Cementing the Divide?

Housing and Wealth Inequality across Europe

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Abstract:

Table of contents

List of Figures

List of Tables

List of Abbreviations

Abbreviation	Explanation
HFCS	Household Finance and Consumption Surveys
DWA	Distributional Wealth Accounts
ECB	European Central Bank
OECD	Organisation for Economic Co-operation and Development
BIS	Bank for International Settlements
OLS	Ordinary Least Squares
SCC	spatial correlation consistent
MGE	Mean Group Estimator

1 Introduction

Housing is Europe's largest asset. Its value is central to both household finances and the macroeconomy. Yet despite advances in the literature, there is still limited comparative evidence on the distributional consequences of housing wealth accumulation in Europe. This thesis draws on recent improvements in distributional data (Blatnik et al. 2024) and methodological approaches developed for the United States (Kuhn, Schularick, and Steins 2020) to examine how the wealth distribution reacts to changes in house prices.

The importance of housing for the modern economy cannot be overstated: houses are the primary item on household balance sheets [1]; mortgages make up the largest share of debt in developed economies (Jordà, Schularick, and Taylor 2016); and housing cycles play a central role in macroeconomic fluctuations (Cesa-Bianchi 2013), particularly evident during and after the financial crisis of 2008.

At the same time, inequality has returned to the forefront of economic debate. Since Piketty's *Capital in the Twenty-First Century* (Piketty 2014), research on the distribution of wealth and income has expanded rapidly, supported by large-scale data initiatives such as WID.world (Alvaredo et al. 2017) and the creation of official distributional accounts in developed economies (e.g. Batty et al. 2022).

Bringing these two strands together, this thesis investigates how changes in asset prices, particularly housing, affect the distribution of wealth in Europe. Because the composition of household portfolios differs across the population identical price movements can have very different distributional consequences. While high-wealth households tend to hold more business and financial assets tied to stock market performance, middle- and lower-wealth households primarily own housing and often carry more leverage, making them more exposed to house price movements (Adam and Tzamourani 2016).

This analysis relies on newly released Distributional Wealth Accounts (DWA) from the European Central Bank (Blatnik et al. 2024). The DWA reconcile detailed micro-level survey's of households balance sheets with data from national accounts, ensuring macro-consistent estimates while preserving detailed information of distribution of assets among households. The result is a harmonised, cross-country dataset for the Eurozone that captures changes in the wealth distribution at a much higher frequency than traditional surveys, making it well-suited for analysing the distributional effects of asset price movements.

Building on the regression framework of Kuhn, Schularick, and Steins (2020), who relate triennial changes in US wealth shares to asset price movements using broad survey data over several decades, this thesis applies a higher-frequency and cross-country approach. Using the quarterly data from the DWA for all euro area countries from 2011–2022, it estimates panel models linking changes in the wealth shares of the bottom 50%, middle 40%, and top 10% respectively to movements in housing and equity prices.

The results highlight the central role asset prices play in the evolution of wealth inequality. Rising House prices increase the share of the middle 40% and particularly the bottom 50% at the expense of the top decile. Conversely, increasing stock prices are found to benefit the top 10%, to the detriment

[1] A country specific breakdown of the share of housing in net wealth is provided in Figure 8 in Appendix A

of the rest of the population. Notably, these results vary strongly across european countries, reflecting differences in portfolio structures and institutional settings.

To illustrate these mechanisms, the effect of counterfactual asset price scenarios are simulated. They show how the wealth share of the top decile would have evolved under alternative housing and equity price paths. Scenarios with strong housing growth shift wealth away from the top 10% toward the middle and lower segments, while weak or falling house prices have the opposite effect. But even in the most extreme housing boom observed, these appreciations cannot offset the gains of rising stock prices for the top decile. In no counterfactual scenario does the share of the top 10% decrease until 2022.

The thesis is structured as follows. Section 2 reviews the relevant research on wealth inequality, asset prices, and portfolio choice. Section 3 describes the Distributional Wealth Accounts and complementary data sources, while Section 4 presents stylized facts and descriptive statistics derived from them, followed by the empirical strategy outlined in Section 5. The main results are presented in two steps: Section 6 reports panel regression results, while Section 7 explores national heterogeneity. Counterfactual scenarios are presented in Section 8. Section 9 interprets the findings in the context of existing literature and policy debates, and Section 10 concludes.

2 Literature on Wealth Inequality

This thesis builds on the effort to collect detailed data on wealth distribution and inequality. Pioneered by Piketty and Saez (2003) and followed by his seminal book (Piketty 2014), where he documents wealth-to-income ratios in developed economics rising to levels previously seen in 19th century Europe[2].

The renewed interest in Inequality inspired the creation of distributional national accounts. These datasets aim to link up national accounts with survey data to ensure macroeconomic consistency of inequality estimates. First presented for the US Income Distribution by Piketty, Saez, and Zucman (2018) and Wealth Distribution by Batty et al. (2022), they are now available as well for european income distributions (Blanchet, Chancel, and Gethin 2019) and wealth distributions (Blatnik et al. 2024). The latter is the main dataset used in this thesis, further explored in Section 3.

The analysis is most closely related to the literature researching asset prices as a central driver of wealth inequality. Kuhn, Schularick, and Steins (2020) use a newly construced historical dataset ranging back to 1948 to document the reactions of different parts of the wealth distribution to stock and house prices (2020, 37). They find that the share of the top decile of the wealth distribution reacts negatively to increases in house prices and the opposite with respect to stock prices, mostly due to differential exposure in Household portfolios (2020, 34). Additionally, they find that the portfolio valuation channel is predominantly responsible for shifts in the wealth distribution, especially in the lower half (2020, 42). A similar analysis is done by Adam and Tzamourani (2016), who multiply

[2]The measurement of Wealth by Piketty was criticised by O. Bonnet et al. (2014), who find that using (imputed) rent as a housing capital measurement, Piketty's fast rising capital-income ratios are actually stable. Allègre and Timbeau (2015) outline internal incosistencies in their critique while emphasizing the central contribution of housing in explaining the wealth dynamics. A summary of the role of housing in the debate around Piketty's work is provided by Stephens (2017).

different asset valuations in european household portfolios by a 10% price increase. The authors document an increase in wealth inequality in response to rising stock prices and a decrease in response to housing price apprecations, although with a large heterogeneity across the Euro Area for the latter. Martínez-Toledano (2022) finds similar efffects, focusing on the relation of House Price Cycles and wealth inequality in spain. She puts a special emphasis on the differential effects in boom and busts and the role of portfolio adjustments by richer Households.

As described above, differential portfolio choice explains the effect of valuation changes on inequality. Cocco (2005) presents a theoretical model of optimal portfolio allocation to explain why younger and poorer households invest in housing and do not take part in the stock market. Sierminska and Doorley (2013) document these differences for age cohorts empirically across European and North American countries, highlighting the role of institutions in portfolio choices. A description of household balance sheets across socio-economic groups is provided by Causa, Woloszko, and Leite (2019) for OECD Countries. They highlight Housing as the most important asset, especially for the middle class, but document pronounced variations in countries at the bottom of the wealth distribution (2019, 22). Additionally, they stress the importance of mortages, due to the increased vulnerability in housing price busts or elevated interest rate periods for leveraged households (2019, 30).

Another explanation for differential gains from assets along the distribution are heterogeneous rates of return. Richer households have higher profits than poorer households adn this holds true when controlling for portfolio differences. This relationship is documented by Fagereng et al. (2020) using detailed norwegian individual tax records, who find that this effect is persistent even across generations. Similar heterogenous patterns are found by Bach, Calvet, and Sodini (2020) in swedish data and by Wolff (2025) for housing in the US.

Moreover, the thesis relates to the literature examining the cross-country wealth differences in the European Union. The central role of housing is highlighted by Biewen, Glaisner, and Kleimann (2025), who find that homeownership is the main household characteristic that explains these differenes. Mathä, Porpiglia, and Ziegelmeyer (2017) adds to this the role of diverse housing price dynamics to explain the variations in net wealth accumulated across Europe. Similarly, Kaas, Kocharkov, and Preugschat (2019) emphasize that homeownership is the channel to explain the differences, and that a large part can be accounted for by distinct home ownership rates in the bottom half of the wealth distribution. Furthermore they decompose inequality into inequality between owners and renters and intra-group inequalities and find that the the former is foremost responsible for the relationship between inequality and homeownership.

A methodology similar to the one in this thesis was first used by Wolff (1995, 31, p.77) for US wealth inequality between 1922 and 1989. The author regressed the wealth share of the top 1% on the share of income accrued by the group and the ratio of stock prices to housing prices. Both factors are statistically significant, with the Prices Ratio explaining most of the divergence of wealth and income inequality between 1945 and 1979. Most recently, Kuhn, Schularick, and Steins (2020) use a similar regression to describe the "race between the stock market and the housing market" (2020, 37). They regress the first differences of the wealth share hold by the top 10% of the US american wealth distribution on the first differences in housing prices, stock prices (proxied by the S&P 500) and the share of income going to the top 10%. The results indicate a negative reaction of the wealth share to Housing Prices and a positive one to Stock Prices, although with limited statistical significance due to small sample size. Fuller, and and Regan (2020) use similar explanatory variables in a panel regression of western european and OECD countries to explain the rising wealth-to-income ratios by Piketty and Zucman (2014). The authors find that the increase is explained by rising house prices as well as to a lesser extent prices of other assets.

This thesis makes a contribution to the literature by examining how different segments of the wealth distribution respond to changes in stock and asset prices. It provides estimates for eurozone as a whole, as well as for a large number of European countries. The following section describes the underlying data for this analysis and provides descriptive statistics of the wealth distribution.

3 The Distributional Wealth Accounts

To understand the wealth dynamics, the analysis employs a variety of different datasets, the main being the Distributional Wealth Accounts (henceforth DWA) compiled by the European Central Bank (Blatnik et al. 2024). The DWA provides quarterly wealth positions of different deciles of the wealth distribution for 21 european countries from 2011 until 2025, splitting up the net wealth according to the amount hold in different asset classes (Housing Wealth, Mortages etc.).

A novelty of the DWA is their consistency with macroeconomic estimates of wealth from the quarterly financial accounts. A limitation of existing distributional data based only on surveys is the underreporting of wealth, which is adressed in the DWA following the US example by Batty et al. (2022) for the Federal Reserve.

The exact methodology to derive quarterly distributional accounts as well as a first analysis of the dataset is described by Engel et al. (2022). They distribute the wealth estimates from the quarterly sectoral financial accounts (QSA) according to the distribution in the Household Finance and Consumption Surveys (HFCS), which are carried out by Eurozone member banks every 3-4 years (Network 2013). To overcome the problems of differential nonresponse (richer Households are underrepresented in the surveys) and the differential underreporting (richer Households undervalue their assets) they use the method proposed by Vermeulen (2016). He builds on the finding that the upper tail of the Wealth Distribution follows a Pareto distribution, which can be used to create synthetic rich Households on a Curve fitted to the HFCS data and Households from external rich lists (e.g. Neßhöfer and Bornefeld (2024) for Germany). After this step, Engel et al. (2022) use linear interpolation to distribute the QSA between HFCS survey waves and extrapolate after the most recent HFCS wave in 2022.

The authors perform a wide range of sensitivity and robustness checks for the DWA, but it is important to stress that it is still an experimental dataset, which can not guarantee the same accuracy as data obtained by wealth taxation or other methods.

This analysis draws on the DWA for the time from 2011 until 2022. Potential extrapolation errors after the last HFCS wave and lagged effects of the Covid shock on the housing market are therefore not included in the dataset. The full range of countries is used, including Hungary, which is not part of the Eurozone, but increases the reliability of the results. The countries are abbreviated in Figures and Tables by ther ISO 2-digit country codes. A table with descriptive statistics and their respective full name is provided in Table 6 in Appendix A.

Furthermore, assets are combined to simplify and ease the interpretation of results (as in Kaas, Kocharkov, and Preugschat 2019). Unlisted shares and non-financial Business Wealth are combined to form Business Wealth; debt securities, listed shares, investment fund shares and life insurance entitlements form the Financial Wealth and Debt is made up of Mortgage Loans and other Loans.

Additionally, wealth estimates for the Deciles 6 to 9 of the wealth distribution are combined to form the Middle 40% wealth group, next to the Bottom 50% and the Top 10% (henfecorth the wealth groups). This follows the literature Kuhn, Schularick, and Steins (2020), as the middle 40% have a portfolio composition and wealth levels distinct from the other groups (see Figure 3). Their wealth is predominatly made up of housing equity, whereas in the top decile business and financial assets play a much larger role.

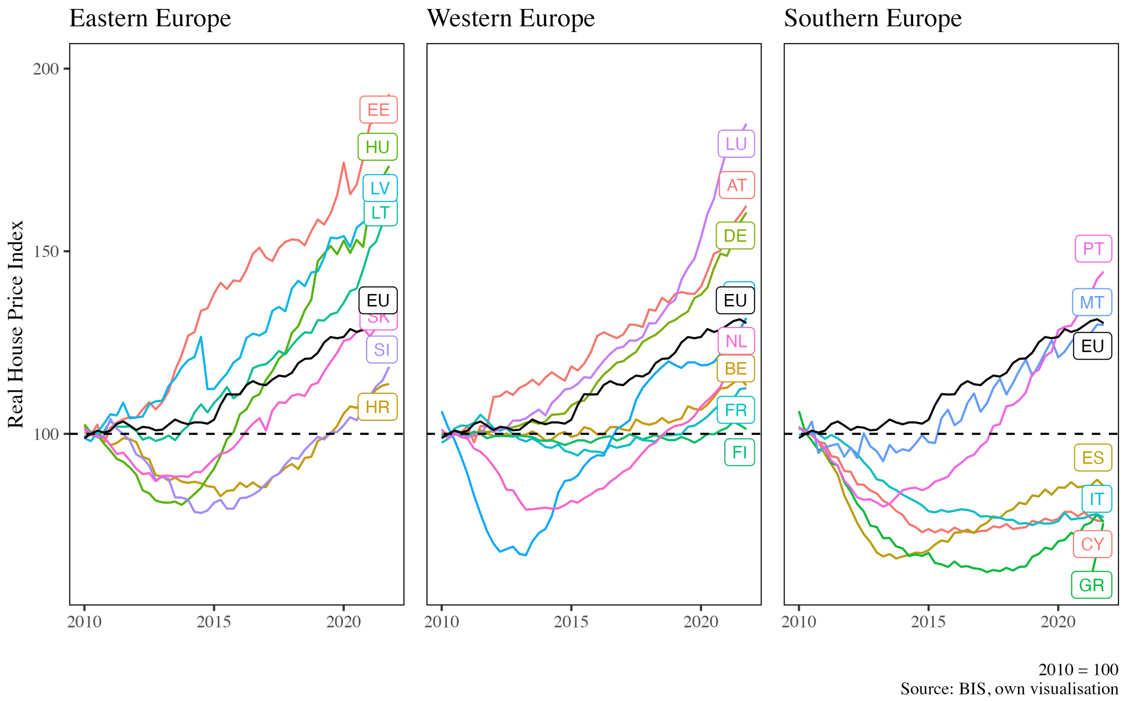


Figure 1: Residential Property Price Index

For Housing Price Data, the Residential Property Price Dataset from the Bank of International Settlement (BIS) is used (Scatigna, Szemere, and Tsatsaronis 2014). The dataset is widely used in cross country comparisons (i.e. Rünstler and Vlekke 2018) and includes quarterly time series for most developed countries in real terms.

Housing Prices in the Eurozone plateaud until 2015 and experienced a strong increase afterwards, as visible in Figure 1. This average marks strong differences in the individual member states. Southern European Countries like Spain, Italy and Greece experienced a devaluation after 2010, while many western and eastern european countries show strong increases in property price indices. Price Indices in Estonia and Luxemburg almost doubled in the observed timeframe, while they declined by 25 index points in Greece.

Stock prices are represented using the Euro Stoxx 50 index, which includes 50 large firms from 11 Eurozone countries, offering broad representation of the region's equity markets. The index captures approximately 60% of total market capitalization and serves as a standard benchmark for European stock market performance (e.g Brechmann and Czado 2013).

The final panel dataset includes asset holdings for the three wealth groups in 21 countries as well as the Eurozone as an aggregate, measured in nominal values. The number of observations per country ranges from 17 in Latvia to 49 in Greece, totaling 860 observations. This is complemented by housing price indices for all countries over the observed time frames and the European stock price index for the entire time period.

After presenting the data sources used in the analysis, the next section provides some stylized facts and descriptive statistics drawn from the DWA.

4 Stylized Facts about the Wealth Distribution

The portfolios of the bottom 50% display the largest heterogeneities across Europe[3]. In most countries, they closely resemble the composition of the middle class with housing as the main asset (examples include Italy, Ireland and Finland). Outliers to this rule include Germany, Austria and the Netherlands. The wealth of the lower half in these countries is predominantly made up of the other assets and housing contributes less than 50% to total wealth.

The distribution of these asset classes among the wealth groups in the Eurozone is described in Figure 2. As visible, Housing is distributed most equally of the wealth categories, with the Top Decile owning 47% of the total Housing Wealth. It is followed by Net Wealth with 57%, and Financial Wealth and Business Wealth with 72% and 85% respectively.

This sequence holds in all european countries, with the absolute numbers differing considerably[4]. While almost all financial wealth is owned by the top decile in Croatia and Greece, it is less than half in the Netherlands and Malta. For business wealth, the most significant share held by the top 10% is in Austria and Germany, while Greece and Cyprus feature the most equal distribution. In Housing Wealth, it is not the share of the top 10% that varies much, but the bottom 50%. In Germany, Austria and the Netherlands they possess below 2% of the asset, while their counterparts in Slovakia and Lithuania own more than 15%.

Figure 4 tracks the portfolios of the wealth groups over the observed time frame. The figure confirms the large heterogeneity of wealth portfolios in the literature and additionally adds a time dimension displaying the diffferent growth trends of net wealth.

The lower half of the distribution have little wealth, with housing and deposits playing the largest role. They are highly leveraged and essentially did not increase their net wealth until 2015, after which it grew slowest of all groups. The portfolio of the Middle 40% is dominated by housing. Compared to the Bottom 50%, they exhibit much higher net wealth and much lower debt. In the top decile, Business as well as Financial Wealth play a larger role, while debt plays a smaller one. The net wealth of the top 10% grew fastest, from 539 thousand euros to 849 thousand euros per capita, a 57% increase in the span of 12 years.

[3]The complete breakdown for all european countries is provided in Figure 10 in Appendix B.

[4]The expanded version of Figure 2 with country-specific distributions is available as Figure 9 in Appendix B

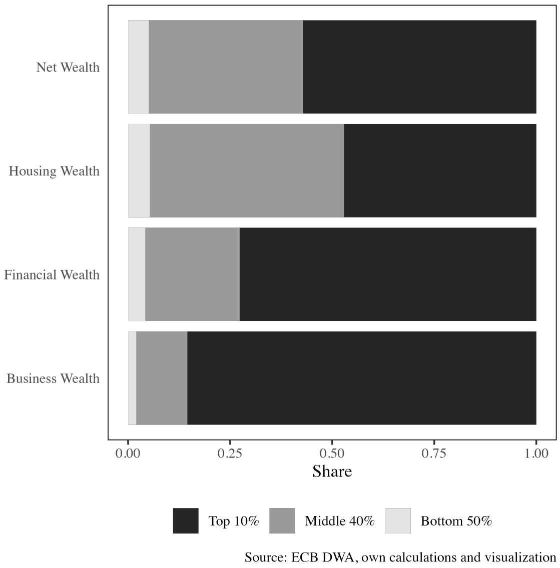


Figure 2: Asset distribution among wealth groups (Eurozone Average)

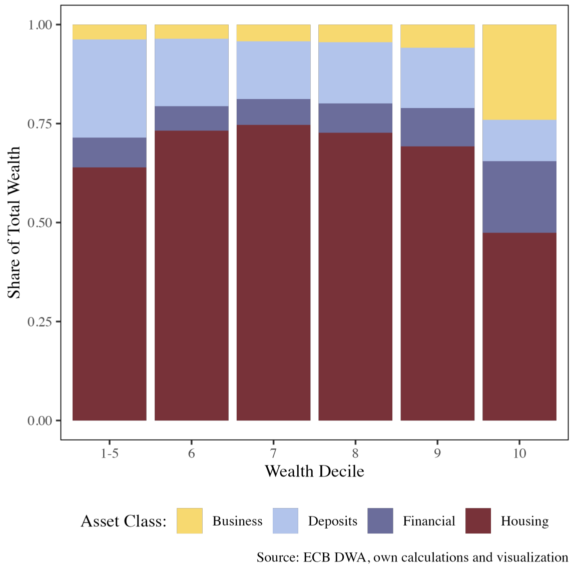


Figure 3: Portfolio Composition of Deciles (Eurozone Average)

These differences in portfolio size and composition suggest that changes in asset prices are likely to affect each segment of the distribution in distinct ways. The next section sets out the econometric framework used to quantify these effects.

5 Empirical Strategy

As described above, different segments of the wealth distribution hold different portfolios, in size as well as in composition of asset classes. Their net wealth therefore reacts in distinct ways to identical changes in valuation of assets. This has a direct effect on the share of overall wealth held by the segment and consequently on general wealth inequality.

To estimate this response, a panel regression outlined in Equation 1 is estimated:

$$\Delta \log(\omega^{g}_{i,t}) = \beta_0 + \beta_h \Delta \log(p^{h}_{i,t}) + \beta_s \Delta \log(p^{s}_{t}) + \epsilon_t \tag{1}$$

Δ log is the first difference of the log, as in $\Delta \log(x_t) = \log(x_t) - \log(x_{t-1})$. $\omega^{g}_{i,t}$ is the wealth share of a wealth group g (Bottom 50%, Middle 40%, Top 10%) in country i in quarter t. p^h describes the housing price index and p^s the stock market index. ϵ_t is an error term. The resulting estimates can be interpreted as the elasticity of the groups wealth share with respect to asset prices (Wooldridge 2013, 44).

Some regressions are extended to include country and time fixed effects. To control for seasonal patterns and macroeconomic shocks, one specification also includes separate fixed effects for each

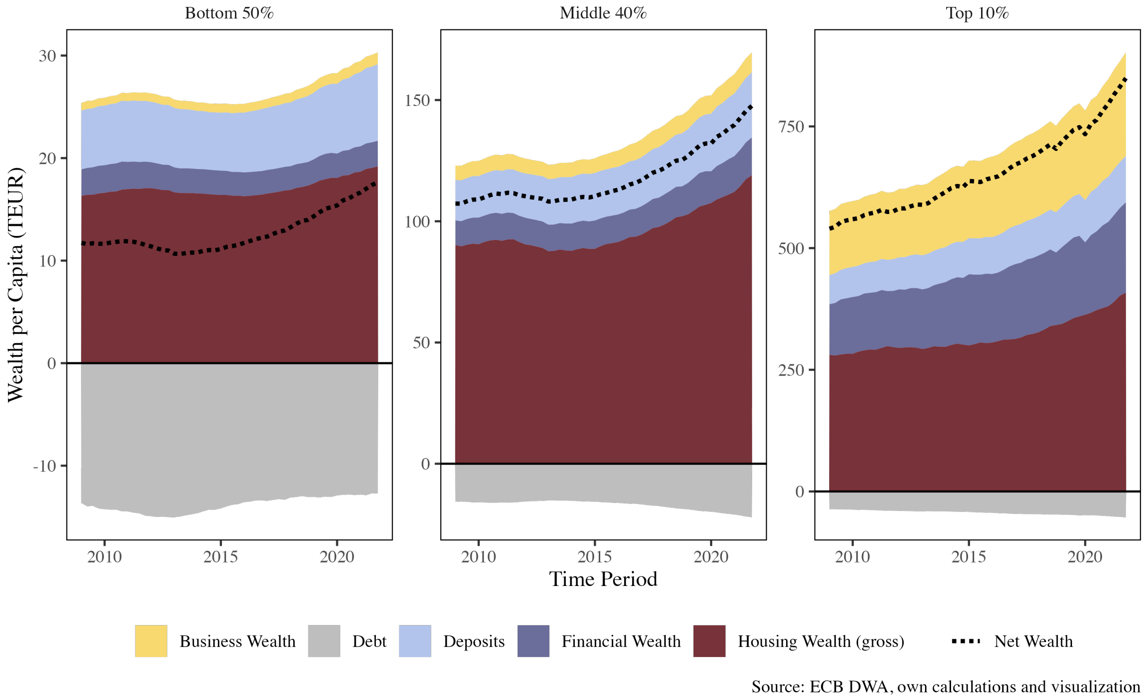


Figure 4: Differential Wealth Trends (Eurozone Average)

quarter and each year. Quarter fixed effects are defined as categorical indicators for Q1 to Q4, while year fixed effects cover the years 2011 to 2022, capturing annual shocks common across countries.

A potential concern with this type of panel structure is spatial dependence. As the cross-section of countries is not randomly sampled, they are subject to common unobserved and observed disturbances, which potentially bias the standard errors of the parameter estimations. To adress this issue, the standard errors are computed using the spatial correlation consistent (SCC) method by Driscoll and Kraay (1998).

Another problem is the heterogeneity in responses subsumed under the parameter estimates in an Ordinary Least Squares (OLS) Regression. Due to differing portfolio compositions of the same wealth groups across Europe, β_h and β_s will not have the same slope in all countries and their estimates will not be able to explain the large variation.

To adress this, the estimates are additionally calculated with the mean group estimator (MGE) proposed by Pesaran and Smith (1995). This estimator allows for heterogeneity in individual coefficients and error terms by running separate regressions for each unit. Resulting estimates are averaged as $\hat{\beta}^{MG} = 1/N \sum_{i=1}^{N} \hat{\beta}_i$ (Millo and Croissant 2018, 190).

The MGE requires that $T \geq p$ and N and T are sufficiently large. Using Monte Carlo simulations, Hsiao, Pesaran, and Tahmiscioglu (1999) find that $T = 5$ leads to considerable estimation error, while $T = 20$ yields reliable results. The DWA dataset places well within the recommended range for applying the MGE, with $N = 21$ and T ranging from 17 to 49 across countries

Table 2: Top 10% Panel Regression

	OLS Estimator			Mean Group Estimator	
	(1)	(2)	(3)	(4)	(5)
House Prices	-0.091***	-0.077***	-0.056	-0.055***	-0.057***
	(0.013)	(0.009)	(0.047)	(0.020)	(0.018)
Stock Prices		0.017***	0.027***		0.014***
		(0.007)	(0.009)		(0.004)
Unit Fixed Effects	No	Yes	Yes	-	-
Time Fixed Effects	Yes	No	Year + Quarter	Yes	No
N	860	860	860	860	860
R^2	0.071	0.087	0.076	0.443	0.313
Adj. R^2	0.013	0.062	0.050	0.408	0.269

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
OLS Estimators use the SCC Standard Errors by Millo (2017)

One specification of the MGE is demeaned cross-sectionally, which reduces the influence of common factors. It is comparable to Time Fixed Effects in an OLS estimate (Coakley, Fuertes, and Smith 2006). Both the standard as well as the demeaned MGE use the implementation in R by Croissant et al. (2023).

Additionally, regressions are estimated separately for each country. This allows for the interpretation of country-specific responses to identical price movements and helps identify outliers. One problem with the OLS estimator in real world time series data like the one used in this analysis is standard errors are autocorrelated. This could result in biased estimates of the standard errors, as one of the core assumptions of the OLS estimator is not fulfilled. To address the autocorrelation and potential heteroskedasticity in the time series, standard errors are computed using the Newey-West estimator (Newey and West 1987). This method corrects the standard errors by computing a heteroskedasticity and autocorrelation consistent variance matrix with a lag window to capture common disturbances (Pesaran 2015, 113).

The following section applies this framework to estimate the relationship between asset price changes and wealth shares.

6 Wealth Share Elasticities: Panel Regression

Table 2 reports the results of the panel regression for the share of the Top 10%. The first column includes time fixed effects, which absorb the stock prices due to the identical nature of the index in every country. Column 2 drops the time fixed effects, and includes unit fixed effects, while the third specification adds year and quarter fixed effects to control for seasonality. Column 4 presents calculations using the Demeaned MGE, which again absorb the estimates for stock prices. Column 5 uses the standard MGE. A separate regression with year and quarter fixed effects is not included, as it is identical. Including lags of the dependent variable does not materially alter the estimated effects. Full results with lags are reported in Table 10 in Appendix D.

Table 3: Middle 40% Panel Regression

	OLS Estimator			Mean Group Estimator	
	(1)	(2)	(3)	(4)	(5)
House Prices	0.058***	0.036***	-0.010	0.033**	0.031*
	(0.012)	(0.009)	(0.040)	(0.015)	(0.016)
Stock Prices		-0.019**	-0.031***		-0.014***
		(0.008)	(0.009)		(0.005)
Unit Fixed Effects	No	Yes	Yes	-	-
Time Fixed Effects	Yes	No	Year + Quarter	Yes	No
N	860	860	860	860	860
R^2	0.027	0.049	0.034	0.388	0.258
Adj. R^2	-0.034	0.023	0.008	0.349	0.210

* p < 0.1, ** p < 0.05, *** p < 0.01
OLS Estimators use the SCC Standard Errors by Millo (2017)

The top 10% wealth share decreases in response to house price increases. The estimates are consistently negative in all specifications and statistically significant, ranging from -0.091 in the first column to -0.057 in the last and preferred specification. A 10% increase in House Prices leads to approximately a half percentage point decrease in the top decile wealth share.

Rising stock prices are found to have an effect in the opposite direction. Estimates for the elasticity of the top decile wealth share range from 0.027 in the third specification and 0.014 in the last. An increase in stock prices increase the share of wealth hold by the Top 10%, while an increase in house prices compresses the share.

The OLS estimates for this as well as the other segments of the wealth distribution display a low coefficient of determination due to the heterogeneity in the data. Using the Mean Group Estimator, the models can explain above 20% of the variance in the standard configuration and above 30% in the demeaned configuration for all groups.

Contrasting effects to those of the top decile are identified for the Middle 40% (Table 3). The elasticity of their wealth share with respect to house prices is positive, ranging from 0.058 in Model (1) to 0.031 in the preferred Model (5). An outlier is the estimate for the specification with Year and Quarter Fixed Effects, which is however not statistically significant. Stock prices on the other hand have a statistically significant negative effect on the middle segment of the wealth distribution. A 10% increase in stock prices leads to a decline in the share of net wealth of approximately 0.14 to 0.31 percentage points, depending on the specification.

The Bottom half of the wealth distribution responds similarly to the middle 40% in direction, albeit with greater magnitude. Estimates for the House Price elasticity range from 0.189 to 0.481. Conversely, accelerating stock prices by 10% decreases the share of the group by 0.28 percentage points to 0.51 percentage points.

This group is notable for its lack of statistical significance for most coefficient values, particularly in specifications that use the mean group estimator. As outlined above, it is the lower half that exhibits the most variation in their wealth portfolio and positions. Therefore, they will display the most

Table 4: Bottom 50% Panel Regression

	OLS Estimator			Mean Group Estimator	
	(1)	(2)	(3)	(4)	(5)
House Prices	0.481***	0.393***	0.189	0.212	0.253
	(0.109)	(0.062)	(0.175)	(0.192)	(0.179)
Stock Prices		-0.028*	-0.051		-0.029
		(0.016)	(0.033)		(0.022)
Unit Fixed Effects	No	Yes	Yes	-	-
Time Fixed Effects	Yes	No	Year + Quarter	Yes	No
N	860	860	860	860	860
R^2	0.065	0.056	0.043	0.361	0.340
Adj. R^2	0.006	0.030	0.016	0.320	0.298

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
OLS Estimators use the SCC Standard Errors by Millo (2017)

variation in their response to price movements of their assets, which cannot be averaged without high standard errors.

7 Country-Level Variation

To examine these heterogeneous effects across countries, the regression is re-estimated separately for each country following Equation 2[5]. As mentioned above, the standard errors are heteroskedasticity and autocorrelation consistent by use of the method of Newey and West (1987).

$$\Delta \log(\omega_t^g) = \beta_0 + \beta_h \Delta \log(p_t^h) + \beta_s \Delta \log(p_t^s) + \epsilon_t \tag{2}$$

Figure Figure 5 displays the resulting country-level coefficients for housing prices for each segment of the wealth distribution. Estimates are ordered by magnitude and colored by statistical significance, with their standard errors represented by the error bars[6].

Visible in the panels is the large heterogeneity in all wealth segments. Estimates for the top decile range from -0.20 for Spain to 0.19 for the Netherlands. The majority of the coefficients with statistical significance are negative, which confirms the results from Table 2. For the middle 40%, the coefficients fall between -0.11 in the Netherlands and 0.13 in France, with a large share of countries for which the null hypothesis cannot be rejected. Results in the lower half of the wealth distribution exceed those of the other groups. The Netherlands has an estimated elasticity of -2.71, which indicates that a 1% increase in house prices decreases the share of net wealth held by that group by 2.7%. In contrast, they increase their share by 2.18% in Ireland in response to an identical increase in house prices.

[5]Full regression tables are presented in Appendix C
[6]A corresponding stock price coefficient plot is available in Appendix E.

Boelhouwer (2020) present explanations for the dutch outlier results. The social housing sector in the Netherlands is larger than in other european countries, promising affordable renting for poorer households. Additionally, new stricter mortgage lending requirements were implemented in 2011, reducing the ability of first time buyers to afford sufficient housing. This could explain the very low share of housing wealth owned by the bottom 50% documented in Figure 9 and the negative effect in response to increasing house prices.

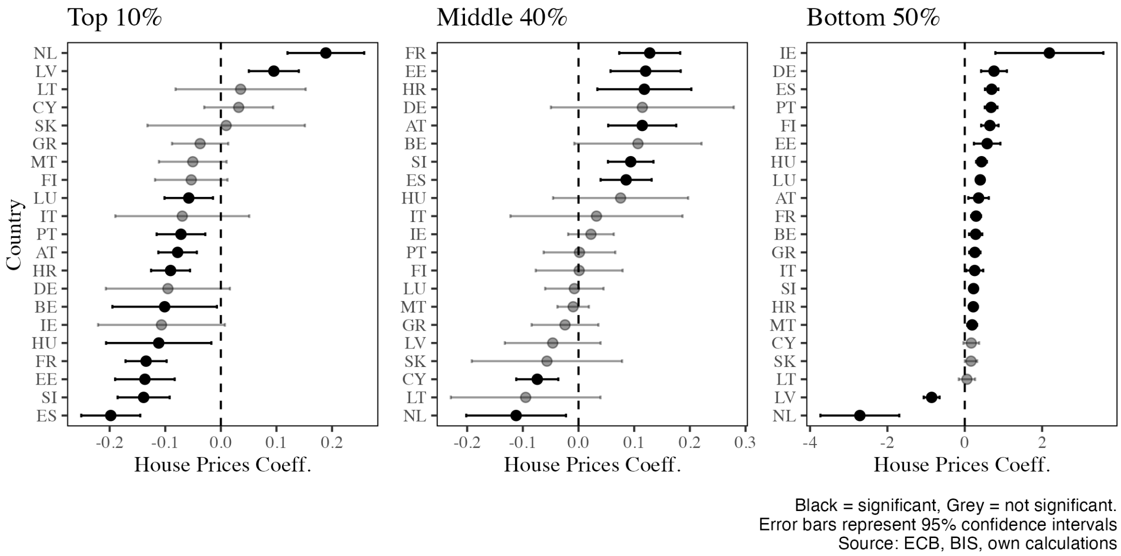


Figure 5: House Price Coefficient Plots

In general, the individual regressions support the panel model results. Accelerating stock prices profits the upper decile of the wealth distribution, at the expense of the rest of the population. House prices have a contrary effect, increasing the share of the bottom 50% and middle 40%. Statistical significance as well as R^2 varies due to heterogeneity in the responses in european countries.

To address the outlier effect of the Netherlands, the panel regressions are re-estimated excluding this country. Table Table 5 compares the results of the preferred specification using the standard mean group estimator with and without the Dutch data.

Excluding the Netherlands slightly reduces the magnitude of the coefficients for housing prices on the Top 10% and Middle 40%, but the signs and significance remain stable. For the Top 10%, the negative effect of house prices weakens from -0.057 to -0.069, while for the Middle 40%, the positive effect increases slightly and becomes more statistically significant.

The most notable change is for the bottom 50%. The coefficient on house prices increases from 0.253 to 0.395 and becomes statistically significant at the 1% level. This suggests that, once the outlier is removed, the effect of housing prices on the lower half of the distribution becomes clearer and more robust.

Stock price effects remain broadly stable across all specifications, with a significant positive effect on the Top 10% and a negative effect on the Middle 40%, consistent with prior estimates. No meaningful change is observed when the Netherlands is excluded

Table 5: Panel Regression without the Netherlands

	Top 10%		Middle 40%		Bottom 50%	
	(1)	(2)	(3)	(4)	(5)	(6)
House Prices	-0.057***	-0.069***	0.031*	0.037**	0.253	0.395***
	(0.018)	(0.015)	(0.016)	(0.016)	(0.179)	(0.115)
Stock Prices	0.014***	0.012***	-0.014***	-0.014***	-0.029	-0.008
	(0.004)	(0.004)	(0.005)	(0.005)	(0.022)	(0.007)
NL included	Yes	No	Yes	No	Yes	No
N	860	832	860	832	860	832
R^2	0.313	0.262	0.258	0.223	0.340	0.278
Adj. R^2	0.269	0.215	0.210	0.174	0.298	0.232

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

Overall, the results strengthen the interpretation that rising house prices tend to benefit the Bottom 50% and Middle 40%, while rising stock prices disproportionately benefit the Top 10%. Having established the sensitivity of wealth segments to asset prices, the next section simulates the evolution of wealth shares under different scenarios.

8 Alternative Asset Price Scenarios

To illustrate the distributional consequences of asset price dynamics, counterfactual scenarios are simulated using the estimated elasticities. Its goal is to highlight how wealth shares would have evolved if prices had followed a different path than observed.

The values are estimated using the formula in Equation 3.

$$\Delta \log(\hat{\omega}^{T10}_{EU,t}) = \hat{\beta}_0 + \hat{\beta}_h \, \Delta \log(p^h_t) + \hat{\beta}_s \, \Delta \log(p^s_t) \tag{3}$$

and the counterfactual absolute shares are calcualted using Equation 4.

$$\hat{\omega}^{T10}_{EU,t} = \hat{\omega}^{T10}_{EU,t-1} \cdot \exp\left(\Delta \log(\hat{\omega}^{T10}_{EU,t})\right) \tag{4}$$

Five scenarios are considered in the counterfactual simulations. (1) In the baseline scenario fitted values are calculated using the actual asset price paths observed in the Eurozone, with $\Delta p^h = \Delta p^h_{EU}$ and $\Delta p^s = \Delta p^s_{\text{Stoxx50}}$. (2) In the second scenario, stock prices are fixed to their initial value ($\Delta p^s = 0$), while house prices follow their observed path. (3) Conversely, the third scenario assumes stable housing prices throughout ($\Delta p^h = 0$), with stock prices equal to the actual price index. (4) In the fourth case, housing prices follow the trajectory observed in Greece ($\Delta p^h = \Delta p^h_{GR}$). Finally, (5) housing prices evolve as in Estonia ($\Delta p^h = \Delta p^h_{EE}$), representing the strongest observed housing boom in the Eurozone.

The fitted values in Figure 6 diverge slightly from actual values, particularly between 2013 and 2018, suggesting that there are factors not captured by the model. Over the full period from 2010 to 2022, the predicted as well as observed share of the top decile rises from 54.1% to 57.5%.

In a scenario with flat stock prices, the share increases, albeit at a slower rate. This indicates the important role equities play in wealth portfolios, as the top decile predominantly holds stocks. Conversely, in a scenario where house prices plateau, the middle 40% and the bottom 50% experience minimal wealth growth, resulting in a relative loss and greater wealth concentration at the top.

When housing prices follow Estonia's trajectory, which exhibited the steepest growth in the eurozone, the top decile's share is the lowest of all the scenarios. This suggests that rapid housing appreciation can benefit the rest of the population trough relatively higher asset gains. In contrast, when housing prices follow Greece's trajectory of decline since 2010, the estimated share reaches its highest level. In this case, financial assets, mainly held by the top decile, drive wealth growth, thereby reinforcing concentration.

The results also enable the calculation of the approximate ratio of house price growth to stock price growth needed to maintain a stable top decile share [7]. The estimated ratio to fulfill this condition equals 4.46. This implies that housing prices would need to grow more than four times as fast as stock prices to keep the top 10% wealth share constant.

This accounting exercise exemplifies the first order consequences of asset valuations in the wealth distribution. Rising house prices can to a certain extent compensate stock prices due to the differential distribution of gains among wealth segments. The estimated difference in top wealth shares between scenario (4) with low house price growth and (5) with high house price growth amounts to 6.8 percentage points. However, not even the highest house price growth in Estonia reaches the necessary ratio to keep the share stable.

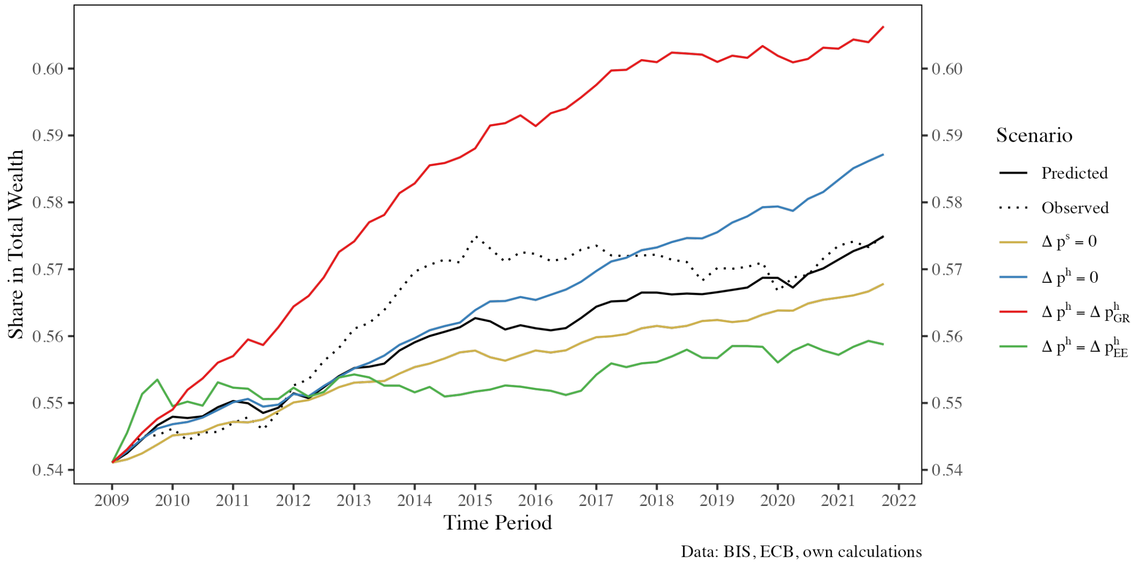


Figure 6: Counterfactual Simulations of top decile wealth shares

[7] Starting from the regression equation $\Delta \log(\omega_t^{T10}) = \beta_h \Delta \log(p_t^h) + \beta_s \Delta \log(p_t^s) + \epsilon_t$, the condition $\Delta \log(\omega_t^{T10}) = 0$ is imposed to keep the top 10% share constant. Solving for the ratio yields $\frac{\beta_h}{\beta_s} = -\frac{\log(p^s)}{\log(p^h)}$. Substituting the estimated EU coefficients results in the reported value.

9 Discussion

The empirical results provide a first indication of how asset prices correlate with changes in wealth distribution across Europe.

One theoretical concern in the regression is reverse causality: rather than asset prices driving shifts in wealth inequality, it is plausible that changes in the wealth distribution affect asset price dynamics themselves. Higher inequality leads to more disposable wealth accruing at the top, which in turn could lead to more investment in financial assets and housing, therefore raising prices in a supply-constrained environment. Goda, Stewart, and Torres García (2020) use cointegration tests to find that absolute income inequality and housing prices are positively correlated in OECD countries, suggesting that inequality itself can fuel price growth.

Given the relatively short time frame of the analysis and its focus on wealth inequality, it is unlikely that long-run structural shifts in inequality have been the main driver of housing prices. If the argument holds, countries with higher inequality at start would have seen a stronger price increase than the ones with lower inequality. Empirically, this does not seem to be the case, as presented in Figure Figure 12 in Appendix F. The relationship between initial inequality and subsequent housing price growth is weak and inconsistent across periods. In particular, countries with higher Gini coefficients in 2014 or 2019 did not systematically experience higher housing price growth over the following five years.

The literature on drivers of housing prices also emphasises the role of other exogenous factors (Duca, Muellbauer, and Murphy 2021). Especially important are financial constraints, e.g. interest rates and borrowing regulation, as well as feedback loops driving endogenous cycles. The authors also stress the diverse regional trajectories and institutions governing house prices. In sum, while housing prices clearly drive shifts in housing wealth and its distribution through the valuation channel, the evidence for a consistent reverse effect from inequality to price growth is limited in this context..

Another potential issue is the use of the Stoxx 50 as a stock price index. As an european average, it cannot capture the individual stock market conditions in european countries, therefore assuming all portfolios move in an identical manner.

On the other hand, the broadness of the index ensures that over 60% of the european market capitalization is accounted for. Additionally, the local stock markets in the European Union are highly integrated into the european market. As Kim, Moshirian, and Wu (2005) describes for 15 member states before 2004 and Savva and Aslanidis (2010) for new member states after 2004, there are significant comovements of local and european stock prices. Using local stock indices therefore would not yield significantly different results and introduce a range of new problems concerning comparability.

A key limitation of the DWA is that it does not differentiate between the valuation effect and savings effect when measuring changes in wealth. An increase in a given groups net wealth could be driven by changes to the valuation of the existing portfolios as well as increased savings of households. This is especially important if rising earnings inequality leads to more disposable income in the upper part of the wealth distribution, which is invested in assets. Rising Income Inequality would then lead to a larger share of wealth owned by the top decile independent of changes in asset valuations.

Kuhn, Schularick, and Steins (2020) document the effects for the US distribution. They find that in the four decades preceding the 2008 financial crisis, the valuation effect played a similar role to savings in the development of the wealth distribution (2020, 41). It is especially pronounced for the bottom half, where over 90% of the groups wealth growth is induced by changes in the valuation of assets, especially housing. In the period after the financial crisis, US house prices plummeted while stock prices quickly rebounded. The authors find that this led to a stark decrease in wealth owned by the bottom 90%, while the top 10% wealth grew due to the stock prices. As a result, the US saw the strongest increase in wealth concentration in post-war history, all the while income inequality remained stable.

In the Eurozone, a similar picture emerges. Wealth inequality increased over the observed period (2011-2022), while income inequality decreased slightly (EUROSTAT 2024). This suggests, that valuation effects are primarily responsible for the wealth growth, and savings play a smaller role. Furthermore, given that the temporal frame of the observation is limited to a brief period, it is more plausible to attribute the increase in net wealth to asset prices.

In addition to the short-term consequences of asset prices on inequality, it is important to consider the second-order effects. Rising house prices without corresponding income increases reduce the affordability of owning a house, especially for first time buyers. This could lead to higher wealth inequality in the long term, as lower income and wealth groups are increasingly excluded from accumulating housing assets and thus miss out on the associated wealth gains.

Empirical evidence of this phenomenon is presented by C. Bonnet, Garbinti, and Grobon (2019) for France. They find that in the last 40 years, low-income households between 25 and 44 years exhibited a decline in their homeownership rates, with the reverse for high-income households. In 1973, in the former group 34% of households owned their home, while in the latter it was 43%. This gap widened in the following decades, with 66% of the high income group owning their residence, while the percentage of the low income group more than halved with 16%. Notably, the average homeownership rate remained relatively stable during this period. The authors attribute the rise in housing inequality to increasing house prices, the subsequent growing importance of inheritances, and shifts in family structures.

Additionally, rising house prices often translate into higher rents, further eroding affordability. As Hick, Pomati, and Stephens (2024) document, housing cost burdens across Europe have become increasingly concentrated among renters in the private market. Higher rents reduce tenants ability to save and often prevent the accumulation of wealth, while rental income flows to landlords, who are disproportionately in the top wealth deciles. This dynamic also affects first-time buyers as high rents make it harder to save for mortgage deposits, delaying homeownership and deepening the divide between those with and without housing wealth.

This divergence between the "have's" and "have-not's" is described in Figure 7. The graph illustrates the growing divide between tenants and owners across EU countries using the tenant-to-owner wealth ratio. In many countries the ratio has increased sharply, indicating that owners have seen much stronger wealth growth relative to tenants. The largest ratio is measured in Croatia, where home owners own approximately 20 times as much wealth as tenants, up from 10.23 in the second quarter of 2017.

This aligns with the argument proposed by Kaas, Kocharkov, and Preugschat (2019), who employed a decomposition approach to analyze european wealth Gini coefficients, distinguishing between owner

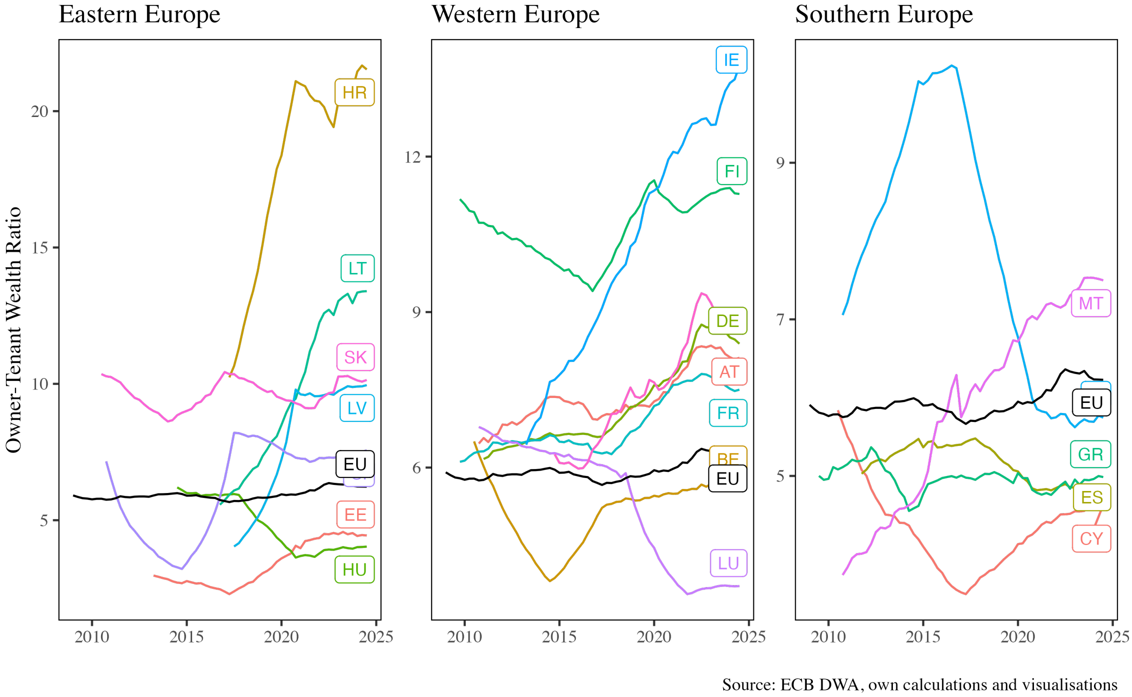


Figure 7: Owner-Tenant Wealth Ratios

and tenant groups. Their analysis revealed that the between-group component contributed significantly to the overall inequality observed (2019, 34).

Wealth share responses estimated in this thesis are also relevant in the context of monetary policy, particularly given the strong influence of monetary interventions on asset prices. Conventional policy tools, such as interest rate cuts, are known to increase equity valuations (Bernanke and Kuttner 2005). Housing markets respond similarly: contractionary shocks have been shown to lower house prices in Europe (Coën and Pourcelot 2024), although the effect is highly heterogeneous across countries (Battistini et al. 2025).

The observation period of this thesis (2011–2022) overlaps with a phase of historically low interest rates, the Eurozone sovereign debt crisis, and the ECB's shift toward unconventional monetary policy. This included large-scale purchases of corporate and government securities, boosting equity prices, which quickly rebounded (Fratzscher, Lo Duca, and Straub 2016). House prices on the other hand plateaud until 2015, before rising, albeit much slower than stock prices.

Thus decisions taken in light of the euro crisis had direct consequences on the wealth distribution in Europe. Higher stock prices, coupled with stable house prices, resulted in an increase in capital gains for the top decile, while the rest of the population did not benefit in a similar fashion. Bernoth, König, and Beckers (2016) described this theoretical consequence of the ECB purchasing programs, and more detailed empirical research on the heterogenous distributional effects is needed to incorporate it into monetary policy frameworks.

One question that arises from the individual results is why portfolios and subsequent reactions to asset price movements differ so strongly across Europe. What institutional and cultural differences explain the large variance?

Research points into the direction of home ownership as a central explanatory power. Mathä, Porpiglia, and Ziegelmeyer (2017) find that the home ownership rate in addition to house price dynamics explain more than 50% of the wealth differences in Europe, particularly in the middle part of the distribution. Similarly, Kaas, Kocharkov, and Preugschat (2019) highlight that home ownership rates are strongly negatively related to wealth inequality in the 9 largest european countries. The authors also stress that the home ownership rate itself is higly endogenous and variations have to be explained by institutional and cultural differences.

Several institutions influencing home ownership decisions are analysed in the literature (for an overview see Bourassa et al. 2015). Cho and Francis (2011) focus on preferential tax treatment in the form of mortgage interest rate deductibility and missing taxation of imputed rents. They find that it provides a financial incentive to own instead of rent in the US case and has negative distributional effects.

Kaas, Kocharkov, and Preugschat (2019) additionally highlight the role of sales tax on homes and average downpayment requirements, which differ across Europe and explain part of the variation in homeownership rates. In a companion paper (Kaas et al. 2021), the authors incorporate these factors into a structural model to explain the low german homeownership rate. Running counterfactual experiments, they show that reducing transfer taxes and implementing mortgage interest rate deductions would increase the share of homeowners, while reducing welfare, particularly for new entrants into the housing market.

Therefore, it is important to note that while a higher homeownership rate may lead to a more equitable distribution of wealth, it also introduces consequences regarding market efficiency and distribution. In addition to upper-income classes profiting more if the higher rate is achieved through preferential tax treatment, it also creates an incentive to over consume housing as an asset (Cho and Francis 2011). This creates a "lock in" effect for owners, decreasing residential mobility with adverse effects on the functioning of the labor market (Causa, Woloszko, and Leite 2019).

Beyond differences in homeownership rates, variation in household leverage is another key factor shaping how housing price changes affect wealth inequality. As noted by Causa, Woloszko, and Leite (2019), there is substantial heterogeneity in household leverage, particularly housing debt. In some countries, such as the Netherlands and Ireland, average loan-to-value ratios exceed 50%, with high leverage especially common in the lower part of the wealth distribution. This can amplify gains when house prices increase, but also exposes households to significant risks if prices fall or if interest rates rise, particularly in markets with variable-rate mortgages.

Such differences in leverage profiles could help explain part of the cross-country heterogeneity in wealth share reactions found in the regressions. While Martínez-Toledano (2022) touches on these dynamics for Spain (2022, 19), broader evidence for other European countries remains scarce. The DWA, with its coverage of housing and other forms of debt across all wealth deciles, offers a promising basis for extending this line of research.

Taken together, the discussion highlights the importance of asset prices, especially housing and equities, in shaping recent wealth dynamics across Europe. While short-term valuation effects appear to drive much of the observed inequality, their distributional consequences are mediated by national institutions, ownership structures, and policy regimes. The analysis also points to monetary policy as an indirect but powerful driver of wealth inequality, raising questions about the distributive impact of asset purchases and interest rate decisions. Given the data limitations and focus on a relatively short time frame, further research is needed to disentangle long-run structural drivers from cyclical price effects, and to assess how policy interventions can be designed to mitigate wealth concentration.

10 Conclusion

This thesis examined how wealth inequality in Europe responds to changes in asset prices. The analysis reveals clear and distinct patterns: the middle and lower parts of the distribution profit from increases in house prices, while the top decile benefits predominantly from growth in stock prices.

The results carry important implications for both housing and monetary policy. Housing market regimes determine who is able to take part in the property ladder, while monetary policy decisions shape asset valuations and, through them, the distribution of wealth. Understanding these channels is essential for assessing the wider consequences of policy interventions in both areas.

The literature on the determinants of wealth inequality identifies asset prices as a central factor, with housing playing a particularly important role. This thesis contributes to that work by using higher-frequency, macro-consistent data from the ECB's novel Distributional Wealth Accounts, allowing a closer examination of short-term changes in wealth shares. The results confirm that valuation effects are a key part of wealth dynamics.

This work yields several avenues for future research. One is to further decompose the role of savings and valuation effects, as well as how they intertwine. Additionally, the role of leverage in shaping wealth distribution has not been well-reported until now, and the DWA opens up multiple avenues for this. Further analysis is also needed to explain the heterogeneous effects of asset prices at the country-specific level.

Appendix

Appendix A: Importance of housing wealth across Europe

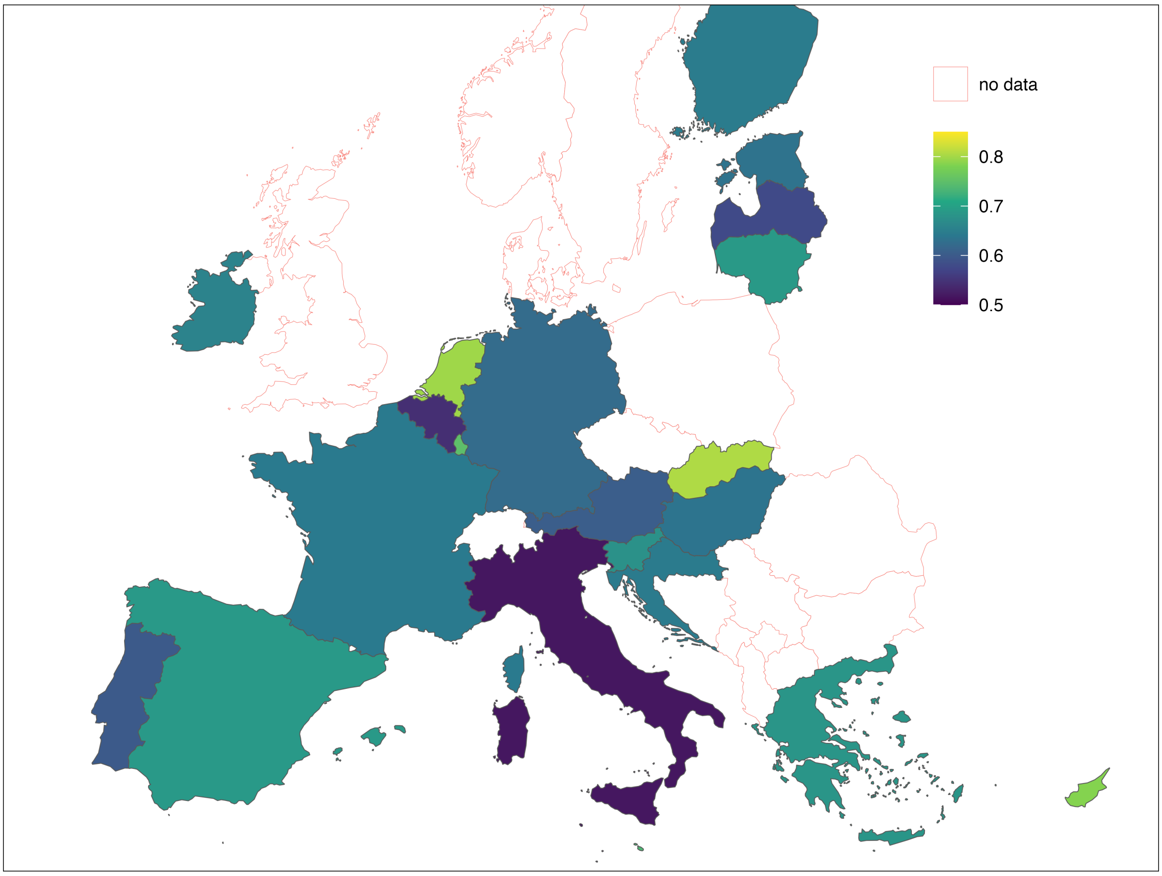


Figure 8: Housing wealth as share of total wealth

Appendix A: Descriptive Table

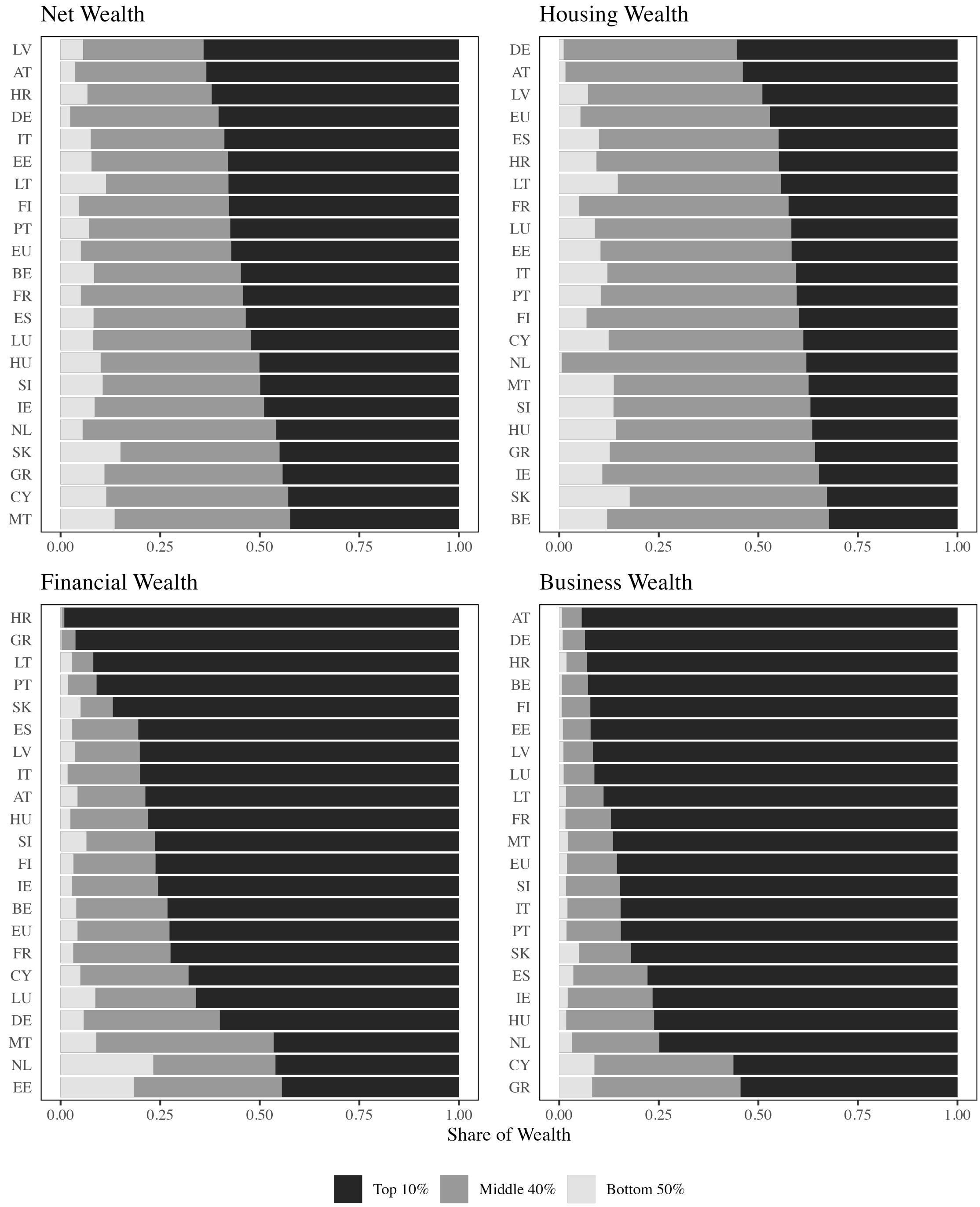
The following Table presents the full country names and the net wealth per Capita in Euro in 2022.

Table 6: Descriptive Table with ISO 2 Codes

Name		Time Period		Net Wealth (EUR p.C)	
ISO2	Full Name	Start	End	Mean	Median
AT	Austria	2010 Q4	2024 Q3	213570	148200
BE	Belgium	2010 Q3	2024 Q3	254570	288469
CY	Cyprus	2010 Q3	2024 Q3	200490	358090
DE	Germany	2011 Q1	2024 Q3	221080	118634
EE	Estonia	2013 Q2	2024 Q3	94850	92574
ES	Spain	2011 Q4	2024 Q3	175130	202247
FI	Finland	2009 Q4	2024 Q3	165160	129728
FR	France	2009 Q4	2024 Q3	198810	175016
GR	Greece	2009 Q3	2024 Q3	89890	131323
HR	Croatia	2017 Q2	2024 Q3	39023	40130
HU	Hungary	2014 Q3	2024 Q3	73370	86680
EU	Eurozone	2009 Q1	2024 Q3	182787	152275
IE	Ireland	2013 Q2	2024 Q3	251940	357059
IT	Italy	2010 Q4	2024 Q3	180390	158171
LT	Lithuania	2016 Q4	2024 Q3	75990	69192
LU	Luxembourg	2010 Q4	2024 Q3	606820	759153
LV	Latvia	2017 Q3	2024 Q3	36900	27821
MT	Malta	2010 Q4	2024 Q3	270420	414803
NL	Netherlands	2014 Q4	2023 Q4	396990	215032
PT	Portugal	2010 Q2	2024 Q3	114100	125440
SI	Slovenia	2010 Q4	2024 Q3	119880	160980
SK	Slovakia	2010 Q3	2024 Q3	56080	101871

Appendix B: Portfolio and Asset Distribution across Europe

The following figures describe Asset Distribution as well as Portfolio Composition across Europe using the latest quarter of 2021.



Source: ECB DWA, own calculations and visualisation

Figure 9: Asset Distribution among Deciles

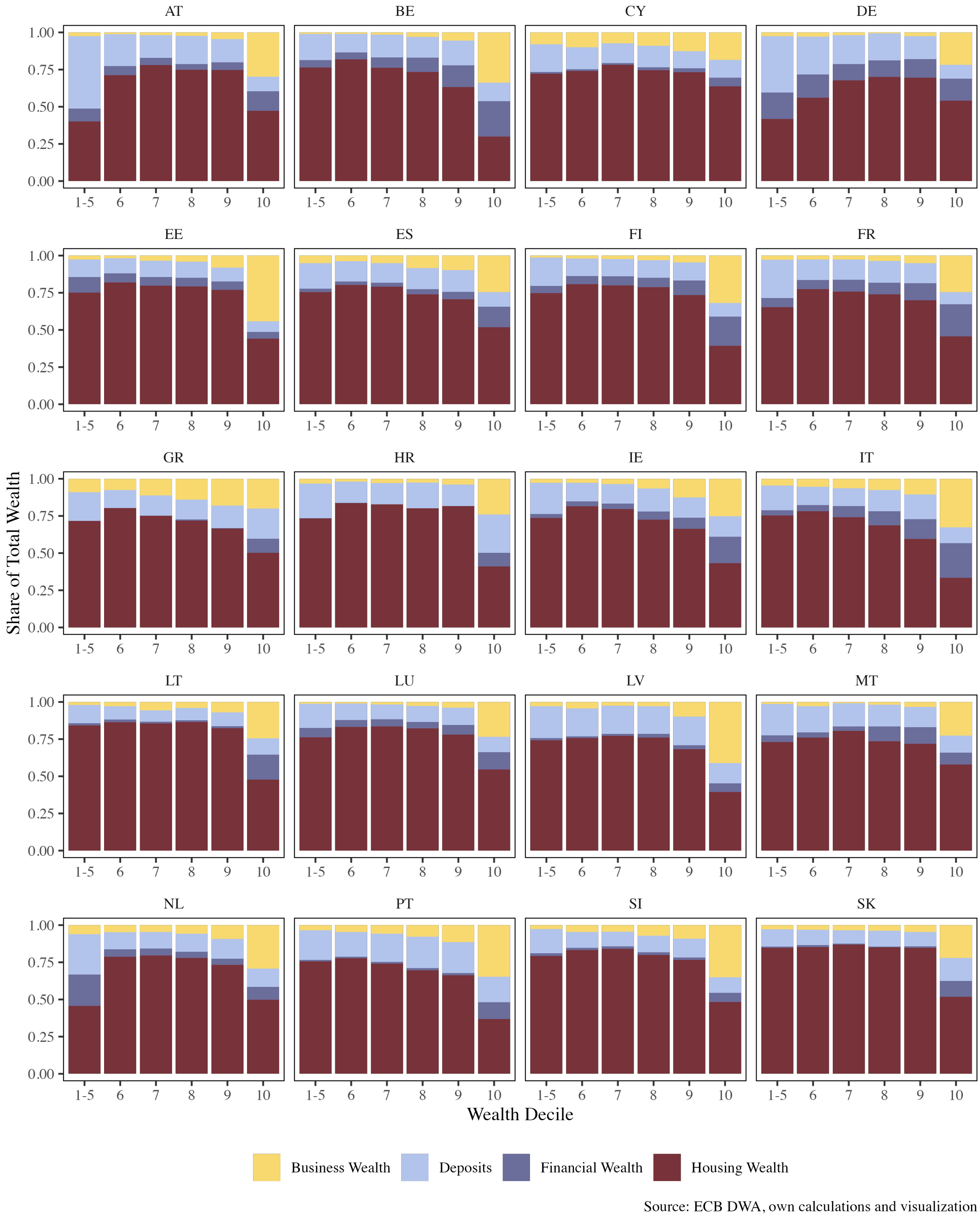


Figure 10: Portfolio Composition of Deciles

Appendix C: Individual regressions results

Table 7: Top 10%: Individual regressions

	AT	BE	CY	DE	EE	ES	FI	FR	GR	HR	HU
House Prices	-0.078***	-0.101*	0.032	-0.095	-0.137***	-0.198***	-0.053	-0.134***	-0.037	-0.090***	-0.112*
	(0.021)	(0.057)	(0.038)	(0.068)	(0.033)	(0.032)	(0.040)	(0.022)	(0.031)	(0.021)	(0.058)
Stock Prices	0.013*	0.014**	-0.005	0.012	-0.010	0.029***	0.021***	0.032***	0.034***	-0.010	0.011
	(0.007)	(0.006)	(0.012)	(0.009)	(0.018)	(0.011)	(0.006)	(0.006)	(0.009)	(0.008)	(0.023)
N	44	45	45	43	34	40	48	48	49	18	29
R^2	0.214	0.136	0.016	0.090	0.196	0.491	0.138	0.366	0.137	0.044	0.069
Adj. R^2	0.176	0.095	-0.031	0.045	0.144	0.463	0.100	0.337	0.100	-0.084	-0.002

* p < 0.1, ** p < 0.05, *** p < 0.01
Standard errors estimated following Newey and West (1987)

	IE	IT	LT	LU	LV	MT	NL	PT	SI	SK
House Prices	-0.107	-0.069	0.036	-0.058**	0.095***	-0.051	0.189***	-0.072***	-0.139***	0.010
	(0.069)	(0.073)	(0.071)	(0.027)	(0.027)	(0.037)	(0.042)	(0.027)	(0.028)	(0.086)
Stock Prices	0.027	0.050***	-0.032**	0.006	-0.013	0.019	0.046***	0.023***	0.008	0.013
	(0.023)	(0.009)	(0.014)	(0.006)	(0.013)	(0.021)	(0.007)	(0.008)	(0.010)	(0.020)
N	34	44	20	44	17	44	28	46	44	45
R^2	0.072	0.298	0.139	0.111	0.246	0.042	0.333	0.165	0.291	0.011
Adj. R^2	0.012	0.264	0.038	0.067	0.139	-0.004	0.279	0.127	0.256	-0.036

* p < 0.1, ** p < 0.05, *** p < 0.01
Standard errors estimated following Newey and West (1987)

Table 8: Middle 40%: Individual regressions

	AT	BE	CY	DE	EE	ES	FI	FR	GR	HR	HU
House Prices	0.114***	0.107	-0.074***	0.115	0.121***	0.085***	0.001	0.128***	-0.024	0.118**	0.076
	(0.037)	(0.069)	(0.023)	(0.100)	(0.038)	(0.028)	(0.047)	(0.033)	(0.036)	(0.051)	(0.074)
Stock Prices	-0.020	-0.016*	-0.001	-0.022	-0.002	-0.031***	-0.032***	-0.034***	-0.032***	0.023	-0.017
	(0.013)	(0.009)	(0.008)	(0.015)	(0.024)	(0.010)	(0.007)	(0.008)	(0.007)	(0.016)	(0.029)
N	44	45	45	43	34	40	48	48	49	18	29
R^2	0.182	0.098	0.090	0.085	0.147	0.266	0.171	0.294	0.155	0.030	0.027
Adj. R^2	0.142	0.055	0.047	0.039	0.092	0.227	0.134	0.263	0.118	-0.099	-0.048

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors estimated following Newey and West (1987)

	IE	IT	LT	LU	LV	MT	NL	PT	SI	SK
House Prices	0.022	0.032	-0.095	-0.007	-0.046	-0.010	-0.112*	0.002	0.094***	-0.057
	(0.025)	(0.094)	(0.082)	(0.032)	(0.052)	(0.017)	(0.054)	(0.039)	(0.025)	(0.082)
Stock Prices	-0.016	-0.066***	0.046**	-0.016**	0.024	-0.003	-0.021	-0.036***	-0.005	-0.013
	(0.021)	(0.012)	(0.019)	(0.007)	(0.017)	(0.011)	(0.014)	(0.012)	(0.009)	(0.018)
N	34	44	20	44	17	44	28	46	44	45
R^2	0.030	0.271	0.191	0.068	0.078	0.003	0.104	0.104	0.179	0.037
Adj. R^2	-0.033	0.235	0.096	0.022	-0.054	-0.045	0.032	0.062	0.139	-0.009

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors estimated following Newey and West (1987)

Table 9: Bottom 50%: Individual regressions

	AT	BE	CY	DE	EE	ES	FI	FR	GR	HR	HU
House Prices	0.357**	0.282***	0.169	0.756***	0.579***	0.696***	0.649***	0.293***	0.261***	0.220***	0.433***
	(0.161)	(0.104)	(0.123)	(0.203)	(0.208)	(0.105)	(0.136)	(0.078)	(0.088)	(0.070)	(0.084)
Stock Prices	-0.026	-0.035**	0.025	0.020	0.079	-0.041*	0.006	-0.051***	-0.003	-0.022	-0.013
	(0.027)	(0.016)	(0.027)	(0.046)	(0.080)	(0.022)	(0.015)	(0.018)	(0.030)	(0.024)	(0.043)
N	44	45	45	43	34	40	48	48	49	18	29
R^2	0.204	0.117	0.045	0.215	0.189	0.596	0.277	0.257	0.248	0.183	0.330
Adj. R^2	0.165	0.075	-0.000	0.176	0.137	0.574	0.244	0.224	0.216	0.074	0.278

* p < 0.1, ** p < 0.05, *** p < 0.01
Standard errors estimated following Newey and West (1987)

	IE	IT	LT	LU	LV	MT	NL	PT	SI	SK
House Prices	2.188**	0.257*	0.056	0.400***	-0.856***	0.192**	-2.713***	0.681***	0.227***	0.162
	(0.849)	(0.134)	(0.128)	(0.063)	(0.125)	(0.077)	(0.620)	(0.100)	(0.045)	(0.097)
Stock Prices	-0.003	-0.051***	0.037*	0.020	0.016	-0.043	-0.471**	-0.025	-0.021	-0.010
	(0.244)	(0.018)	(0.020)	(0.017)	(0.065)	(0.033)	(0.171)	(0.022)	(0.018)	(0.032)
N	34	44	20	44	17	44	28	46	44	45
R^2	0.137	0.234	0.078	0.176	0.675	0.197	0.255	0.541	0.412	0.057
Adj. R^2	0.081	0.197	-0.031	0.136	0.628	0.158	0.195	0.519	0.383	0.013

* p < 0.1, ** p < 0.05, *** p < 0.01
Standard errors estimated following Newey and West (1987)

Appendix D: Dynamic Panel Regression

Table 10: Dynamic Panel Regression

	(1)	(2)	(3)	(4)	(5)
House Prices	-0.057***	-0.071***	-0.070***	-0.073***	-0.070***
	(0.018)	(0.017)	(0.015)	(0.016)	(0.016)
Stock Prices	0.014***	0.016***	0.018***	0.019***	0.020***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Lag 1		0.076	0.029	0.016	0.009
		(0.078)	(0.073)	(0.076)	(0.076)
Lag 2			0.082*	0.058	0.030
			(0.046)	(0.046)	(0.059)
Lag 3				0.024	-0.003
				(0.033)	(0.040)
Lag 4					-0.055
					(0.062)
N	860	838	816	794	772
R^2	0.313	0.431	0.463	0.484	0.505
Adj. R^2	0.269	0.381	0.401	0.408	0.416

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

Table 10 reports results from dynamic panel regressions of the top 10% wealth share on changes in house and stock prices, including up to four lags of the dependent variable. The coefficients on house prices remain negative and highly significant across all specifications, indicating that rising house prices reduce the top 10% share. Stock prices consistently exhibit a positive and significant effect. Lagged dependent variables are mostly insignificant, suggesting limited persistence in quarterly changes. Model fit improves modestly with additional lags, but the main asset price effects remain stable.

Appendix E: Stock Prices Coefficient Plot

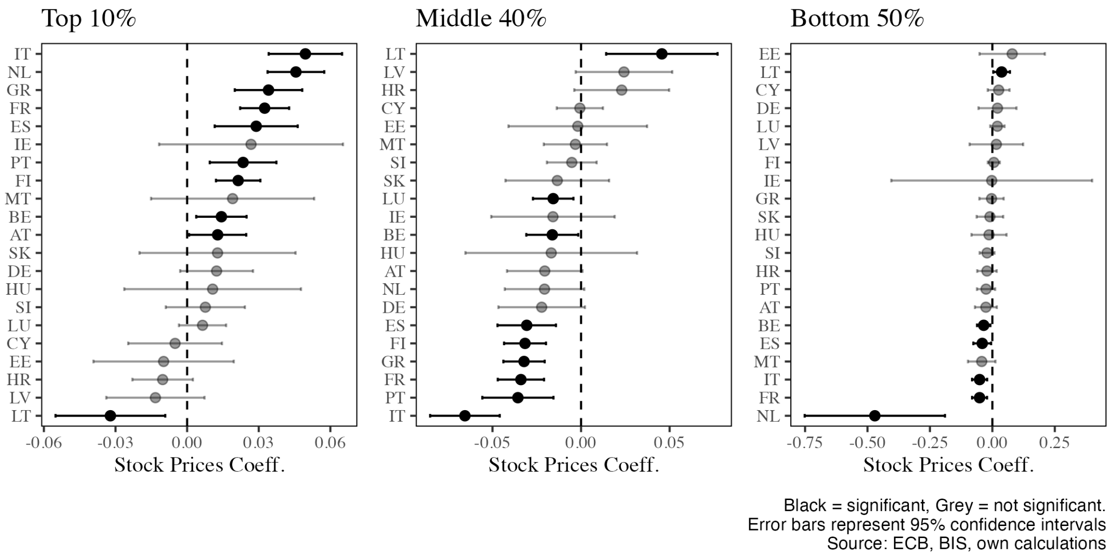


Figure 11: Stock Prices Coefficient Plot

Appendix F: Reverse Causality

Figure 12 plots the relationship between the Gini coefficient at the beginning of a five-year period and the cumulative growth in real house prices during that period. Two periods are shown: 2014–2019 (red) and 2019–2024 (blue). The year 2014 is used as the starting point because it maximizes country coverage in the ECB DWA dataset. The periods are split to account for potential structural breaks around the COVID-19 pandemic and related policy interventions. Each point represents a country, and linear fits are shown separately for each period. The absence of a clear or consistent slope in either period suggests that higher initial inequality does not robustly predict stronger house price growth.

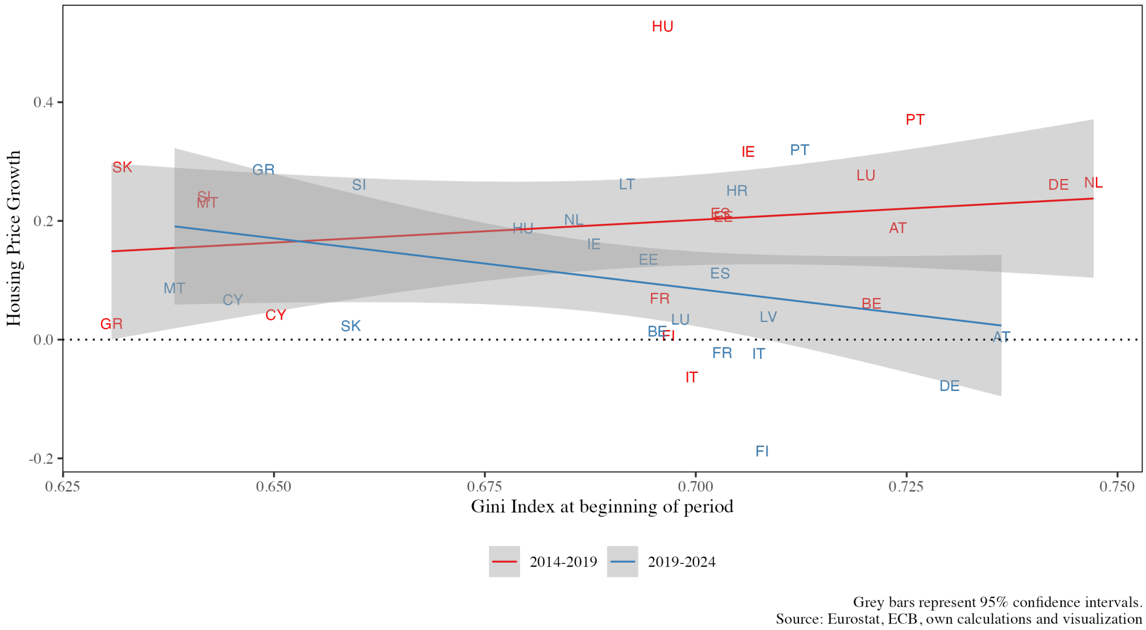


Figure 12: Inequality and Housing Price Growth

Appendix G: Data and Code

Data and code used in this thesis are available for reproduction online at https://github.com/skriptum/inequality

References

Adam, Klaus, and Panagiota Tzamourani. 2016. "Distributional Consequences of Asset Price Inflation in the Euro Area." *European Economic Review* 89 (October): 172–92. https://doi.org/10.1016/j.euroecorev.2016.07.005.

Allègre, Guillaume, and Xavier Timbeau. 2015. "Does housing wealth contribute to wealth inequality?:A reply to Bonnet et al. (2014)." *Revue de l'OFCE* 137 (1): 83–95.

Alvaredo, Facundo, Lucas Chancel, Thomas Piketty, Emmanuel Saez, and Gabriel Zucman. 2017. "Global Inequality Dynamics: New Findings from WID.world." *American Economic Review* 107 (5): 404–9. https://doi.org/10.1257/aer.p20171095.

Bach, Laurent, Laurent E. Calvet, and Paolo Sodini. 2020. "Rich Pickings? Risk, Return, and Skill in Household Wealth." *American Economic Review* 110 (9): 2703–47. https://doi.org/10.1257/aer.20170666.

Battistini, Niccolò, Matteo Falagiarda, Angelina Hackmann, and Moreno Roma. 2025. "Navigating the Housing Channel of Monetary Policy Across Euro Area Regions." *European Economic Review* 171 (January): 104897. https://doi.org/10.1016/j.euroecorev.2024.104897.

Batty, Michael, Jesse Bricker, Joseph Briggs, Sarah Friedman, Danielle Nemschoff, Eric Nielsen, Kamila Sommer, and Alice Henriques Volz. 2022. "The Distributional Financial Accounts of the United States." In *Measuring Distribution and Mobility of Income and Wealth*, 641–78. University of Chicago Press.

Bernanke, Ben S., and Kenneth N. Kuttner. 2005. "What Explains the Stock Market's Reaction to Federal Reserve Policy?" *The Journal of Finance* 60 (3): 1221–57. https://doi.org/10.1111/j.1540-6261.2005.00760.x.

Bernoth, Kerstin, Philipp König, and Benjamin Beckers. 2016. "ECB Asset Purchases May Affect Wealth Distribution." *DIW Economic Bulletin* 6 (7): 75–81.

Biewen, Martin, Stefan Glaisner, and Rolf Kleimann. 2025. "The Shape of the Wealth Distribution and Differences in Wealth Inequality Across Euro Area Countries." *The Journal of Economic Inequality* 23 (1): 1–25. https://doi.org/10.1007/s10888-024-09630-z.

Blanchet, Thomas, Lucas Chancel, and Amory Gethin. 2019. "How Unequal Is Europe? Evidence from Distributional National Accounts, 1980–2017." *WID Working Papers*, no. 2019/06 (June).

Blatnik, Nina, Alina Bobasu, Georgi Krustev, and Mika Tujula. 2024. "Introducing the Distributional Wealth Accounts for Euro Area Households." *Economic Bulletin Articles* 5.

Boelhouwer, Peter. 2020. "The Housing Market in The Netherlands as a Driver for Social Inequalities: Proposals for Reform." *International Journal of Housing Policy* 20 (3): 447–56. https://doi.org/10.1080/19491247.2019.1663056.

Bonnet, Carole, Bertrand Garbinti, and Sebastien Grobon. 2019. "Rising Inequalities in Access to Home Ownership Among Young Households in France, 1973-2013." *Banque de France Working Paper*, no. 711 (March). https://doi.org/10.2139/ssrn.3352361.

Bonnet, Odran, Pierre-Henri Bono, Guillaume Flamerie de La Chapelle, and Etienne Wasmer. 2014. "Does Housing Capital Contribute to Inequality? A Comment on Thomas Piketty's Capital in the 21st Century."

Bourassa, Steven C., Donald R. Haurin, Patric H. Hendershott, and Martin Hoesli. 2015. "Determinants of the Homeownership Rate: An International Perspective." *Journal of Housing Research* 24 (2): 193–210. https://doi.org/10.1080/10835547.2015.12092104.

Brechmann, Eike Christain, and Claudia Czado. 2013. "Risk Management with High-Dimensional

Vine Copulas: An Analysis of the Euro Stoxx 50." *Statistics & Risk Modeling* 30 (4): 307–42. https://doi.org/10.1524/strm.2013.2002.

Causa, Orsetta, Nicolas Woloszko, and David Leite. 2019. "Housing, Wealth Accumulation and Wealth Distribution: Evidence and Stylized Facts." *OECD Economics Department Working Papers*, no. 1588 (December).

Cesa-Bianchi, Ambrogio. 2013. "Housing Cycles and Macroeconomic Fluctuations: A Global Perspective." *Journal of International Money and Finance* 37 (October): 215–38. https://doi.org/10.1016/j.jimonfin.2013.06.004.

Cho, Sang-Wook (Stanley), and Johanna L. Francis. 2011. "Tax Treatment of Owner Occupied Housing and Wealth Inequality." *Journal of Macroeconomics*, SI: Macroeconomics with Frictions, 33 (1): 42–60. https://doi.org/10.1016/j.jmacro.2010.09.002.

Coakley, Jerry, Ana-María Fuertes, and Ron Smith. 2006. "Unobserved Heterogeneity in Panel Time Series Models." *Computational Statistics & Data Analysis*, Statistical signal extraction and filtering, 50 (9): 2361–80. https://doi.org/10.1016/j.csda.2004.12.015.

Cocco, João F. 2005. "Portfolio Choice in the Presence of Housing." *The Review of Financial Studies* 18 (2): 535–67. https://doi.org/10.1093/rfs/hhi006.

Coën, Alain, and Alexis Pourcelot. 2024. "Monetary Shocks and House Prices in Europe." *Journal of European Real Estate Research* 17 (3): 331–72. https://doi.org/10.1108/JERER-12-2023-0050.

Croissant, Yves, Giovanni Millo, Kevin Tappe, Ott Toomet, Christian Kleiber, Achim Zeileis, Arne Henningsen, Liviu Andronic, and Nina Schoenfelder. 2023. "Plm: Linear Models for Panel Data."

Driscoll, John C., and Aart C. Kraay. 1998. "Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data." *The Review of Economics and Statistics* 80 (4): 549–60. https://doi.org/10.1162/003465398557825.

Duca, John V., John Muellbauer, and Anthony Murphy. 2021. "What Drives House Price Cycles? International Experience and Policy Issues." *Journal of Economic Literature* 59 (3): 773–864. https://doi.org/10.1257/jel.20201325.

Engel, Janina, Pau Gayà Riera, Joseph Grilli, and Pierre Sola. 2022. "Developing Reconciled Quarterly Distributional National Wealth: Insight into Inequality and Wealth Structures." *ECB Working Paper*, no. 2687 (July). https://doi.org/10.2866/412495.

EUROSTAT. 2024. "Gini Coefficient of Equivalised Disposable Income by Age." https://doi.org/10.2908/ILC_DI12.

Fagereng, Andreas, Luigi Guiso, Davide Malacrino, and Luigi Pistaferri. 2020. "Heterogeneity and Persistence in Returns to Wealth." *Econometrica* 88 (1): 115–70. https://doi.org/10.3982/ECTA14835.

Fratzscher, Marcel, Marco Lo Duca, and Roland Straub. 2016. "ECB Unconventional Monetary Policy: Market Impact and International Spillovers." *IMF Economic Review* 64 (1): 36–74. https://doi.org/10.1057/imfer.2016.5.

Fuller, Gregory W., Johnston, and Aidan and Regan. 2020. "Housing Prices and Wealth Inequality in Western Europe." *West European Politics* 43 (2): 297–320. https://doi.org/10.1080/01402382.2018.1561054.

Goda, Thomas, Chris Stewart, and Alejandro Torres García. 2020. "Absolute Income Inequality and Rising House Prices." *Socio-Economic Review* 18 (4): 941–76. https://doi.org/10.1093/ser/mwz028.

Hick, Rod, Marco Pomati, and Mark Stephens. 2024. "Housing Affordability and Poverty in Europe:

On the Deteriorating Position of Market Renters." *Journal of Social Policy*, January, 1–24. https://doi.org/10.1017/S0047279423000703.

Hsiao, Cheng, M. Hashem Pesaran, and A. Kamil Tahmiscioglu. 1999. "Bayes Estimation of Short-Run Coefficients in Dynamic Panel Data Models." In *Analysis of Panels and Limited Dependent Variable Models*, edited by Cheng Hsiao, M. Hashem Pesaran, Kajal Lahiri, and Lung Fei Lee, 1st ed., 268–96. Cambridge University Press. https://doi.org/10.1017/CBO9780511493140.013.

Jordà, Òscar, Moritz Schularick, and Alan M. Taylor. 2016. "The Great Mortgaging: Housing Finance, Crises and Business Cycles." *Economic Policy* 31 (85): 107–52. https://doi.org/10.1093/epolic/eiv017.

Kaas, Leo, Georgi Kocharkov, and Edgar Preugschat. 2019. "Wealth Inequality and Homeownership in Europe." *Annals of Economics and Statistics*, no. 136: 27–54. https://doi.org/10.15609/annaeconstat2009.136.0027.

Kaas, Leo, Georgi Kocharkov, Edgar Preugschat, and Nawid Siassi. 2021. "Low Homeownership in Germany—a Quantitative Exploration." *Journal of the European Economic Association* 19 (1): 128–64. https://doi.org/10.1093/jeea/jvaa004.

Kim, Suk Joong, Fariborz Moshirian, and Eliza Wu. 2005. "Dynamic Stock Market Integration Driven by the European Monetary Union: An Empirical Analysis." *Journal of Banking & Finance* 29 (10): 2475–2502. https://doi.org/10.1016/j.jbankfin.2004.09.002.

Kuhn, Moritz, Moritz Schularick, and Ulrike I. Steins. 2020. "Income and Wealth Inequality in America, 1949–2016." *Journal of Political Economy* 128 (9): 3469–519. https://doi.org/10.1086/708815.

Martínez-Toledano, Clara. 2022. "House Price Cycles, Wealth Inequality and Portfolio Reshuffling," World Inequality Database WORKING PAPER,.

Mathä, Thomas Y., Alessandro Porpiglia, and Michael Ziegelmeyer. 2017. "Household Wealth in the Euro Area: The Importance of Intergenerational Transfers, Homeownership and House Price Dynamics." *Journal of Housing Economics* 35 (March): 1–12. https://doi.org/10.1016/j.jhe.2016.12.001.

Millo, Giovanni, and Yves Croissant. 2018. "Panel Time Series." In *Panel Data Econometrics with R*, 185–209. John Wiley & Sons, Ltd. https://doi.org/10.1002/9781119504641.ch8.

Neßhöfer, Christoph, and Andreas Bornefeld. 2024. "Rangliste der größten Vermögen 2024." *manager magazin*, October.

Network, Eurosystem Household Finance and Consumption. 2013. "The Eurosystem Household Finance and Consumption Survey - Results from the First Wave." Working {{Paper}} 2. ECB Statistics Paper. https://doi.org/10.2866/12862.

Newey, Whitney K., and Kenneth D. West. 1987. "Hypothesis Testing with Efficient Method of Moments Estimation." *International Economic Review* 28 (3): 777–87. https://doi.org/10.2307/2526578.

Pesaran, M. Hashem. 2015. *Time Series and Panel Data Econometrics*. Oxford University Press.

Pesaran, M. Hashem, and Ron Smith. 1995. "Estimating Long-Run Relationships from Dynamic Heterogeneous Panels." *Journal of Econometrics* 68 (1): 79–113. https://doi.org/10.1016/0304-4076(94)01644-F.

Piketty, Thomas. 2014. *Capital in the Twenty-First Century*. Harvard University Press. https://doi.org/10.4159/9780674369542.

Piketty, Thomas, and Emmanuel Saez. 2003. "Income Inequality in the United States, 1913–1998*." *The Quarterly Journal of Economics* 118 (1): 1–41. https://doi.org/10.1162/00335530360535135.

Piketty, Thomas, Emmanuel Saez, and Gabriel Zucman. 2018. "Distributional National Accounts: Methods and Estimates for the United States*." *The Quarterly Journal of Economics* 133 (2): 553–609. https://doi.org/10.1093/qje/qjx043.

Piketty, Thomas, and Gabriel Zucman. 2014. "Capital Is Back: Wealth-Income Ratios in Rich Countries 1700–2010 *." *The Quarterly Journal of Economics* 129 (3): 1255–1310. https://doi.org/10.1093/qje/qju018.

Rünstler, Gerhard, and Marente Vlekke. 2018. "Business, Housing, and Credit Cycles." *Journal of Applied Econometrics* 33 (2): 212–26. https://doi.org/10.1002/jae.2604.

Savva, Christos S., and Nektarios Aslanidis. 2010. "Stock Market Integration Between New EU Member States and the Euro-zone." *Empirical Economics* 39 (2): 337–51. https://doi.org/10.1007/s00181-009-0306-6.

Scatigna, Michela, Robert Szemere, and Kostas Tsatsaronis. 2014. "Residential Property Price Statistics Across the Globe." {{SSRN Scholarly Paper}}. Rochester, NY: Social Science Research Network.

Sierminska, Eva, and Karina Doorley. 2013. "To Own or Not to Own? Household Portfolios, Demographics and Institutions in a Cross-National Perspective." Working {{Paper}} 611. SOEPpapers on Multidisciplinary Panel Data Research.

Stephens, Mark. 2017. "Piketty, Inequality and Housing." *Housing, Theory and Society* 34 (2): 167–70. https://doi.org/10.1080/14036096.2017.1293381.

Vermeulen, Philip. 2016. "Estimating the Top Tail of the Wealth Distribution." *American Economic Review* 106 (5): 646–50. https://doi.org/10.1257/aer.p20161021.

Wolff, Edward N. 1995. *Top Heavy: A Study of the Increasing Inequality of Wealth in America*. A Twentieth Century Fund Report. Twentieth Century Fund Press.

———. 2025. "Heterogenous Rates of Return on Homes: Do The Rich Do Better?" *Review of Income and Wealth* 71 (1): e12704. https://doi.org/10.1111/roiw.12704.

Wooldridge, Jeffrey M. 2013. *Introductory Econometrics: A Modern Approach*. Cengage Learning.