3
Estonia, couples	62.8	23.8	43.5	74.5	171.2
Estonia, other	43.7	14.6	33.2	60.4	102.8
Finland, singles	120.4	1.3	49.0	166.5	449.9
Finland, couples	160.9	77.1	118.1	205.1	440.5
Finland, other	138.1	32.8	101.6	181.6	421.7
France, singles	144.2	5.9	38.5	171.0	554.4
France, couples	360.6	67.1	331.6	512.8	1 065.8
France, other	263.7	39.7	178.2	415.3	815.4
Germany, singles	137.0	2.0	18.5	147.9	554.2
Germany, couples	189.1	44.2	130.0	240.1	604.7
Germany, other	117.1	-10.1	61.0	155.2	483.3
Greece, singles	62.3	4.3	32.7	78.6	244.6
Greece, couples	53.7	23.6	47.6	77.3	134.1
Greece, other	50.5	15.9	42.5	74.9	147.2
Hungary, singles	49.6	9.7	26.2	51.8	148.0
Hungary, couples	73.2	27.3	48.6	90.8	248.2
Hungary, other	58.0	24.3	41.5	66.2	200.8
Ireland, singles	241.7	3.6	107.4	271.3	800.6
Ireland, couples	218.7	113.2	245.2	419.3	810.7
Ireland, other	178.2	15.1	100.0	298.6	822.9
Italy, singles	144.1	8.0	79.9	193.1	509.0
Italy, couples	150.1	67.2	118.3	194.5	397.5
Italy, other	114.2	45.4	83.9	146.7	318.8
Latvia, singles	26.6	0.7	12.4	33.0	72.2
Latvia, couples	32.3	-1.7	21.3	59.4	154.1
Latvia, other	54.6	-1.0	23.1	63.6	229.1
Lithuania, singles	71.0	20.1	39.5	68.4	301.1
Lithuania, couples	78.4	50.4	71.9	98.1	150.5
Lithuania, other	72.7	46.1	63.7	92.6	163.4
Luxemburg, singles	565.6	32.4	316.0	681.8	1 910.5
Luxemburg, couples	576.2	248.8	534.7	818.9	1 681.0
Luxemburg, other	431.9	97.0	333.4	682.9	1 392.5
Malta, singles	347.2	48.4	141.6	327.8	941.2
Malta, couples	323.8	148.3	225.5	318.0	1 026.9
Malta, other	240.7	96.1	185.7	313.1	670.0
Netherlands, singles	112.1	4.2	24.0	108.8	459.1
Netherlands, couples	149.9	42.3	99.7	176.3	439.3
Netherlands, other	104.4	6.4	49.7	123.6	365.2
Poland, singles	53.6	4.8	33.4	67.0	152.4
Poland, couples	56.8	30.7	47.1	70.8	131.6

Poland, other	41.6	20.4	36.6	55.2	100.2
Portugal, singles	102.2	6.3	50.3	114.2	338.4
Portugal, couples	133.7	46.4	107.7	166.4	426.0
Portugal, other	85.8	5.3	65.1	133.0	352.5
Slovakia, singles	56.1	15.1	40.1	71.3	154.9
Slovakia, couples	57.7	35.5	51.7	70.7	166.7
Slovakia, other	51.7	26.3	47.7	62.3	184.6
Slovenia, singles	86.7	7.5	52.6	112.9	281.1
Slovenia, couples	91.7	56.8	85.6	115.9	177.7
Slovenia, other	66.8	44.4	66.3	97.6	152.1

Source: Authors' calculations from the HFCS.

Notes: The individual-level net wealth in single-person households is collected from the survey and is the same as the values in Table 1.

Table A.3. Inequality indicators and wealth measures

	(1) Gender wage gap	(2) Gender gap in labour force participation	(3) Gini index of net wealth	(4) Top 10% share	(5) Home-owner-ship rate	(6) Share of business assets	(7) Share of financial invest-ments	(8) Median Debt-to-Income ratio
Austria	20.7	0.11	0.73	56.4	45.9	17.1	2.09	34.0
Belgium	5.8	0.13	0.63	47.2	69.3	10.7	7.83	90.6
Croatia	11.6	0.14	0.61	46.6	85.3	8.7	0.16	26.6
Cyprus	11.2	0.12	0.75	62.1	68.2	26.4	na	208.6
Estonia	24.9	0.09	0.71	58.1	75.3	22.6	1.08	21.7
Finland	17.2	0.05	0.66	46.8	66.3	4.8	7.92	77.1
France	15.6	0.11	0.67	49.2	57.9	8.1	2.65	64.5
Germany	20.4	0.10	0.74	55.4	43.9	10.2	4.56	45.1
Greece	12.5	0.21	0.60	46.6	72.0	8.7	na	26.6
Hungary	14.0	0.18	0.65	51.3	84.0	10.7	3.53	38.3
Ireland	14.4	0.15	0.67	50.4	68.8	3.9	3.60	66.4
Italy	5.0	0.25	0.61	43.4	68.5	5.5	4.27	47.2
Latvia	19.8	0.07	0.68	52.1	72.7	4.6	na	21.2
Lithuania	15.2	0.04	0.59	47.9	93.2	10.0	0.18	43.9
Luxembourg	2.6	0.11	0.65	50.2	69.0	13.4	3.32	95.5
Malta	13.2	0.28	0.60	47.7	81.4	16.3	4.31	110.6
Netherlands	15.1	0.11	0.78	56.6	57.5	4.1	6.99	243.0
Poland	7.0	0.18	0.57	41.3	79.3	11.8	0.54	16.7
Portugal	10.8	0.08	0.68	53.9	74.5	16.7	1.02	131.6
Slovakia	20.1	0.16	0.54	40.6	88.8	10.3	na	61.1
Slovenia	8.4	0.08	0.59	44.0	76.3	12.6	1.11	27.6

Source: Labour market indicators in col (1) – (2) from Eurostat series TESEM180 and LFSI_EMP_A in 2017. The gender wage gap for Greece is from 2014. The wage gap is measured in per cent and is calculated excluding the public sector and enterprises with fewer than 10 employees. The gender gap in the labour force participation rate is measured as the difference in labour force participation rates of men and women in per cent, for the age group 15-64. Wealth indicators in col (3) – (8) are from statistical tables in HFCN (2020) for HFCS wave 2017. Column (3) shows the Gini index of net wealth as assets and liabilities; column (4) the share of the wealthiest 10% in the total net wealth of households; column (5) the percentage of households owning their home; column (6) the share of business assets in total assets held by households; column (7) the share of stocks, bonds and mutual funds in total assets held by households; and column (8) the ratio of total debt to yearly gross household income.

Table A.4. Pearson correlation coefficients between the mean gender wealth gap and the indicators for the countries

	Pearson correlation coefficient	p-value
Gender wage gap	0.141	0.541
Gender gap in labour force participation	0.094	0.685
Gini index of net wealth	0.549***	0.010
Top 10% share	0.509**	0.018
Homeownership rate	–0.446**	0.043
Share of business assets in total assets	0.209	0.363
Share of securities in total assets	0.399	0.112
Median debt-to-income ratio	0.359	0.110

Source: Authors' calculations from Table 3 column (1) and Table A.3.