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# The Impact of Social Security Wealth on the Distribution of Wealth in the European Union<sup>1 2</sup>

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## Abstract

The ageing of society means that public pension systems are becoming increasingly important. This study evaluates the influence of public pension entitlements on wealth inequality among pensioners. A novel data source - the Eurosystem Household Finance and Consumption Survey – is used to compare the impact of the public pension system on wealth inequality in 19 European countries. Findings indicate that in all investigated countries, social security wealth reduces wealth inequality. Augmented wealth inequality is ca. 30% lower than private wealth inequality. This estimate refers to the population of pensioners, while in the whole population the equalizing impact of public pension systems may be weaker. Social security wealth mitigates not only wealth inequality measured at the country level, but also wealth inequality in the whole European Union.

**Keywords:** household finance, household wealth, social security wealth, European Union, Household Finance and Consumption Survey, pension system

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## Introduction

Household wealth is commonly defined as the total value of assets minus the total value of liabilities. Social security wealth is usually not included in the value of households' assets. The first reason for the omission of social security wealth is usually the lack of data, and the second is its limited liquidity (OECD, 2013). Because for the majority of households public pension entitlements are the most valuable asset (Atkinson, 1983) researchers try to estimate their value and assess the impact of social security wealth on wealth distribution.

In this paper, we investigate the impact of social security wealth on wealth inequality in 19 EU member states. To achieve this aim, we use a novel dataset – the third wave of the Eurosystem Household Finance and Consumption Survey, which provides internationally comparable data on household wealth. Our estimates of social security wealth are based on Eurostat's (2019) demographic forecast EUROPOP 2019. We also study the impact of social security wealth on cross-country wealth gaps.

Wolff & Marley (1989) investigate the evolution of wealth inequality in the US in the period 1922-1983 using various wealth concepts. They find that social security wealth significantly decreases wealth inequality. Social security wealth equalizes wealth distributions also in other countries (Dunn & Hoffman, 1983; Bönke et al., 2019; Shamsuddin, 2001; Mazaferro & Toso, 2009; Roine & Waldenström, 2009; Maunu, 2010, Kuhn, 2020, Longmuir, 2021, Wroński, 2021a, 2021b; Jabłonowski, 2021; Jacobs et al., 2022; Knell & Koman, 2022). Sierminska & Wroński (2022) review literature on the impact of public pension entitlements on wealth inequality and conclude that the equalizing impact of the public pension system has been confirmed in 25 countries.

Although the equalizing impact of social security wealth on wealth distribution is commonly acknowledged, literature has two important limitations. Firstly, it covers almost exclusively developed economies, where social security systems are usually progressive. Secondly, the availability of cross-country studies is very low (e.g. Frick & Hadey, 2009;

Bönke et al, 2020, Cowell et al., 2017). Results of single-country studies are very difficult to compare because researchers use different data sources and adopt various methods to estimate the value of social security wealth. In this paper, we fill this gap by delivering comparable measures of social security wealth and its equalizing power in 19 EU economies.

The hypothesis that social security wealth may partly decrease cross-country wealth gaps and thus it should be taken into account in international wealth comparisons is widely accepted in literature (Cowell & Van Kerm, 2015; Cowell et al., 2018). However, because empirical evidence on the distribution of social security wealth is scarce, authors studying this issue mostly use macroeconomic indicators such as pension spending relative to GDP. Fessler & Schürz (2018) estimate multilevel cross-country regressions and find that the degree of welfare state spending across countries is negatively correlated with household net wealth. Their research is based on HFCS data for 13 countries. Skopek (2015) studies the impact of the public pension system in a sample of 40 countries and also the robust link between higher generosity of public pension systems and lower values of private wealth. Wroński (2021c) reviews literature on the substitution between social security wealth and private wealth.

We find that social security wealth significantly decreases wealth inequality in the European Union. However, there is great variation in the strength of the equalizing power of the public pension system. The impact of social security wealth on (augmented) wealth inequality is strongest in Germany, Austria, the Netherlands, and Estonia, while it is lowest in Greece, Slovenia, and Luxembourg.

Countries where public pension systems mitigate wealth inequality to the greatest extent tend to have high private wealth inequality. Demography does not seem to significantly impact the equalizing power of public pension systems, at least in our case, in which the sample is composed only of those who already claim public pension benefits. The equalizing power of social security wealth is positively correlated with the social security wealth – private wealth

ratio (which may be seen as a measure of the size of the public pension system) and the share of single households in the population. Higher homeownership and a stronger correlation between the position of the household in the distribution of private wealth and its position in the distribution of augmented wealth weaken the equalizing power of the public pension system.

Social security wealth does not invalidate the European wealth hierarchy. Western Europe is richer not only in private wealth terms, but also in social security wealth terms. Social security wealth lowers not only within-country wealth inequality but also wealth inequality in the whole European Union (19 countries in our sample taken together). On the other hand, however, Theil index decomposition shows that the augmented wealth inequality in the European Union is to a larger extent generated by between-country inequality than private wealth inequality.

The paper is structured as follows. Data and methods are presented in the next section, followed by the results. The discussion of results and research limitations follows, and the last section concludes and indicates the direction for future research.

### **Methods**

The Eurosystem Household Finance and Consumption Survey (HFCS) is our main data source. We use microdata from the third wave of the survey, which was conducted in late 2016 or 2017. The HFCS is a complex wealth survey coordinated by the European Central Bank and conducted by national central banks and statistical agencies. In total, 22 countries participated in the third wave of the HFCS. Our final sample includes 19 countries. We have to exclude Spain, where data is not yet available, and Ireland and Malta, which provide data on age only in brackets. The HFCS is the best and almost only data source to study the distribution of household wealth in the European Union. HFCN (2020a) reviews the main outcomes of the survey, while HFCN (2020b) presents the methodology.

The main wealth concept used in the HFCS is net wealth, defined as the total value of assets – the total value of liabilities. The approach of survey organizers is consistent with *OECD Guidelines for Micro Statistics on Household Wealth* (OECD, 2013). This wealth concept excludes the value of public pension entitlements. According to the *Guidelines*, the main reason for this exclusion is the lack of comparable data on public pension entitlements. In this paper, we estimate the value of social security wealth and augmented wealth (the sum of private wealth and social security wealth). Therefore for clarity, we use the term *private wealth* instead of *net wealth*. The HFCS does not perfectly cover the very top of the wealth distribution (e.g. Bach et al. 2019, Brzeziński et al. 2020). To limit this problem, many countries participating in the HFCS apply various oversampling techniques. The oversampling methods vary across countries depending on local context. Some countries use administrative data to cover more wealthy households, others only oversample households from rich regions, and some countries do not oversample wealthy households at all. The effective oversampling rates vary widely across countries. The cross-country comparability of the HFCS data on top wealth remains limited (see Morelli et al., 2021 for the discussion).

The HFCS questionnaire includes questions on the value of social security accounts. However, the quality of answers given by respondents is too low to use this data directly. Moreover, in many countries data is missing because of the structure of public pension systems. Therefore we have to estimate the value of social security wealth on our own. We limit our data sample to those who already receive public pensions. Such an approach is common in literature (e.g. Cowell et al., 2017). Some studies look at the distribution of augmented wealth in the whole population (Bönke et al, 2020; Kuhn, 2021; Longmuir, 2021; Knell & Koman, 2022), however, they are limited to one or two countries. Authors of single-country studies are sometimes able to link survey data with administrative data from pension registers (e.g. Kuhn, 2021; Knell and Koman, 2022). In our context, we cannot extend our study to cover the whole

population because we do not have any data on the public pension entitlements of those who are still working. Because they have already accumulated public pension entitlements of unknown value, we cannot assume that the value of their social security wealth is zero and use our estimates of the social security wealth of pensioners to estimate the impact of the public pension system on wealth inequality in the whole sample. Linking survey data with administrative data is also not a possible solution due to administrative and legal difficulties in obtaining administrative data from 19 countries, and the fact that not all countries in our sample share administrative data with researchers.

Our sample includes one and two-person households, in which all members already receive public pensions. In the HFCS, the age of respondents is top-coded at 85 to protect their privacy. Because knowledge of the exact age of respondents is necessary to estimate the value of social security wealth we have to discard households in which someone is older than 84 from our sample.

The value of social security wealth is estimated using the actuarial method. This is the discounted cash flow of future public pension benefits. Our estimates cover benefits from defined benefit (DB) as well as defined contribution (DC) public pension schemes. The estimates are based on the value of pension benefits already claimed by households in our sample. 11% of our sample report receiving income not only from public pension schemes, but also from occupational or private pensions. The mean value of income from occupational and private pensions is significantly lower than the mean value of income from public pensions (14,643 € vs 23,077 € annually). We do not include occupational and private pensions in our estimates, because the HFCS does not provide any data on the rules of these schemes. While public pension benefits are paid until the death of the recipient, occupational and private pensions are not always annuities. In many cases, especially in Central and Eastern Europe, occupational pension schemes do not provide annuity, pension benefits are paid only until the collected savings are fully spent. Public pension benefits are indexed, which protects recipients against inflation, while indexation rules in the

case of occupational and private pensions are diverse. In some cases, occupational and private pensions are not indexed at all. In the future, it would be beneficial to extend the study to cover also occupational and private pension schemes, but in our view, the HFCS does not provide enough data to do this.

To estimate the value of social security wealth, we use mortality rates implied by the Eurostat EUROPOP 2019 forecast (Eurostat, 2019). Therefore, our estimate takes into account the rise in life expectancy during the retirement period. We estimate the value of social security wealth according to the formula given below.

$$(1) \quad SSW_i = \sum_{t=0}^T \frac{1}{(1+r)^t} * P_{i,t}$$

$$(2) \quad P_{i,t} = benefit_i * q_{i,t,g}$$

$SSW_i$  stands for the social security wealth of person  $i$ ,  $benefit_i$  stands for yearly pension benefit of person  $i$ ,  $q_{i,t,g}$  is the survival probability of person  $i$  differentiated by time, and gender, and  $r$  is the interest rate. We follow OECD (2019), Cowell et al. (2017), and Bönke et al. (2019) and use  $r = 2\%$ . The value of pension wealth is first calculated on the individual level, and then calculated on the household level. Because in the European Union member states the rules on survivor pensions (known also as widowers' pensions) are very complex, our estimates do not include the value of survivor pensions which may be claimed in the future. In the case of many countries, HFCS does not include enough data to accurately estimate the value of future survivors' benefits. Moreover, in some countries, survivors' benefits are rather a tool of social policy than a component of the pension system. We set the maximum age at 100, which is common in literature.

The augmented wealth is a sum of private wealth and social security wealth.

$$(3) \quad \textit{Augmented wealth} = \textit{Private wealth} + \textit{Social security wealth}$$

To assess the impact of social security wealth on wealth inequality we use various measures of wealth inequality (Cowell, 2011). We apply inequality decomposition techniques. To investigate the impact of social security wealth on wealth inequality, we decompose the



Gini index by factors (wealth components). This method has been applied before in the context of applied wealth by Bönke et al (2020). The Gini index may be decomposed by factors using the following equation (Shorrocks, 1982; Lerman & Yitzhaki, 1985)

$$(4) \quad G = \sum_{k=1}^K R_k G_k S_k, \text{ where}$$

$S_k$  is the factor share in the total value of wealth,  $G_k$  stands for the value of the Gini index calculated for the distribution of the given factor, and  $R_k$  stands for the so-called ‘‘Gini correlation’’ defined as  $\text{cov}(y_k, F(y)) : \text{cov}(y_k, F(y_k))$ . The value of augmented wealth serves as the total value of wealth. Private wealth and social security wealth are studied components (factors).

It is also possible to estimate marginal effects and assess the impact of a marginal change in the value of a given component on total inequality (Stark, 1986).

$$(5) \quad \frac{\partial G}{\partial e} = S_k (G_k R_k - G)$$

$$(6) \quad \frac{\partial G / \partial e}{G} = \frac{S_k G_k R_k}{G} - S_k$$

We also decompose the Theil index to identify the contribution of between-countries and within-countries inequalities to overall augmented wealth inequality measured at the level of the European Union (19 countries in the investigation taken together). The equation given below presents the decomposition of the Theil index by subgroups (Cowell, 2011).

$$(7) \quad T = \sum_{k=1}^m \left( \frac{n_k}{n} \frac{\bar{y}_k}{\bar{y}} \right) T_k + \sum_{k=1}^m \frac{n_k}{n} \left( \frac{\bar{y}_k}{\bar{y}} \right) \ln \left( \frac{\bar{y}_k}{\bar{y}} \right)$$

The first term of the equation measures within-group inequality, while the second term measures between-group inequality. In our case, countries serve as groups.  $N$  stands for a number of observations, and  $y$  depicts the value of a variable of interest (augmented wealth or its components). The decomposition of Theil index ignores households which report zero or negative wealth values. 2.5% households in our sample report zero or negative private wealth. In all households, the value of social security wealth is positive. Only in 5 households (0.03% of the sample) is the value of augmented wealth negative.

## Results

Descriptive statistics are presented in Table 1. Mean wealth is higher in Western Europe than in Central and Eastern Europe, and highest in Luxembourg and lowest in Latvia. The HFCS data for Luxembourg include only residents of the country, including immigrants. Because many people working in Luxembourg live abroad, this estimate may be somehow inflated by the fact that those receiving the lowest income may not be living in the country, but commuting to work. In all countries except Luxembourg, the mean value of social security wealth is similar to or higher than the mean value of private wealth. On average, the mean value of augmented wealth is 235% of the mean value of private wealth. The gap between augmented wealth and private wealth is the smallest in Luxembourg, where mean augmented wealth equals only 154% of mean private wealth. The gap is highest in Greece, where mean augmented wealth equals 369% of mean private wealth.

**Please insert Table 1 here**

### **The impact of social security wealth on within-country wealth inequality**

The impact of social security wealth on wealth inequality depends on the correlation between the position of households in distributions of private wealth, social security wealth, and augmented wealth. If the same households are top private wealth holders and top social security wealth holders (Pearson's  $r$  close to 1) the equalizing effects of social security wealth are much weaker than when the correlation between the value of private wealth and the value of social security wealth is weak (Pearson's  $r$  close to 0). The correlation (Pearson's  $r$ ) between private wealth, social security wealth and augmented wealth is presented in Figure 1. In Appendix Table A1 we present full numerical outcomes, including the value of Kendall's  $\tau$ , which is a measure of rank correlation and as such is more resilient to outliers than Pearson's  $r$ .

The correlation between private wealth and augmented wealth in nearly all countries is stronger than the correlation between private wealth and social security wealth. Only in Poland and Greece is social security wealth more strongly correlated with augmented wealth than private wealth.

The correlation between private wealth and social security wealth is rather weak. The correlation between private wealth and social security wealth is highest in Latvia, France (Kendall's Tau, see Table A1), Estonia and Italy, while it is low in Lithuania, the Netherlands, and Finland. It seems that countries with a high correlation between private wealth and social security wealth are to a large extent the same countries that have a high correlation between income and wealth (Wroński 2021d). The correlation between private wealth and augmented wealth is strongest in Cyprus and Luxembourg, and weakest in the Netherlands, Poland, and Greece. The correlation between social security wealth and augmented wealth is highest in Greece, Latvia, and Poland, while it is low in Luxembourg, Finland, and Cyprus. The ranking of the countries depends on the chosen method of correlation measurement. Nevertheless, there is a significant cross-country variation in the link between investigated distributions .

**Please insert Figure 1 here**

The impact of social security wealth on wealth inequality is presented in Figure 2. Full, numerical results are presented in Appendix Table A2. Wealth inequality among pensioners varies significantly in the European Union. Private wealth is distributed most equally in Slovakia, Slovenia, and Poland (Gini index lower than 0.5), while wealth inequality is highest in Germany, Austria, the Netherlands, and Cyprus (Gini index higher than 0.67). Social security wealth is distributed more equally than private wealth. While the Gini index calculated for the private wealth distribution in the majority of countries stands between 0.5 and 0.65, in the case of social security wealth distribution in the majority of countries it is lower than 0.4.

Social security wealth inequality is highest in Finland, Portugal, and Slovenia, while it is lowest in Slovakia, Estonia, and Austria.

**Please insert Figure 2 here**

Social security wealth equalizes (augmented) wealth distribution in all countries in our sample. The augmented wealth inequality is 18 – 43% lower than private wealth inequality (if measured according to the Gini index). The equalizing power of the public pension system differs across countries. It is strongest in Austria, the Netherlands, Estonia, and Germany, where the value of the Gini index calculated for the augmented wealth distribution is ca. 40% lower than its value calculated for private wealth distribution. The equalizing impact of social security wealth is rather weak in Slovenia and Luxembourg, where augmented wealth inequality measured by the Gini index is only 18/20% lower than private wealth inequality.

The Gini index provides a simple and intuitive assessment of wealth inequality. However, we cannot assess the impact of social security wealth on different parts of the wealth distribution using only the Gini index. Therefore, we use decile shares as a supplementary measure. The inclusion of social security wealth in household wealth increases (augmented) wealth shares of the bottom 50% and middle 40%, while it decreases the wealth share of the top 10%. The data on wealth shares are presented in Appendix Table A3. Other measures of wealth inequality also confirm the equalizing impact of public pension systems.

Cowell et al. (2017) estimate the distribution of augmented wealth in a smaller sample of 13 European countries based on the earlier wave of the HFCS. They measure the equalizing impact of public pension entitlements in the same way as we here, using the gap between the Gini index for private wealth distribution and the Gini index for augmented wealth distribution. The country ranking of equalizing power of the public pension system based on the results by Cowell et al. (2017) is similar to the ranking presented here. This shows that estimates of the impact of social security wealth on (augmented) wealth inequality are rather robust.

To obtain precise measures of the impact of social security wealth on wealth inequality, we decompose the Gini index by factors. The results of the decomposition are presented in Table 2. In all countries in our data sample, the relative contribution of private wealth to wealth inequality is higher than the share of private wealth in augmented wealth. The marginal effects of social security wealth are negative and statistically significantly different from zero. This confirms that social security wealth is a wealth equalizer. However, there is significant variation in the size of marginal effects. The marginal increase in social security wealth would have only a very weak impact on augmented wealth inequality in Greece and Slovenia, while the impact in Estonia, Germany, Finland, and Latvia would be the strongest.

**Please insert Table 2 here**

Why does equalizing power of social security wealth differ across countries? To provide a preliminary answer to this question, we investigate the correlation between equalizing power of the public pension system measured as the relative difference between the Gini index calculated for the augmented wealth distribution and the Gini index calculated for the private wealth distribution defined as  $(Gini_{AW} - Gini_{PW})/Gini_{PW}$  and possible explanatory factors. Figures 3-8 present correlation plots.

According to our results, the equalizing power of social security wealth is positively correlated with the degree of private wealth inequality. This result may be partially driven by the fact that we measure the equalizing power of public pension systems relatively (as a share of private wealth inequality reduced by social security wealth). If private wealth inequality is higher, there is more space for inequality reduction. On average, in countries with higher private wealth inequality, the gap between private wealth and augmented wealth inequality is higher. All countries with the highest equalizing power of the public pension system (inequality reduction by more than 35%, Austria, Germany, Estonia, the Netherlands) have high private wealth inequality. Demography does not seem to significantly impact the equalizing power of

the public pension system, at least in our sample composed only of pensioners (results in the full population may be different). The correlation between the share of the population aged 65 years and higher and the equalizing power of the public pension system is positive, but very weak (0.12) and has little explanatory power ( $R^2=0.014$ )

The equalizing power of the public pension system is correlated with the ratio of mean social security wealth to mean private wealth (which may be seen as a measure of the relative size of the public pension system) and the share of single households in the population. The equalizing power of social security wealth is negatively correlated with homeownership and the correlation between the distributions of augmented wealth and private wealth. The correlation between the equalizing power and social security wealth to private wealth ratio indicates that more generous public pension systems mitigate wealth inequality to a greater extent. In our view, homeownership and the share of single households in the population influence the equalizing power of the public pension system mainly through their impact on private wealth inequality.

The institutional setting of public pension schemes varies significantly across countries in our sample. The OECD (2021) provides country profiles with detailed information on the pension system. Countries with the highest equalizing power of public pension schemes (Austria, Germany, and Estonia) combine earning-related pension schemes with income supplements for low-income pensioners (Austria, Germany) or a basic pension not related to earnings (Estonia). In Germany, the earnings-related pension formula is to a large extent redistributive (see Bönke et al., 2020 for discussion).

Hammer et al. (2021) classify welfare states in the European Union in five categories. Old-age-oriented countries provide generous public pensions, but limited support for non-pensioners. Western Europe-style countries have generous pensions, but combine them with considerable support for the low-income working population. Low-income-oriented welfare

states provide basic pensions and strong support for the low-income population. The last category is low redistribution, which includes most of the CEE countries.

The classification developed by Hammer et al. (2021) is not very supportive at the top of our ranking. Austria is classified as “Western-Europe style”, the Netherlands is “Low income oriented”, while Estonia is classified as “Low redistribution”. However, on the rest of the list important similarities are observed. “Old-age oriented” countries (Hungary, Greece, Italy, Portugal) are concentrated in the middle of our ranking (see Figure 2). Four countries at the bottom of the ranking are “Western-Europe” style. The biggest surprise is probably the fact that “low-redistribution” countries are mostly in the top half of the ranking. This finding suggests that the assessment of redistribution based only on the dimension of income may be not complete.

Maszczyk (2021) investigates social spending in the European Union and classifies EU member states in three clusters: the generous benefits model (most of the EU14 countries), high taxes and public consumption model (only Denmark and Sweden), and private mode of coordination (most of the CEE11 countries). Our country ranking of equalizing effects of social security wealth fits this classification. In countries with the generous benefits model, social security wealth to a greater extent equalizes the wealth distribution than in countries classified as the private mode of coordination.

**Please insert Figures 3-8 here**

### **The impact of social security wealth on cross-country wealth gaps.**

Data presented in Table 1 shows that mean wealth differs significantly across the countries in our sample. We find that social security wealth mitigates within-country wealth inequality. In this section, we investigate the impact of social security wealth on cross-country wealth gaps.

Data presented in Table 1 clearly indicates that social security wealth does not invalidate the European wealth hierarchy. In Western Europe, not only is the value of private wealth higher than in Central and Eastern Europe, but also the value of social security wealth is higher. The wealth gap between Western Europe and Central and Eastern Europe is bigger in the case of augmented wealth than in the case of private wealth.

To identify the impact of social security wealth on cross-country wealth gaps, we estimate the value of the Theil index and decompose it to identify between-country inequality and within-country inequality. In the case of private wealth, the Theil index is 0.84, while in the case of social security wealth it is only 0.31. This confirms that social security wealth is more equally distributed in the European Union than private wealth. In the case of augmented wealth, the Theil index is higher (0.40) than in the case of social security wealth, but still it is much lower than in the case of private wealth. Thus social security wealth lowers wealth inequality not only within-country wealth distributions but also the European wealth distribution. The results of the decomposition of the Theil Index are presented in Table 3.

**Please insert Table 3 here**

On the other hand, the decomposition of the Theil index shows that social security wealth inequality and augmented wealth inequality are to a larger extent generated by between-country inequality. In the case of private wealth, between-country inequality is responsible for less than 13% of total inequality. In the case of social security wealth, the share of between-country inequality is ca. 28% of total inequality, while in the case of augmented wealth the contribution of between-country inequality stands at ca. 22%. However, in the case of all investigated wealth concepts, wealth inequality in the European Union is mostly generated within country borders, not between countries.

**Discussion**

In this paper, we provide internationally comparable measures of social security wealth in 19 European countries. In each of the countries in our sample, social security wealth



is an important component of household wealth. Only in four countries (Cyprus, Luxembourg, Finland, and Croatia) is the value of social security wealth lower than the value of private wealth. However, even in these cases, the value of public pension entitlements is still higher than half of the private wealth. In our view, this result supports the inclusion of public pension entitlements in household wealth, at least in the case of pensioners, who already profit from their public pension entitlements.

The correlation between the position of the household in the distribution of social security wealth and the position in the distribution of the private wealth varies strongly across countries. The higher the correlation, the more the public pension system replicates inequality caused by market forces. Interestingly, this correlation is higher in Western Europe than in Central and Eastern Europe.

We investigated the impact of social security wealth on wealth inequality. In each country in our sample, social security wealth equalizes wealth distribution. Augmented wealth inequality is typically ca. 30% lower than private wealth inequality. The marginal effects identified through the inequality decomposition techniques confirm the equalizing power of public pension systems. Public pension entitlements equalize the wealth distribution not only within-countries, but also at the level of the European Union (19 countries in our sample as a whole). In our view, this result indicates that researchers studying the inequality of wealth should consider the role of public pension systems in their research. Because of the ageing of society, the impact of public pension systems on the distribution of wealth will increase in the future.

The impact of social security wealth on wealth distribution is strongest in the lower half of the distribution. Social security wealth is most important for those who have little private wealth. Therefore, in our opinion, the distributional aspects of public pension reforms cannot

be ignored. Although reforms may be needed to increase the sustainability of public pension systems, sustainability should not be increased at the cost of the worse-off.

The value of public pension entitlements and the impact of the public pension system on wealth inequality varies strongly across countries. The value of social security wealth varies between 54% of private wealth in Luxembourg and 269% of private wealth in Greece. Therefore we think that social security wealth should be included in the cross-country studies of household wealth. Measuring only private wealth ignores the majority of household wealth, at least in the case of the older population. We show that the impact of social security wealth on (augmented) wealth inequality is correlated with the generosity of the public pension system (measured as the ratio of augmented wealth to private wealth), the share of single households, and homeownership. The institutional setting of pension systems determines their equalizing effects. Although correlation does not mean causation, in our view this finding suggests that scholars of economic inequality should be interested not only in the distribution of income or wealth, but also in the institutional setting of the economy and society.

The impact of social security wealth on wealth inequality in the European Union (19 countries taken together) is not straightforward. On the one hand, cross-country wealth gaps are bigger in the case of augmented wealth than in the case of private wealth. Social security wealth does not invalidate the European wealth hierarchy. Western Europe is not only richer than Central and Eastern Europe in terms of private wealth, but also richer in terms of social security wealth and augmented wealth. On the other hand, social security wealth to some extent equalizes the wealth distribution in Europe. However, social security wealth inequality is generated by between-country inequality to a larger extent than in the case of private wealth.

### **Limitations**

The sample selection is the most important limitation of our research. Because data on public pension entitlements of the working-age population is scarce, we have to limit our sample to those who already receive benefits from public pension systems. We cannot cover

the whole population, because the HFCS does not provide data on public pension entitlements of working-age households. Although the limitation of the sample to pensioners may be seen as a shortcoming, in our view it is not. Firstly, it allows for the investigation of the impact of social security wealth on wealth distribution among those who already profit from their social security wealth. The estimation of the value of social security wealth is complicated by many non-linearities existing in pension systems, e.g. minimum pensions. The value of social security wealth of those who are still working may change rapidly before they reach pension age and therefore measures of social security wealth of the working-age population are not robust (Borgmann & Heidler, 2007) The limitation of the sample to pensioners is common in literature (e.g. Cowell et al, 2017)

The second limitation is the reliance on the survey data, which tends to miss top-wealth holders. Thus, our estimates of private wealth inequality may be understated. Moreover, because oversampling strategies differ across countries, the HFCS data on the top wealth is not fully comparable.

### **Conclusions**

In this paper, we extend commonly used measures of household wealth to measure the impact of social security wealth on wealth inequality. We confirm that social security wealth equalizes wealth distribution in the investigated countries and the European Union (19 investigated countries as a whole). In our view, the evidence presented in this paper provides important arguments for the inclusion of social security wealth in household wealth measures, or at least an auxiliary analysis of social security wealth in the research of household wealth.

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**Table 1. Descriptive statistics.**

	Sample size	Mean			Ratio
		Private wealth (PW)	Social security wealth (SSW)	Augmented wealth (AW)	AW / PW
<b>Country</b>					
<b>Austria</b>	862	191,739 (14,757)	422,738 (9,364)	614,478 (20,960)	320%
<b>Belgium</b>	584	406,682 (35,208)	411,582 (19,882)	818,264 (44,400)	201%
<b>Cyprus</b>	188	289,009 (50,499)	204,816 (17,377)	493,825 (56,689)	171%
<b>Germany</b>	1,351	228,968 (14,793)	302,200 (7,445)	531,261 (17,575)	232%
<b>Estonia</b>	694	68,477 (5,448)	80,407 (2,445)	148,884 (6,774)	217%
<b>Finland</b>	543	127,120 (10,439)	68,449 (3,897)	195,569 (10,479)	154%
<b>France</b>	3,205	290,194 (8,865)	390,804 (5,903)	680,998 (12,395)	235%
<b>Greece</b>	502	81,436 (5,358)	219,178 (9,452)	300,613 (12,602)	369%
<b>Croatia</b>	281	81,816 (6,344)	68,584 (3,554)	150,400 (8,306)	184%
<b>Hungary</b>	2,016	57,021 (4,053)	67,934 (1,275)	124,955 (4,438)	219%
<b>Italy</b>	2,050	228,761 (9,129)	300,394 (7,232)	529,155 (12,688)	231%
<b>Lithuania</b>	266	73,768 (24,813)	61,821 (5,479)	135,588 (24,800)	184%
<b>Luxembourg</b>	233	1 445,700 (209,244)	779,410 (40,584)	2 225,110 (218,091)	154%
<b>Latvia</b>	369	30,649 (3,193)	54,425 (2,742)	85,073 (,276)	278%
<b>Netherlands</b>	792	175,627 (12,104)	280,519 (8,559)	456,147 (15,287)	260%
<b>Poland</b>	1,635	59,571 (1,753)	92,306 (1,883)	151,877 (2,787)	255%



<b>Portugal</b>	1,288	149,663 (15,384)	169,367 (5,949)	319,029 (17,761)	213%
<b>Slovenia</b>	437	116,127 (6,328)	122,725 (4,235)	238,853 (8,771)	206%
<b>Slovakia</b>	739	71,527 (4,080)	100,519 (1,935)	172,047 (4,929)	241%
<b>All</b>	18,035	212,340 (4,910)	285,827 (2,881)	498,190 (6,183)	235%

*Source: own estimation using HFCS data. Standard errors based on 1000 bootstrap*

*replications are presented in parentheses.*

**Table 2. Wealth inequality – the decomposition of the Gini coefficient by source**

<b>Country</b>	<b>PW share in AW</b>	<b>SSW share in AW</b>	<b>PW share ineq</b>	<b>SSW share ineq</b>	<b>PW marginal effects</b>	<b>SSW marginal effects</b>
<b>Austria</b>	31.23% (0.04%)	68.77% (0.04%)	47.74% (0.07%)	52.27% (0.07%)	0.1650 (0.000)	- 0.1650 (0.000)
<b>Belgium</b>	49.64% (0.06%)	50.36% (0.06%)	65.12% (0.10%)	34.87% (0.10%)	0.1548 (0.001)	-0.1549 (0.001)
<b>Cyprus</b>	58.26% (0.13%)	41.74% (0.13%)	74.36% (0.14%)	25.62% (0.14%)	0.1609 (0.000)	-0.1612 (0.000)
<b>Germany</b>	43.01% (0.04%)	56.98% (0.04%)	61.64% (0.06%)	38.35% (0.06%)	0.1863 (0.000)	-0.1863 (0.000)
<b>Estonia</b>	45.95% (0.05%)	54.05% (0.05%)	67.97% (0.08%)	32.01% (0.08%)	0.2202 (0.000)	-0.2204 (0.000)
<b>Finland</b>	64.83% (0.08%)	35.17% (0.08%)	82.68% (0.09%)	17.32% (0.09%)	0.1785 (0.000)	-0.1785 (0.000)
<b>France</b>	42.64% (0.02%)	57.36% (0.02%)	56.57% (0.03%)	43.42% (0.03)	0.1393 (0.000)	-0.1394 (0.000)
<b>Greece</b>	27.08% (0.03%)	72.92% (0.03%)	29.23% (0.07%)	70.78% (0.07%)	0.0215 (0.000)	-0.0214 (0.000)
<b>Croatia</b>	54.39% (0.06%)	45.61% (0.06%)	65.22% (0.10%)	34.78% (0.10%)	0.1083 (0.001)	-0.1084 (0.001)
<b>Hungary</b>	45.55% (0.06%)	54.45% (0.06%)	60.71% (0.10%)	39.29% (0.10%)	0.1516 (0.000)	-0.1516 (0.000)
<b>Italy</b>	43.18% (0.03%)	56.82% (0.03%)	53.03% (0.05%)	46.97% (0.05%)	0.0985 (0.000)	-0.0986 (0.000)
<b>Lithuania</b>	54.13% (0.16%)	46.16% (0.17%)	63.74% (0.31%)	36.26% (0.31%)	0.0961 (0.002)	-0.0990 (0.002)
<b>Luxembourg</b>	64.22% (0.17%)	35.85% (0.17%)	76.95% (0.21%)	23.03% (0.21%)	0.1273 (0.001)	-0.1282 (0.001)
<b>Latvia</b>	36.02% (0.06%)	63.98% (0.06%)	48.20% (0.10%)	51.78% (0.10%)	0.1218 (0.000)	-0.1220 (0.000)
<b>Netherlands</b>	38.31% (0.05%)	61.47% (0.05%)	55.88% (0.09%)	44.11% (0.09%)	0.1757 (0.001)	-0.1736 (0.001)
<b>Poland</b>	39.22% (0.02%)	60.78% (0.02%)	47.95% (0.06%)	52.05% (0.06%)	0.0873 (0.000)	-0.0874 (0.000)
<b>Portugal</b>	46.83% (0.07%)	53.17% (0.07%)	55.61% (0.12%)	44.38% (0.12%)	0.0878 (0.000)	-0.0879 (0.000)

<b>Slovenia</b>	48.62%	51.38%	50.94%	49.05%	0.0232	-0.0233
	(0.04%)	(0.04%)	(0.08%)	(0.08%)	(0.001)	(0.001)
<b>Slovakia</b>	41.54%	58.46%	54.58%	45.43%	0.1304	-0.1303
	(0.03%)	(0.03%)	(0.08%)	(0.08%)	(0.001)	(0.001)

*Note: “PW” stands for private wealth, “SSW” stands for social security wealth, “AW” stands for augmented wealth.*

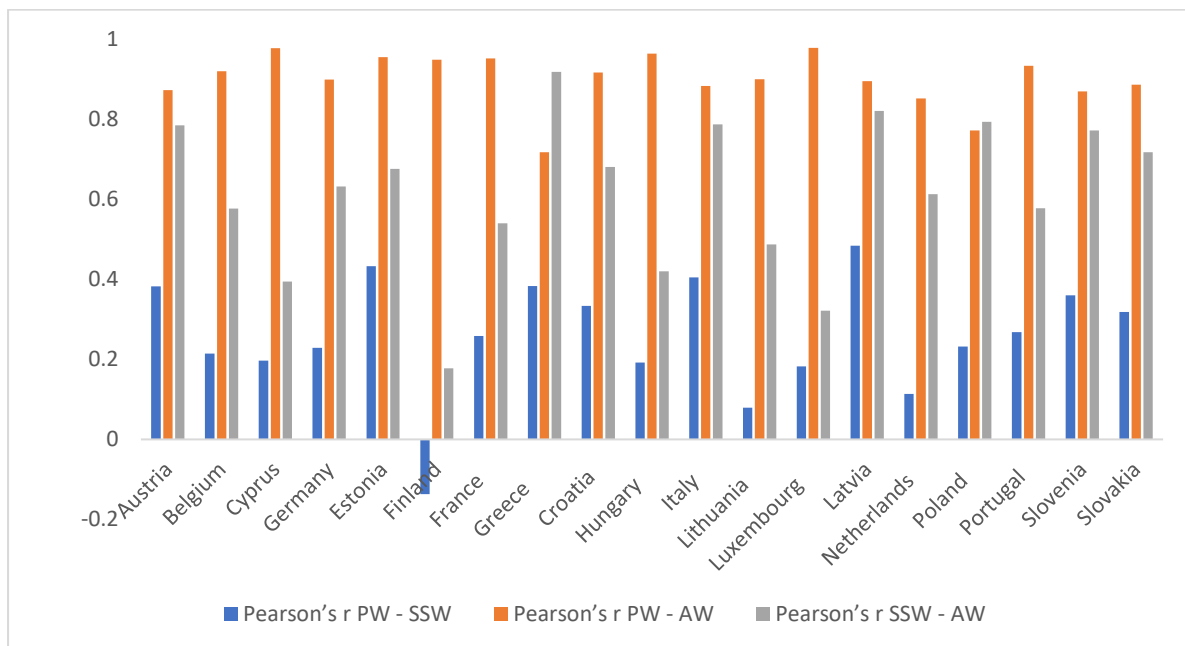
*Source: own estimation using HFCS data. Standard errors based on 1000 bootstrap replications are presented in parentheses.*

**Table 3. The decomposition of the Theil Index**

<b>Stat</b>	<b>PW</b>	<b>SSW</b>	<b>AW</b>
<b>Theil</b>	0.8408 (0.001)	0.3101 (0.001)	0.3967 (0.000)
<b>Theil_within</b>	0.7392 (0.001)	0.2243 (0.001)	0.3081 (0.001)
<b>Theil_between</b>	0.1016 (0.001)	0.0858 (0.000)	0.0886 (0.000)
<b>Theil_within: share</b>	87.91% (0.02%)	72.34% (0.02%)	77.66% (0.02%)
<b>Theil_between: share</b>	12.09% (0.02%)	27.66% (0.02%)	22.34% (0.02%)

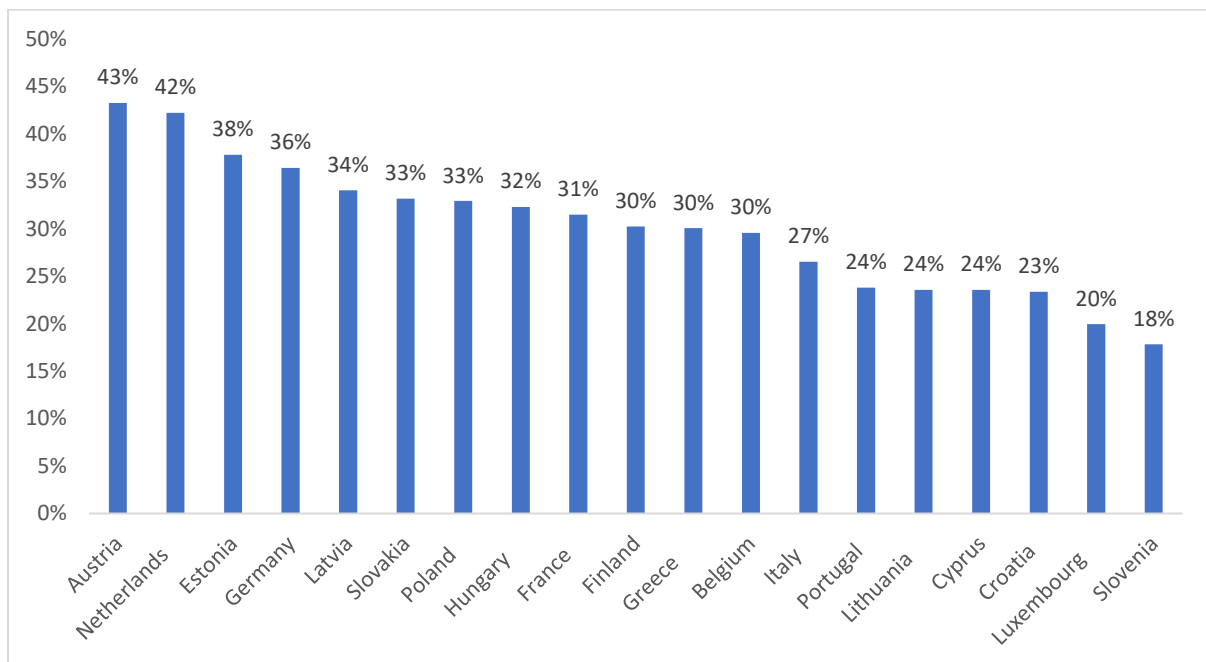
*Source: own estimation using HFCS data. Standard errors based on 1000 bootstrap replications are presented in parentheses.*

**Figure 1. The correlation between private wealth, social security wealth, and augmented wealth (Pearson's r).**



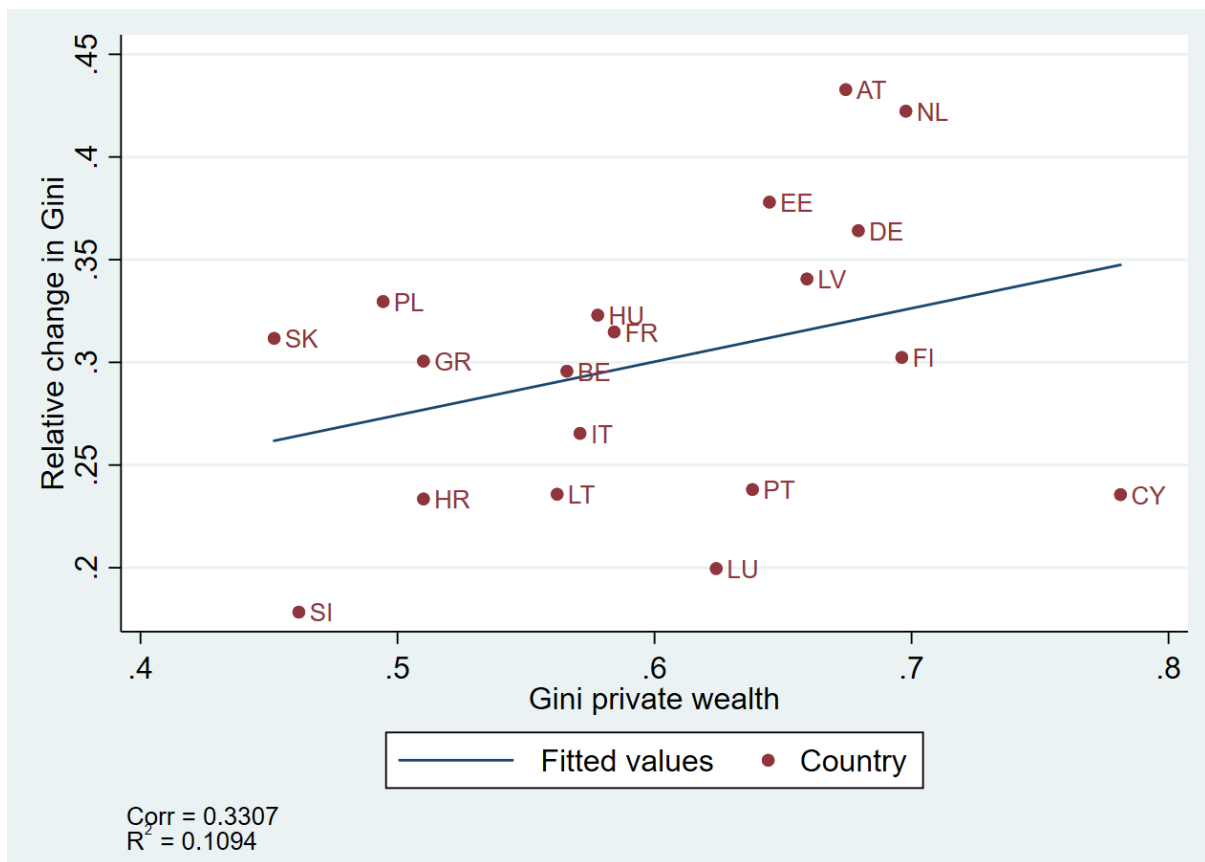
Source: own estimation using HFCS data.

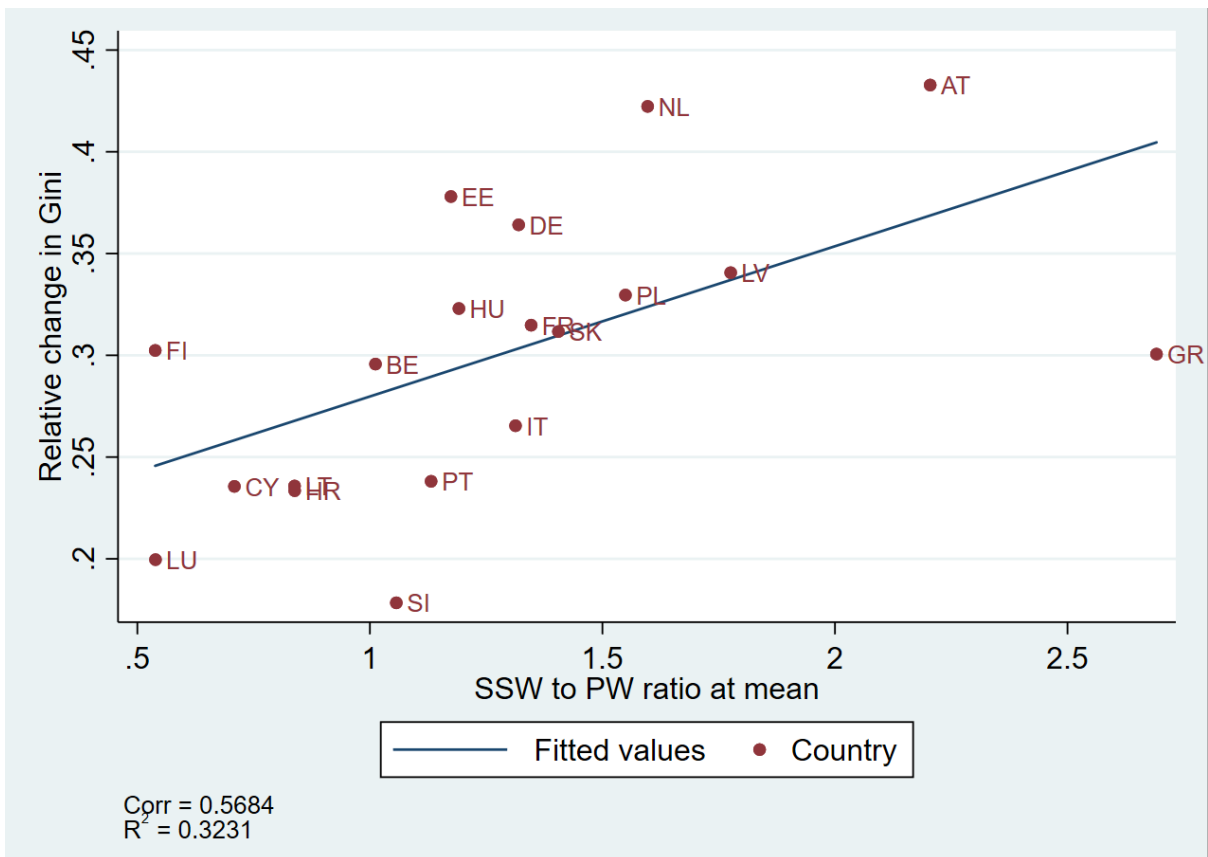
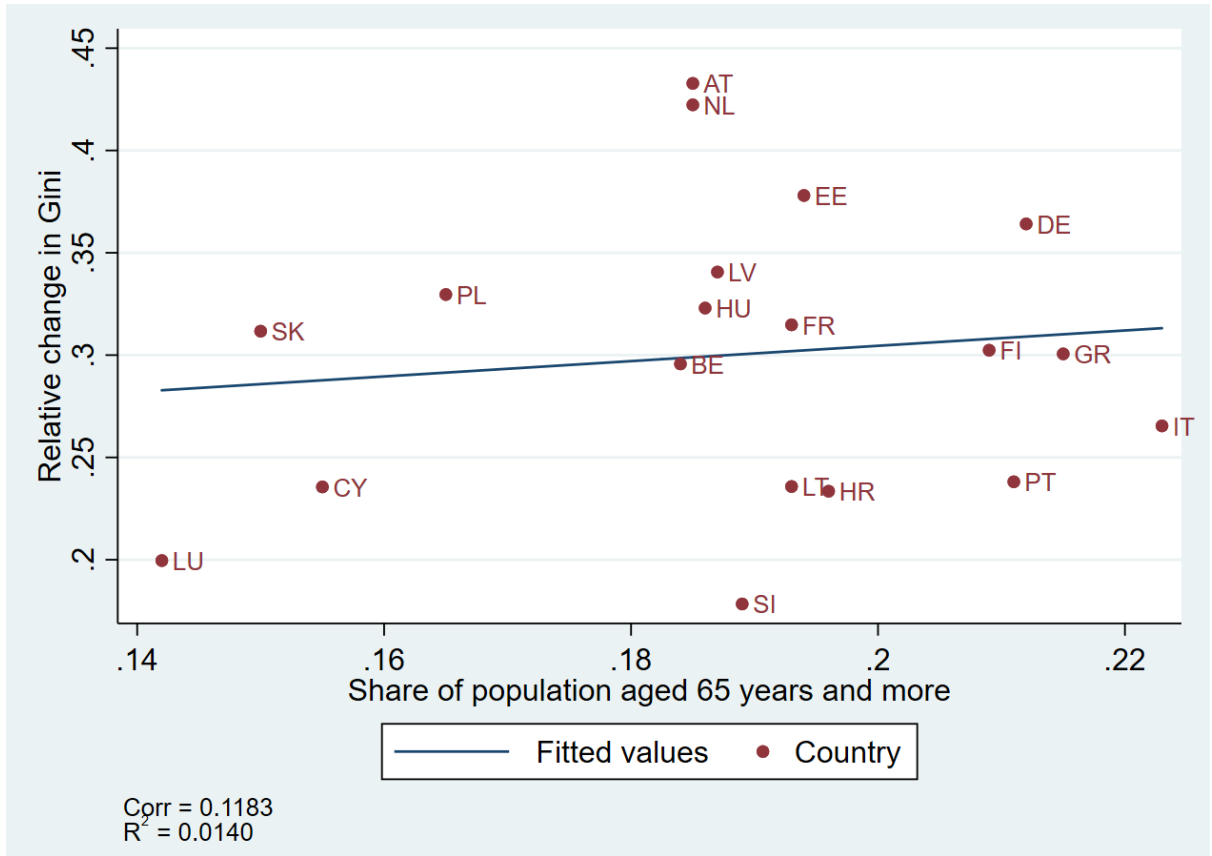
**Figure 2. The impact of social security wealth on wealth inequality. The reduction in private wealth inequality after including social security wealth into household wealth.**



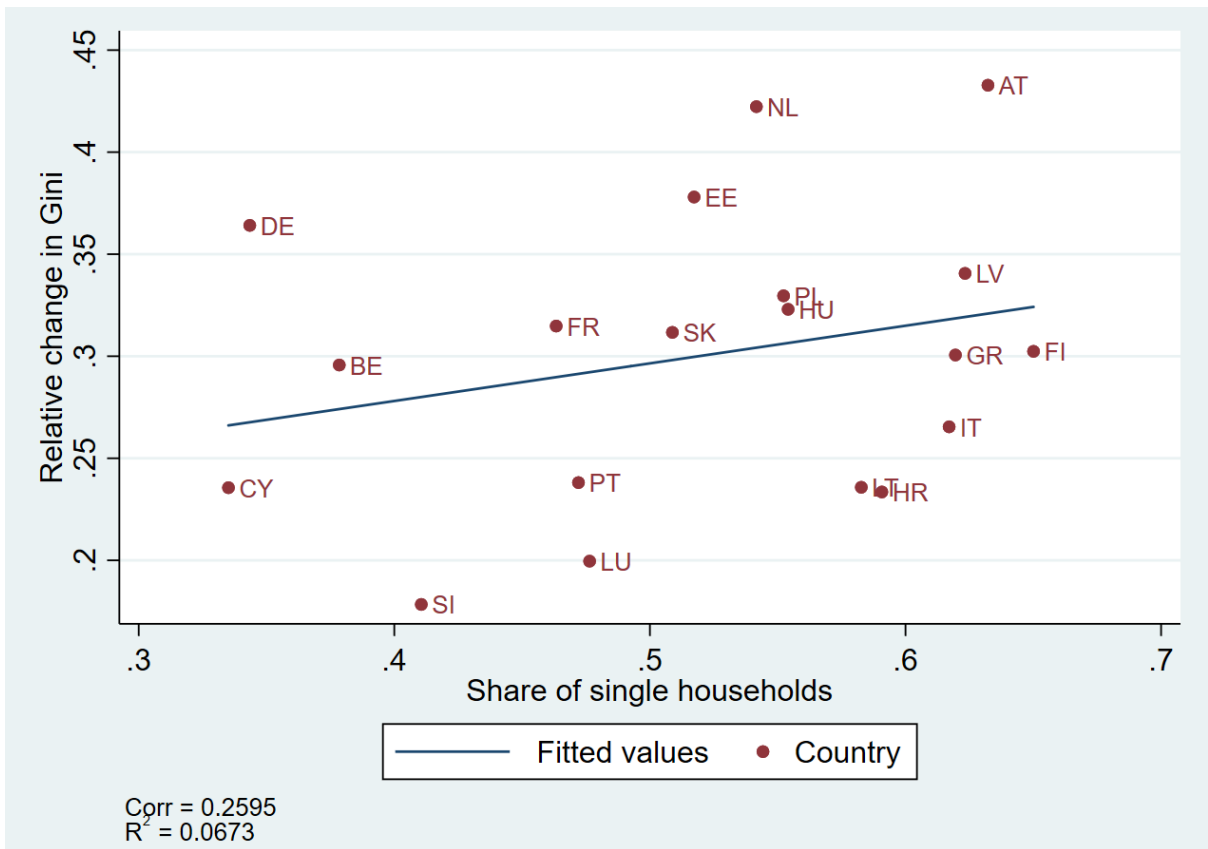
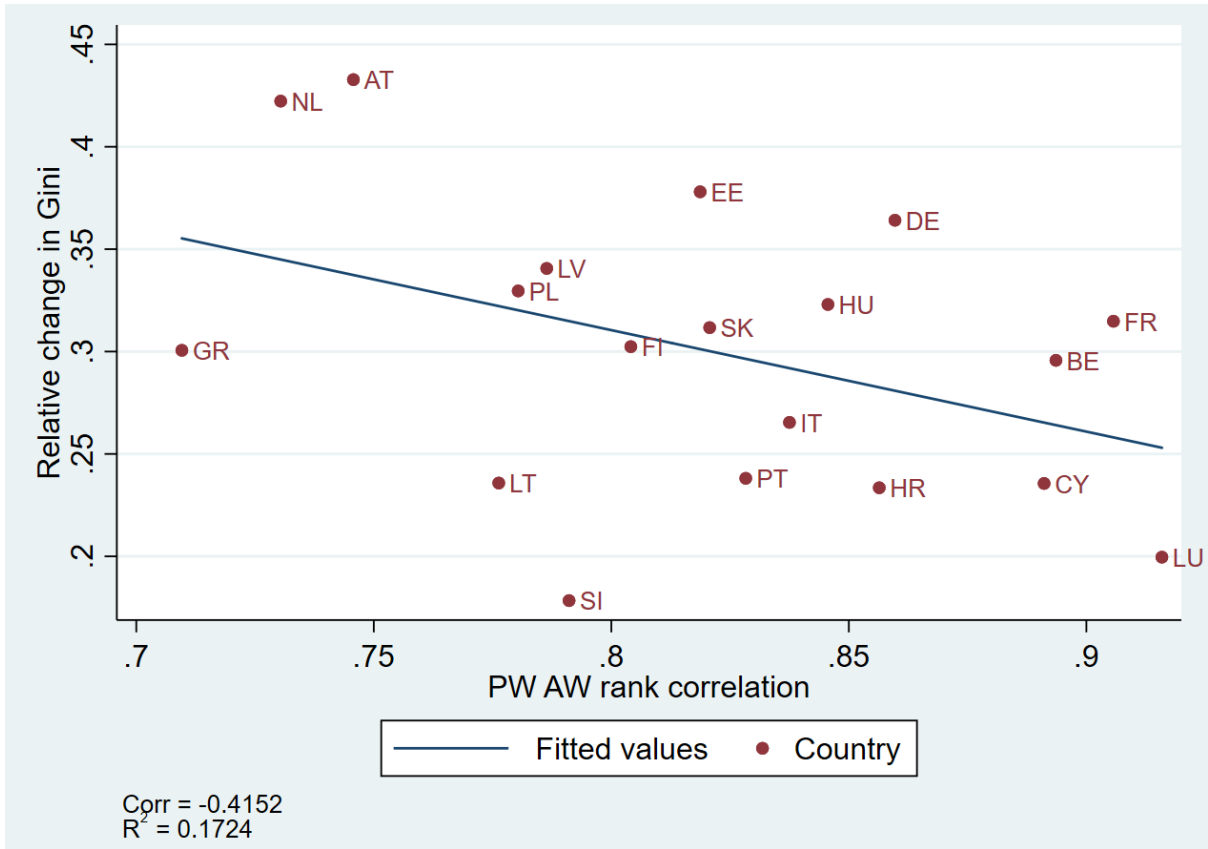
Source: own estimation using HFCS data.

**Figures 3-8. Various correlates of equalizing power of social security system (measured by the relative change in the Gini index).**

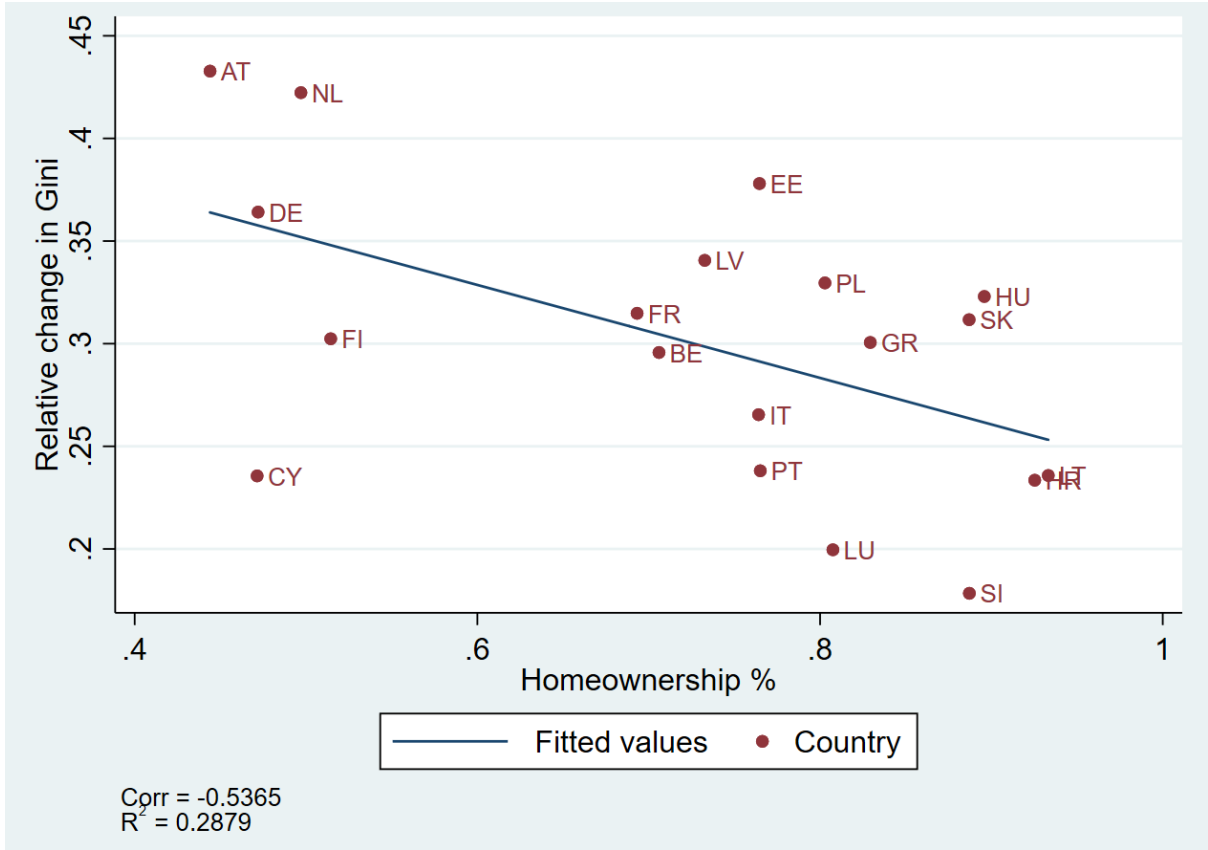




Source: own estimation.







**Table A1. Correlation between distributions.**

Country	Pearson's r	Pearson's r	Pearson's r	Kendall's T	Kendall's T	Kendall's T
	PW - SSW	PW-AW	SSW-AW	PW-SSW	NW-AW	SSW-AW
<b>Austria</b>	0.3824 (0.001)	0.8722 (0.001)	0.7842 (0.001)	.2872 (0.022)	.5683 (0.015)	0.7189 (0.014)
<b>Belgium</b>	0.2145 (0.002)	0.9195 (0.001)	0.5767 (0.002)	0.2551 (0.033)	0.6970 (0.018)	0.5581 (0.028)
<b>Cyprus</b>	0.1964 (0.003)	0.9768 (0.000)	0.3940 (0.004)	0.4518 (0.049)	0.7603 (0.032)	0.6915 (0.018)
<b>Germany</b>	0.2290 (0.001)	0.8986 (0.000)	0.6320 (0.001)	0.2605 (0.029)	0.6538 (0.015)	0.6068 (0.025)
<b>Estonia</b>	0.4327 (0.004)	0.9549 (0.001)	0.6757 (0.003)	0.2022 (0.029)	0.6421 (0.018)	0.5601 (0.020)
<b>Finland</b>	-0.1365 (0.001)	0.9486 (0.001)	0.1776 (0.002)	-0.1672 (0.034)	0.5742 (0.033)	0.2585 (0.034)
<b>France</b>	0.2584 (0.001)	0.9512 (0.001)	0.5395 (0.002)	0.3385 (0.014)	0.6689 (0.007)	0.6693 (0.010)
<b>Greece</b>	0.3831 (0.002)	0.7169 (0.001)	0.9180 (0.000)	0.2737 (0.033)	0.5071 (0.026)	0.7666 (0.015)
<b>Croatia</b>	0.3332 (0.002)	0.9165 (0.001)	0.6802 (0.002)	0.2909 (0.041)	0.7075 (0.025)	0.5834 (0.030)
<b>Hungary</b>	0.1923 (0.002)	0.9636 (0.001)	0.4201 (0.005)	0.2531 (0.017)	0.6192 (0.012)	0.6340 (0.011)
<b>Italy</b>	0.4048 (0.001)	0.8827 (0.000)	0.7865 (0.001)	0.3330 (0.017)	0.6647 (0.010)	0.6684 (0.012)
<b>Lithuania</b>	0.0796 (0.002)	0.8992 (0.002)	0.4868 (0.004)	0.1801 (0.049)	0.6096 (0.044)	0.5705 (0.043)
<b>Luxembourg</b>	0.1826 (0.006)	0.9780 (0.001)	0.3215 (0.009)	0.2832 (0.044)	0.7372 (0.021)	0.5460 (0.037)
<b>Latvia</b>	0.4836 (0.003)	0.8944 (0.008)	0.8207 (0.002)	0.2949 (0.039)	0.5891 (0.028)	0.7057 (0.022)
<b>Netherlands</b>	0.1133 (0.002)	0.8519 (0.001)	0.6125 (0.002)	0.0830 (0.027)	0.5141 (0.022)	0.5690 (0.020)
<b>Poland</b>	0.2321 (0.002)	0.7712 (0.002)	0.7931 (0.001)	0.1972 (0.018)	0.5807 (0.012)	0.6165 (0.012)
<b>Portugal</b>	0.2683 (0.003)	0.9328 (0.001)	0.5773 (0.005)	0.2593 (0.026)	0.6240 (0.017)	0.6354 (0.017)
<b>Slovenia</b>	0.3600 (0.002)	0.8695 (0.001)	0.7713 (0.001)	0.2759 (0.032)	0.6210 (0.020)	0.6549 (0.020)
<b>Slovakia</b>	0.3179 (0.001)	0.8862 (0.001)	0.7176 (0.002)	0.3079 (0.025)	0.6514 (0.017)	0.6565 (0.015)

*Source: own estimation using HFCS data. Standard errors based on 1000 bootstrap replications are presented in parentheses*

**Table A2. The impact of social security wealth on wealth inequality – change in the Gini coefficient.**

<b>Country</b>	<b>PW Gini</b>	<b>SSW Gini</b>	<b>AW Gini</b>	<b>AW - PW diff (abs.)</b>	<b>AW/PW diff (rel.)</b>
<b>Austria</b>	0.6744 (0.000)	0.3275 (0.000)	0.3852 (0.000)	-0.2119 (0.000)	- 43.28% (0.03%)
<b>Belgium</b>	0.5659 (0.001)	0.3465 (0.000)	0.3984 (0.001)	-0.1675 (0.000)	-29.57% (0.05%)
<b>Cyprus</b>	0.7813 (0.001)	0.4217 (0.001)	0.5973 (0.001)	-0.1840 (0.001)	-23.56% (0.07%)
<b>Germany</b>	0.6793 (0.000)	0.3672 (0.000)	0.4320 (0.000)	-0.2474 (0.000)	-36.41% (0.00%)
<b>Estonia</b>	0.6447 (0.001)	0.2994 (0.000)	0.4011 (0.001)	-0.2437 (0.000)	-37.80% (0.05%)
<b>Finland</b>	0.6962 (0.001)	0.5157 (0.000)	0.4857 (0.000)	-0.2105 (0.000)	-30.24% (0.06%)
<b>France</b>	0.5843 (0.000)	0.3522 (0.000)	0.4004 (0.000)	-0.1840 (0.000)	-31.48% (0.02%)
<b>Greece</b>	0.5101 (0.001)	0.3705 (0.000)	0.3565 (0.000)	-0.1536 (0.001)	-30.06% (0.01%)
<b>Croatia</b>	0.5101 (0.001)	0.3742 (0.000)	0.3909 (0.001)	-0.1192 (0.000)	-23.35% (0.06%)
<b>Hungary</b>	0.5779 (0.001)	0.3326 (0.000)	0.3912 (0.001)	-0.1867 (0.000)	-32.30% (0.03%)
<b>Italy</b>	0.5710 (0.000)	0.3952 (0.000)	0.4194 (0.000)	-0.1516 (0.000)	-26.54% (0.03%)
<b>Lithuania</b>	0.5621 (0.002)	0.3998 (0.001)	0.4288 (0.001)	-0.1333 (0.001)	-23.58% (0.08%)
<b>Luxembourg</b>	0.6240 (0.003)	0.4004 (0.001)	0.5001 (0.002)	-0.1239 (0.001)	-19.96% (0.06%)
<b>Latvia</b>	0.6593 (0.001)	0.3891 (0.001)	0.4347 (0.001)	-0.2246 (0.001)	-34.06% (0.07%)
<b>Netherlands</b>	0.6978 (0.001)	0.3747 (0.000)	0.4030 (0.000)	-0.2948 (0.000)	-42.23% (0.05%)
<b>Poland</b>	0.4944 (0.000)	0.3379 (0.000)	0.3315 (0.000)	-0.1628 (0.000)	-32.93% (0.04%)
<b>Portugal</b>	0.6381 (0.001)	0.4576 (0.000)	0.4860 (0.001)	-0.1521 (0.000)	-23.81% (0.04%)

<b>Slovenia</b>	0.4616	0.4237	0.3790	-0.083	-17.84%
	(0.001)	(0.000)	(0.000)	(0.000)	(0.07%)
<b>Slovakia</b>	0.4520	0.2755	0.3019	-0.1501	-33.17%
	(0.001)	(0.000)	(0.000)	(0.000)	(0.05%)

*Note: “PW” stands for private wealth, “SSW” stands for social security wealth, “AW” stands for augmented wealth.*

*Source: own estimation using HFCS data. Standard errors based on 1000 bootstrap replications are presented in parentheses.*

**Table A3. The impact of social security wealth on wealth inequality – deciles shares.**

Country	Bottom 50%			Middle 40%			Top 10%		
	PW	SSW	AW	PW	SSW	AW	PW	SSW	AW
<b>Austria</b>	5.2%	27.0%	23.9%	45.7%	49.7%	47.8%	49.1%	23.4%	28.3%
	(0.5%)	(0.6%)	(0.7%)	(2.1%)	(0.5%)	(0.8%)	(2.4%)	(0.6%)	(1.2%)
<b>Belgium</b>	13.6%	26.0%	23.3%	46.3%	47.3%	47.4%	40.1%	26.6%	29.3%
	(1.5%)	(1.0%)	(1.2%)	(2.6%)	(1.1%)	(1.4%)	(3.4%)	(1.5%)	(2.0%)
<b>Cyprus</b>	4.2%	22.4%	13.1%	31.7%	46.3%	40.1%	64.1%	31.3%	46.7%
	(1.5%)	(1.9%)	(1.7%)	(4.6%)	(2.3%)	(3.5%)	(5.3%)	(2.6%)	(4.3%)
<b>Germany</b>	5.2%	24.7%	20.9%	48.3%	48.7%	48.7%	46.5%	26.6%	32.2%
	(0.7%)	(0.7%)	(0.8%)	(1.9%)	(0.6%)	(0.9%)	(2.2%)	(0.8%)	(2.2%)
<b>Estonia</b>	8.9%	29.1%	23.9%	42.5%	47.5%	43.9%	48.6%	23.4	32.2%
	(1.0%)	(0.8%)	(1.0%)	(2.4%)	(1.1%)	(1.4%)	(3.0%)	(1.7%)	(2.2%)
<b>Finland</b>	4.8%	15.9%	18.3%	47.6%	47.5%	46.6%	47.7%	36.6%	35.1%
	(1.0%)	(1.0%)	(1.1%)	(2.7%)	(1.3%)	(1.8%)	(3.1%)	(1.8%)	(2.5%)
<b>France</b>	11.9%	25.3%	22.9%	46.5%	50.2%	48.0%	41.6%	24.5%	29.0%
	(0.6%)	(0.4%)	(0.4%)	(1.0%)	(0.3%)	(0.5%)	(1.2%)	(0.4%)	(0.7%)
<b>Greece</b>	16.5%	23.8%	24.9%	48.1%	50.7%	49.9%	35.3%	25.5%	25.1%
	(1.0%)	(0.9%)	(0.9%)	(1.3%)	(1.2%)	(1.2%)	(1.8%)	(1.2%)	(1.2%)
<b>Croatia</b>	17.3%	23.8%	23.6%	47.0%	50.1%	49.4%	35.7%	26.2%	27.0%
	(1.5%)	(1.2%)	(1.2%)	(1.8%)	(1.1%)	(1.3%)	(2.4%)	(1.3%)	(1.8%)
<b>Hungary</b>	15.4%	26.7%	24.8%	39.9%	48.6%	44.1%	44.7%	24.7%	31.0%
	(1.0%)	(0.5%)	(0.8%)	(2.5%)	(0.5%)	(1.3%)	(3.4%)	(0.6%)	(2.1%)
<b>Italy</b>	13.5%	22.9%	21.9%	45.8%	48.7%	48.3%	40.7%	28.4%	29.9%
	(0.6%)	(0.5%)	(0.5%)	(1.0%)	(0.5%)	(0.5%)	(1.3%)	(0.6%)	(0.7%)
<b>Lithuania</b>	15.2%	24.8%	22.4%	36.4%	44.0%	40.9%	48.4%	31.2%	36.8%
	(4.2%)	(2.0%)	(3.6%)	(8.4%)	(1.7%)	(5.3%)	(12.2%)	(2.9%)	(8.5%)
<b>Luxembourg</b>	11.9%	22.3%	18.3%	34.5%	49.7%	40.5%	53.6%	28.0%	41.2%
	(2.4%)	(1.5%)	(2.2%)	(6.1%)	(1.4%)	(4.3%)	(8.2%)	(1.4%)	(6.1%)
<b>Latvia</b>	10.7%	23.1%	21.8%	40.7%	47.8%	44.7%	48.6%	29.1%	33.5%
	(1.4%)	(1.1%)	(1.3%)	(2.5%)	(1.1%)	(1.4%)	(3.3%)	(1.6%)	(2.2%)
<b>Netherlands</b>	5.7%	24.2%	22.9%	46.2%	48.6%	48.2%	48.1%	27.2%	28.9%
	(0.6%)	(0.9%)	(0.9%)	(2.1%)	(0.8%)	(1.0%)	(2.4%)	(1.3%)	(1.5%)
<b>Poland</b>	18.8%	26.7%	27.8%	49.1%	48.7%	47.9%	32.1%	24.6%	24.3%
	(0.7%)	(0.6%)	(0.5%)	(0.9%)	(0.7%)	(0.6%)	(1.3%)	(1.1%)	(0.9%)
<b>Portugal</b>	11.0%	19.9%	19.3%	39.5%	44.7%	41.8%	49.5%	35.4%	38.9%
	(1.2%)	(0.7%)	(1.0%)	(3.2%)	(0.9%)	(1.7%)	(4.2%)	(1.2%)	(2.5%)
<b>Slovenia</b>	19.7%	19.2%	23.7%	48.0%	54.9%	50.5%	32.3%	25.9%	25.9%
	(1.1%)	(1.3%)	(1.0%)	(1.6%)	(0.9%)	(1.8%)	(2.1%)	(0.8%)	(1.3%)

<b>Slovakia</b>	21.3%	30.5%	29.8%	47.2%	49.9%	48.2%	31.5%	19.6%	22.1%
	(1.3%)	(0.6%)	(0.8%)	(1.9%)	(0.5%)	(0.8%)	(2.8%)	(0.6%)	(1.3%)

*Note: “PW” stands for private wealth, “SSW” stands for social security wealth, “AW”*

*stands for augmented wealth.*

*Source: own estimation using HFCS data. Standard errors based on 1000 bootstrap replications are presented in parentheses.*