# The Dynamics of Wealth Inequality: Distributional Effects of Asset Prices in Europe

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Last updated November 4, 2025

**Abstract**

How do asset prices shape the wealth distribution? Motivated by the different trajectories of European housing markets after the financial crisis, this thesis examines how capital gains, particularly in housing, influence wealth inequality in Europe. Drawing on the ECB's new Distributional Wealth Accounts, the analysis uses panel regressions that exploit cross-country variation in housing markets. The results show that asset prices have first-order consequences on the wealth distribution, driven by differences in portfolio composition across population groups. Rising house prices benefit the middle 40% and especially the bottom 50%, while a booming stock market concentrates gains in the top 10%. These effects are robust across specifications but vary substantially across countries, reflecting institutional and portfolio differences. Simulations of alternative price scenarios show that housing booms can slow concentration. However, no country saw house prices grow fast enough to reverse the upward trend in top wealth shares in Europe. Together, the results provide detailed insights into the distributional effects of asset prices in Europe, with implications for both monetary and housing policy.

*Keywords:* Wealth inequality, Housing Prices, Distributional Wealth Accounts, Portfolio heterogeneity, Asset Prices

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## 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[1]. 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 et al., 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; mortgages make up the largest share of debt in developed economies (Jordà et al., 2016); and housing cycles play a central role in macroeconomic fluctuations (Cesa-Bianchi, 2013), particularly apparent 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 vastly 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 combine detailed micro-level survey's of households balance sheets with data from national accounts, ensuring macro-consistent estimates while preserving detailed information about the distribution of assets. 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 et al. (2020), who relate 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 2009–2022, 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 demonstrate the central role asset prices play in the evolution of wealth inequality.

[1]In all Eurozone countries, housing wealth represents more than 50% of net wealth (see Figure 8 in Appendix A)

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

To further analyze the effects, counterfactual simulations explore how alternative asset price paths would have affected wealth shares in Europe. 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. However, 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 over the observed timeframe.

The rest of 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 Related Literature

The literature increasingly recognizes the importance of housing dynamics in analyzing both the macroeconomy and the distribution of wealth. On the one hand, research highlights its role in credit cycles, asset returns, and financial crises; on the other, housing is identified as a decisive factor in the long-run rise of wealth inequality.

In the wake of the financial crisis of 2008, research has focused on the role of asset price bubbles, particularly real estate, in the business cycle. Jordà et al. (2015) analyze the last 140 years to show that bubbles associated with a credit boom pose the greatest risk for macroeconomic stability. Subsequent recessions are deeper and longer than ones with low credit growth. In a related paper (Jordà et al., 2016) they focus on the role of real estate finance. Using a newly constructed dataset, they document that the share of mortgages in total debt has risen, from 30% in 1900 to 60% today. Furthermore, they emphasise the associated risks with mortgage lending booms. They are increasingly linked to recessions and have deep repercussions for the business cycle.

Other contributions take a long-run view on housing as an asset class. Knoll et al. (2017) document the evolution of housing prices since 1870 to find a "hockey stick pattern" (Knoll et al., 2017, p. 332) of fast rising prices after World War II. They show that the increase is to a large part made up by the underlying value of land, with substantial heterogeneity across countries. Jordà et al. (2019) analyse the same time frame and document that total returns on housing are historically similar to equity returns, even though the latter is associated with more risk. Additionally, they show that almost half of all capital stock in developed economies is made up of housing (Jordà et al., 2019, p. 8).

Beyond its macroeconomic role, housing is also a core driver of wealth inequality. The surge of research on long-run inequality, most prominently initiated by Piketty and Zucman (2014), has emphasized the post-war rise of wealth inequality and wealth-to-income ratios in advanced economies. A large part of this increase is attributed to housing assets, which play a decisive role in shaping modern wealth dynamics[2].

The renewed interest in inequality and its measurement inspired the development of distributional national accounts. These new datasets aim to link national accounts with survey data to generate macroeconomically consistent estimates of the wealth / income distribution. First presented for the US income distribution by Piketty et al. (2018) and wealth distribution by Batty et al. (2022), they are now available as well for european income (Blanchet et al., 2019) and wealth distributions (Blatnik et al., 2024). The latter is the main dataset used in this thesis, further explored in Section 3.

Wealth accumulation is shaped by three main drivers: labor income, savings rates, and capital gains (Saez and Zucman, 2016, p.28). Labor income and savings rates together determine how much new wealth households can build up (the savings effect), whereas capital gains capture revaluations of existing assets (the valuation effect). Inequality in any of these channels across different parts of the population translates into increased wealth inequality. For instance, higher income inequality, ceteris paribus, leads to higher wealth inequality because households at the top receive a larger flow of income, which, even under identical savings rates, allows them to accumulate wealth at a faster pace. Likewise, differential capital gains from rising asset prices can increase wealth inequality even when income and savings rates remain unchanged.

Blanchet and Martínez-Toledano (2023) research these drivers empirically, comparing the dynamics of wealth inequality in the US and Europe. The authors employ decomposition techniques to show that the higher income inequality as well as the decline in house prices after the financial crisis are responsible for the stronger increase in US wealth inequality compared to Europe. In the latter, valuation effects were more important, while in the former savings effects played a larger role in explaining inequality. This highlights that the relative role of savings and valuation channels differs across regions, and that capital gains deserve closer attention in inequality research.

A growing line of literature therefore focuses explicitly on asset prices as a central driver of wealth inequality. Kuhn et al. (2020) use the newly constructed Historical Survey of Consumer Finances ranging back to 1948 to document the reactions of the top 10% of the US wealth distribution to stock and house prices (Kuhn et al., 2020, p.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 (Kuhn et al., 2020, p.34). Additionally, they find that the valuation channel is predominantly

[2] The measurement of capital by Piketty was criticised by Bonnet et al. (2014), who find that using (imputed) rent as housing valuation, Piketty's fast rising capital-income ratios are actually stable. Allègre and Timbeau (2015) outline internal incosistencies in their subsequent response 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).

responsible for shifts in the wealth distribution, especially in the lower half of the population (Kuhn et al., 2020, p.42).

A similar avenue is followed by Adam and Tzamourani (2016). They use data from the 2013 wave of the Household Finance and Consumption Survey (HFCS) to simulate the effect of asset gains on European household portfolios by scaling portfolio positions by a 10% increase in value. The authors document an increase in wealth inequality in response to rising stock prices and a decrease in response to house price apprecations, similar to Kuhn et al. (2020). They highlight a large heterogeneity in real estate gains across Europe, particularly in the lower parts of the distribution. Additionally, they document the existence of a group of households that do not gain noticable amounts from asset prices, making up ca. 20% of the Eurozone population.

Martínez-Toledano (2020) focuses specifically on the effects of house price cycles on wealth inequality in Spain. She puts a special emphasis on the role of portfolio reshuffling in different phases of a house price cycle. In booms, the share of the top decile decreases to the benefit of the bottom 50% and especially the middle 40%, while in busts that effect reverses. The top wealth holders are faster in adjusting their portfolio towards other assets in downturns, while the rest of the population faces portfolio adjustment frictions in the form of moving costs and mortgage commitments.

While these studies establish asset prices as a key driver of wealth inequality, they are limited by either long-run survey data or a single-country focus. This thesis takes a different approach by using the ECB's official Distributional Wealth Accounts, which provide macro-consistent quarterly data for countries in the euro area. This allows for a closer empirical look at short-term valuation effects in recent years and a systematic comparison of heterogeneity across national contexts.

Households' exposure to asset prices depends on their portfolio composition, making portfolio choice an important factor in understanding distributional effects. Cocco (2005) presents a theoretical model of optimal portfolio allocation to explain the different choices along the age and income distribution. The author highlights the cost of participating in the equity market, which presents a barrier for poorer and younter households, especially after investment in housing. Additionally, risks associated with house price cycles reduces risk appetite, and in turn exposure to stock markets. This effect is especially pronounced for lower parts of the wealth distribution.

Sierminska and Doorley (2013) document these portfolio differences for age cohorts empirically across Europe and North America, highlighting the role of institutions in portfolio choices. A description of household balance sheets across socio-economic groups is provided by Causa et al. (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 (Causa et al., 2019, p.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 (Causa et al., 2019, p.30).

Another explanation for differential gains from assets along the distribution are heterogeneous rates of return on assets. Richer households have higher profits than poorer households even 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 across generations. Similar heterogenous patterns are found by Bach et al. (2020) in swedish tax data. Wolff (2025) looks specifically at rates of returns on real estate in the US, and finds that rich households earn significantly more on their investments. Counter-intuitively, the author finds that increasing rates of return on housing still decreases wealth inequality, due to the larger share of the asset in portfolios of poorer households.

The thesis relates closely to the literature examining the cross-country wealth differences in the European Union. The central role of housing is highlighted by Biewen et al. (2025), who find that homeownership is the main household characteristic that explains these differences. Similarly, Kaas et al. (2019) emphasize that homeownership is the channel to explain the differences, with home ownership rates strongly negatively related to wealth inequality in the 9 largest european countries. A large part of these differences 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 primarily responsible for the relationship between inequality and homeownership. Mathä et al. (2017) adds to this the role of diverse housing price dynamics to explain the variations in net wealth accumulated across Europe. Both factors together can explan more than 50% of the wealth differences in Europe.

A methodology similar to the one in this thesis was first used by Wolff (1995, 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 et al. (2020) use a similar regression to describe the "race between the stock market and the housing market" (Kuhn et al., 2020, p. 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 house prices and a positive one to stock prices, although with limited statistical significance due to small sample size. Fuller et al. (2020) use similar explanatory variables in a panel regression of OECD countries to explain the rising wealth-to-income ratios by Piketty and Zucman (2014). The authors find that the increase is mostly explained by rising house prices as well as to a lesser extent prices of other assets.

This thesis contributes by examining how different segments of the wealth distribution respond to changes in stock and housing prices. In addition to estimates for the euro area as a whole, it provides country-level evidence that highlights the heterogeneity of these effects. The next section introduces the dataset underpinning this analysis and outlines its key features.

## 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 (DWA) compiled by the European Central Bank (Blatnik et al., 2024). The DWA provides quarterly household balance sheets, disaggregated into major asset classes, of different deciles of the wealth distribution. It contains data for 21 countries, with coverage beginning in 2009 for the earliest countries and extending until 2025.

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. Essentially, the approach is to correct for missing top households by oversampling at the upper end of the distribution, a point further explained below.

The exact methodology to derive quarterly distributional accounts 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 (Eurosystem Household Finance and Consumption 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).

To compile quarterly time series in between the HFCS survey waves, Engel et al. (2022) use the linear interpolation developed by Kavonius and Honkkila (2016). Additionally, they extrapolate the national accounts data 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 data 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 their ISO 2-digit country codes. A table with descriptive statistics and their respective full name is provided in Table 6 in Appendix B.

Furthermore, assets are combined to simplify and ease the interpretation of results (as in Kaas et al., 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 financial wealth. Debt is composed of mortgage loans and other loans.

Additionally, the wealth estimates for Deciles 6 to 9 are combined to form the middle 40%, alongside the bottom 50% and top 10% (hereafter, the wealth groups). This follows the literature (e.g Piketty (2014), Kuhn et al. (2020)), as the middle 40% have distinct portfolio compositions and wealth levels from the other groups (see Figure 3). Their wealth is predominantly made up of housing equity, whereas business and financial assets play a much larger role in the top decile.

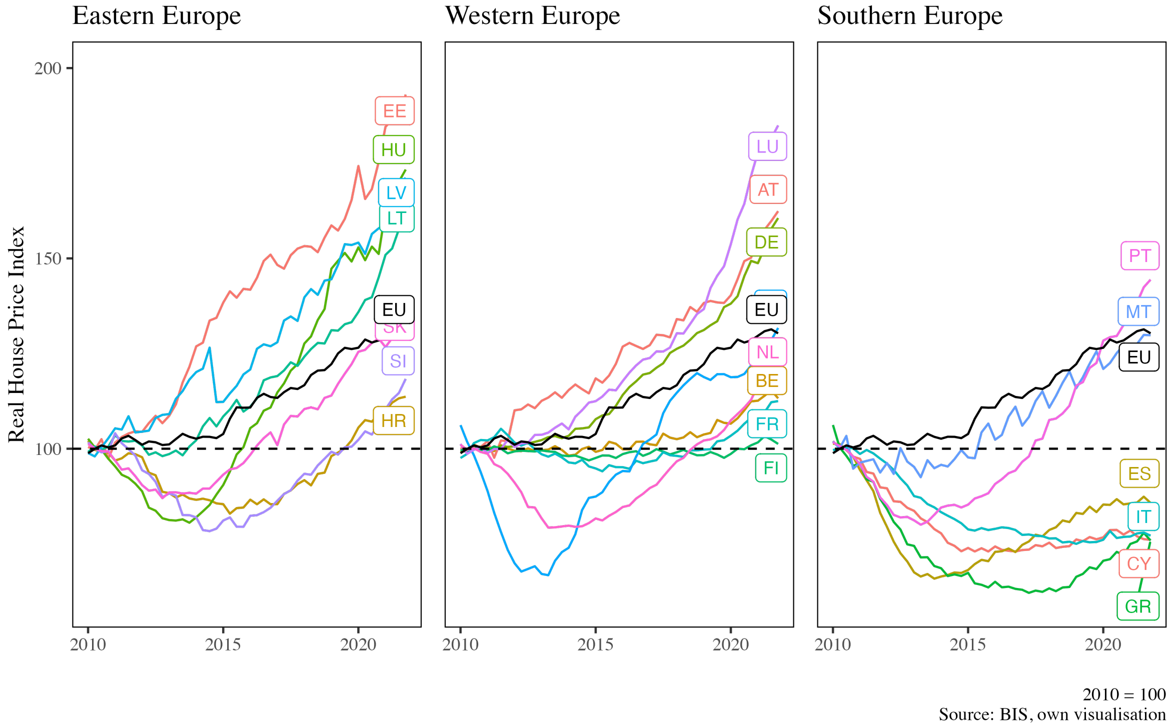



Figure 1: Residential Property Price Index

For house price data, the Residential Property Price Dataset from the Bank of International Settlement (BIS) is used (Scatigna et al., 2014). The dataset is widely employed in cross country comparisons (i.e. Rünstler and Vlekke, 2018) and includes quarterly house price indices for all countries covered in the analysis.

House prices in the eurozone plateaued until 2015 and then increased significantly, as shown in Figure 1. However, there are significant differences among the individual member states. Southern European countries such as Spain, Italy, and Greece experienced a devaluation after 2010, while many Western and Eastern European countries showed strong increases. Estonia and Luxembourg saw their price indices almost double during this period, while Greece's declined by 25 index points.

Stock prices are represented using the Euro Stoxx 50 index, which includes the 50 largest firms in the Eurozone. They stem 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 house price indices for all countries over the observed time frames and the European stock price index.

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

Wealth inequality reflects not only differences in levels but also in portfolio composition. The following descriptive evidence shows how assets are distributed across groups in the euro area, highlighting the structural differences that shape responses to price shocks.

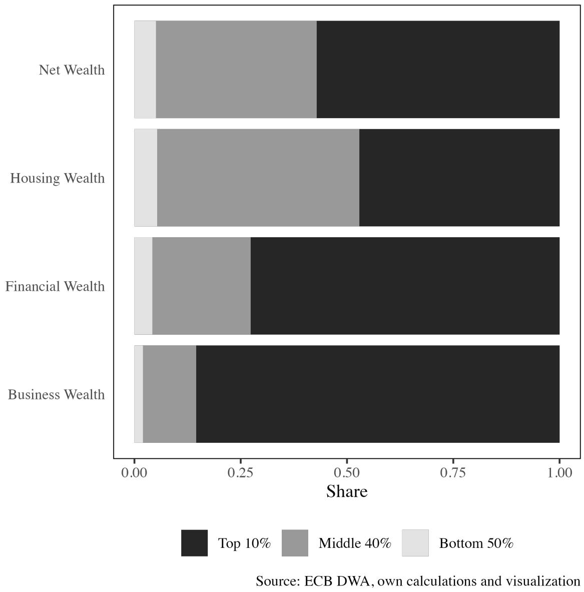



Figure 2: Asset distribution among wealth groups

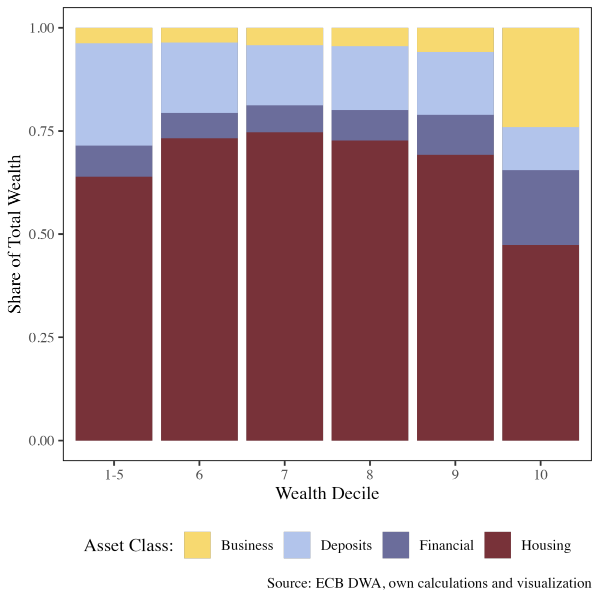



Figure 3: Portfolio Composition of Deciles

Figure 3 shows the composition of household portfolios across the wealth distribution. Housing dominates for all but the top decile, making up around two-thirds to three-quarters of total wealth. The middle 40% in particular (deciles 6–9) display very similar portfolios, heavily concentrated in housing with modest holdings in deposits and only limited exposure to financial or business assets. As wealth rises, however, other asset classes gradually gain weight: deposits and financial assets increase in the upper deciles, and business wealth becomes substantial only for the top 10%.

These aggregate patterns mask considerable heterogeneity across countries. The portfolios of the bottom 50% display the greatest variation in composition[3]. In many cases, their holdings

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

resemble those of the middle class, with housing as the main asset (e.g., Italy, Ireland, and Finland). In others, such as Germany, Austria, and the Netherlands, housing plays a far smaller role, contributing less than half of total wealth.

Figure 2 shows how different asset classes are distributed across the wealth groups in the Eurozone. Housing wealth is the most evenly distributed, with the top 10% holding 47% of the total. Net wealth as a whole is somewhat more concentrated, with 57% in the top decile. The concentration is much stronger for financial wealth and business wealth, where the top decile controls 72% and 85% respectively. This highlights that while housing provides a broader base of wealth across the population, financial and business assets are largely restricted to the very top of the distribution.

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.

These differences in portfolio size and composition suggest that changes in asset prices are likely to affect each segment of the distribution differently. 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 amounts 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:

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

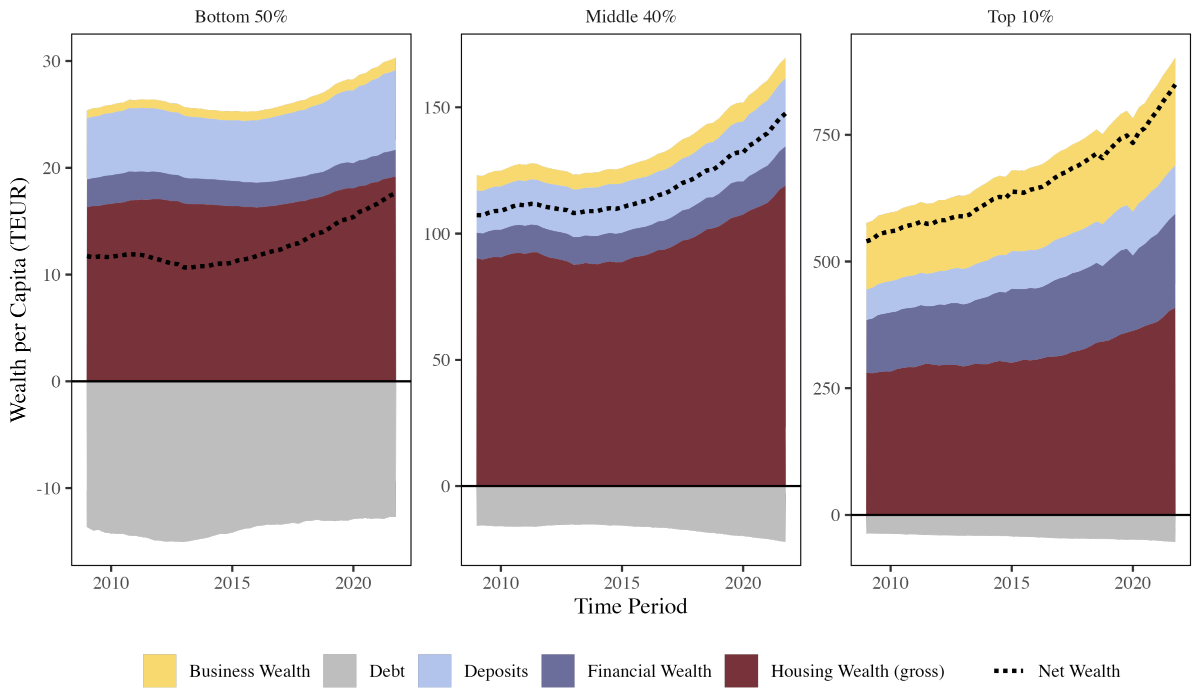



Figure 4: Differential Wealth Trends (Eurozone Average)

$$\Delta \log(\omega_{i,t}^{g}) = \beta_0 + \beta_h \Delta \log(p_{i,t}^{h}) + \beta_s \Delta \log(p_t^{s}) + \epsilon_t \tag{1}$$

The resulting coefficients can be interpreted as elasticities, capturing the percentage change in a group's wealth share associated with a one percent change in asset prices (Wooldridge, 2013, p. 44). This makes the effects directly comparable across groups and asset classes. $\Delta \log$ is the first difference of the log, as in $\Delta \log(x_t) = \log(x_t) - \log(x_{t-1})$. $\omega_{i,t}^{g}$ 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 house price index and $p^s$ the stock market index. $\epsilon_t$ is an error term.

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 quarter and each year. Quarter fixed effects are defined as categorical indicators for Q1 to Q4, while year fixed effects cover the years 2009 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). This estimator adjusts the covariance matrix to remain consistent in the presence of cross-sectional and temporal dependence.

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, $\beta_h$ and $\beta_s$ will not have the same slope in all countries and the aggregate 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, p. 190).

The MGE requires that $T \geq p$ and $N$ and $T$ are sufficiently large. Using Monte Carlo simulations, Hsiao et al. (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

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 et al., 2006). Both the standard as well as the demeaned MGE use the implementation in R by Croissant et al. (2023).

Additionally, regressions results are presented separately for each country. This enables the interpretation of country-specific responses to identical price movements and helps identify potential outliers. A challenge in real-world time series is that OLS residuals are often 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, p. 113). Lag length is selected automatically following Newey and West (1994), as implemented in R by Zeileis et al. (2020).

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 price variation since the index is identical across all countries. 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 estimates using the demeaned MGE, which again absorbs the stock price index, and Column (5) reports the standard MGE. A separate regression combining year and quarter fixed effects with the standard MGE is not reported, as its results are identical to Column (5) due to the nature of the estimator. Including lags of the dependent variable does not materially alter the estimated effects; full results with lags are provided in Table 7 in Appendix C.

The top 10% wealth share decreases in response to house price increases. Across all specifications the coefficients are negative, with estimates ranging from –0.091 in Column (1) to –0.057 in

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)

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)

Column (5). The effect is statistically significant in all but one specification, and robust to the inclusion of different fixed effects. The preferred specification is the standard MGE, as it allows for heterogeneous slopes across countries and avoids the bias of imposing a common response. The magnitude is economically meaningful: a 10% increase in house prices reduces the wealth share of the top decile by about half a percentage point, broadly consistent with evidence from Kuhn et al. (2020) for the US.

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 all segments of the wealth distribution show a low explanatory power, reflecting the heterogeneity across countries. By contrast, the Mean Group Estimator captures this heterogeneity and substantially improves the fit, explaining over 20% of the variance in the standard specification and more than 30% in the demeaned version for all groups.

Contrasting effects to those of the top decile are identified for the middle 40% (Table 3). The

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)

elasticity of their wealth share with respect to house prices is positive, ranging from 0.058 in Column (1) to 0.031 in the preferred Column (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%, albeit with a greater magnitude (Table 4). Estimates for house price elasticity range from 0.189 to 0.481. Conversely, increasing stock prices by 10% decreases the group's share by 0.28 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 variation in their response to price movements of their assets, which cannot be averaged without substantial standard errors in the MGE.

## 7 Country-Level Variation

To examine these heterogeneous effects across countries, the regression is estimated separately for each country following Equation 2. 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 5 displays the resulting country-level coefficients for house prices for each segment of the wealth distribution[5]. Estimates are ordered by magnitude and colored by statistical significance,

[5] Full regression tables are presented in Appendix E

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.

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 buying a house. 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.

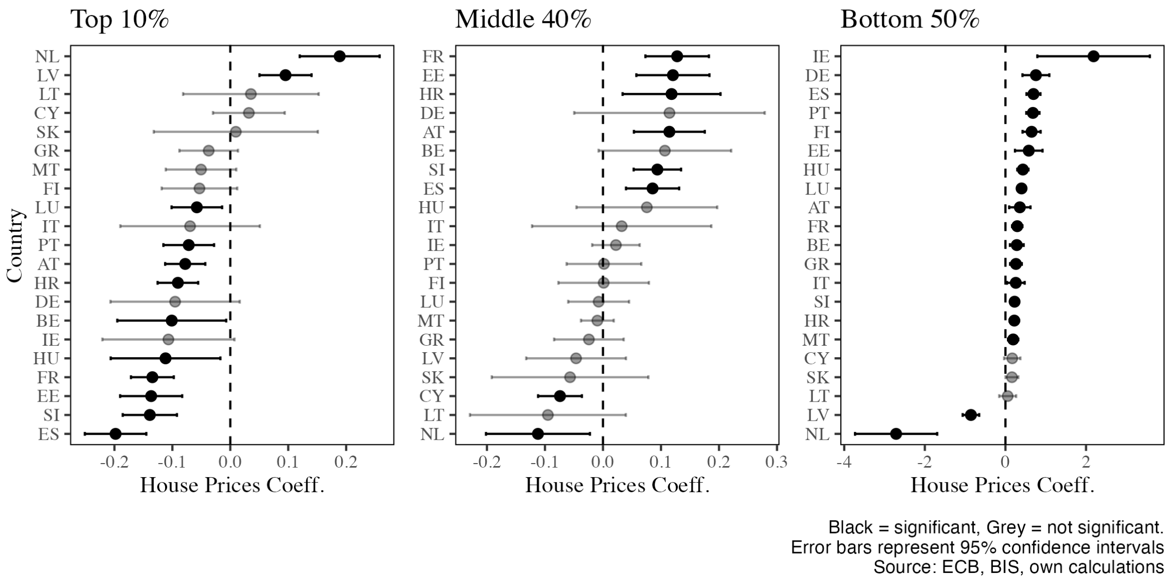



Figure 5: House Price Coefficient Plots

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 in the individual regressions.

However, the country-level estimates also reveal important deviations. In every wealth group, there are countries with statistically significant coefficients that go in the opposite direction of the mean group estimator (especially evident in the Netherlands). These opposite signs highlight the extent of cross-country heterogeneity and underline that identical house price

[6] A corresponding stock price coefficient plot is available in Appendix F.

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

shocks can redistribute wealth very differently depending on national institutions and portfolio structures.

To address the outlier effect of the Netherlands, the panel regressions are re-estimated excluding this country. 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 increases the magnitude of the coefficients for house prices in the upper half of the distribution, and the signs and significance remain stable. For the top 10%, the negative effect of house prices increases from -0.057 to -0.069, with standard errors being reduced. The house price coefficient for the middle 40% 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 house 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.

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 converted into counterfactual wealth shares 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 house prices throughout ($\Delta p^h = 0$), with stock prices equal to the actual price index. (4) In the fourth case, house prices follow the trajectory observed in Greece ( $\Delta p^h = \Delta p^h_{GR}$ ). Finally, (5) house prices evolve as in Estonia ( $\Delta p^h = \Delta p^h_{EE}$ ), representing the strongest observed housing boom in the Eurozone.

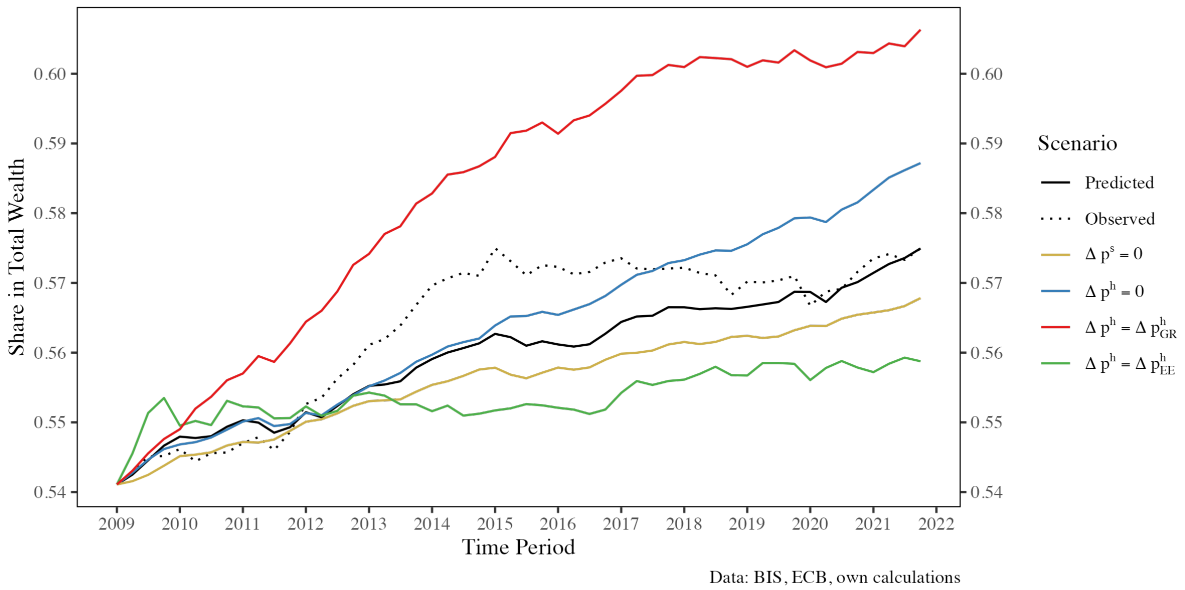



Figure 6: Counterfactual Simulations of top decile wealth shares

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 house 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 real estate appreciation can benefit the rest of the population trough relatively higher asset gains. In contrast, when 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 4.07. This implies that house 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, even the highest house price growth in Estonia does not reach the necessary ratio to keep the top decile wealth share stable.

## 9 Discussion

The empirical results provide evidence of how asset prices correlate with changes in wealth distribution across Europe. Rising house prices increase the relative wealth of the middle 40% and the bottom 50%, while stock price growth primarily benefits the top decile. This aligns with the results by Kuhn et al. (2020) for the US top decile, and the theoretical simulation by Adam and Tzamourani (2016).

A contribution of this thesis is the systematic documentation of cross-country heterogeneity. The estimates show that in some countries the effects run counter to the European average, and that identical price shocks can have very different distributional outcomes. This resonates with earlier work on homeownership and wealth differences in Europe (Mathä et al., 2017; Kaas et al., 2019; Biewen et al., 2025), but extends it by directly linking asset price shocks to changes in inequality.

The counterfactual simulations highlight the real-world consequences of these dynamics. They show that no European country experienced a ratio of housing to stock price growth high enough to prevent further concentration at the top. At 4.07, the estimated ratio to keep the top decile share is remarkably similar to the 3.65[8] implied by Kuhn et al. (2020). The implication is that only very strong housing booms or a significant downturn in stock markets could slow the rise of top 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 coefficients from Table 2 results in the reported value.

[8] Derived from the coefficients reported in Table 5 of Kuhn et al. (2020, p.38). Using the same formula as before.

### 9.1 Limitations

One theoretical concern in the regressions 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 real estate, therefore raising prices in a supply-constrained environment. Goda et al. (2020) use cointegration tests to find that absolute income inequality and house prices are positively correlated in OECD countries, suggesting that this type of inequality 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 rising house 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 12 in Appendix G. The relationship between initial inequality and subsequent house price growth is weak and inconsistent across periods. In particular, countries with higher Gini coefficients in 2014 or 2019 did not systematically experience higher house price growth over the following five years.

The literature on drivers of rising property values emphasises the role of other factors (Duca et al., 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 house prices clearly drive shifts in housing wealth and its distribution through the valuation channel, the evidence for a consistent reverse effect from wealth inequality to price growth is limited in the context of this analysis.

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 et al. (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. In this case, rising income inequality would lead to a larger share of wealth owned by the top decile, independent of changes in asset valuations.

Kuhn et al. (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 (Kuhn et al., 2020, p. 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 (2009-2022), 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 time frame of the observation is limited to a short period, it is more plausible to attribute the increase in net wealth to asset prices.

Another limitation concerns the data itself. The Distributional Wealth Accounts are an official but still experimental dataset. They rely on assumptions to correct well-known problems of undersampling and undervaluation of very rich households. This could potentially lead to an understatement of wealth concentration at the very top and bias the estimated effects of asset prices, especially with regard to financial assets predominantly held by the richest households. Nonetheless, validation exercises and robustness checks in the underlying publications (Engel et al., 2022) show that the DWA produces results consistent with independent sources. This suggests that the distributional patterns identified in this thesis are reliable, even if the very top tail remains imperfectly captured.

Ideally, more comprehensive data would be available, particularly from wealth tax registers as used in Denmark or Switzerland. Such sources would improve measurement at the top and allow more precise analysis of the top 1%, whose portfolios differ substantially from the top decile. Integrating these data would reduce concerns about underreporting and sharpen estimates of how asset prices affect the most concentrated parts of the distribution.

### 9.2 Cross-Country Heterogeneity

The individual results raise the question of why portfolios and subsequent reactions to asset price movements differ so strongly across Europe. What institutional and cultural differences explain the large variance?

As outlined in the literature review, homeownership rates are a central factor. 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 et al. (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 property 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 et al., 2019).

Beyond differences in homeownership rates, variation in household leverage is another key factor shaping how house prices affect wealth inequality. As noted by Causa et al. (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. In the Dutch case, this helps explain why the individual estimates showed an unusual negative response of the bottom 50% to rising house prices: highly leveraged households with limited ownership of housing assets gained little from appreciation, while stricter mortgage regulations after 2011 further constrained new entrants.

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 (2020) touches on these dynamics for Spain (2020, p. 19), broader evidence for other European countries remains limited. 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.

### 9.3 Implications

In addition to the short-term consequences of asset prices on inequality, it is important to consider the second-order effects. Without a corresponding increase in income, rising house prices 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 Bonnet et al. (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 ownership inequality to increasing house prices, the subsequent growing importance of inheritances, and shifts in family structures.

Additionally, rising house prices often lead to higher rents, which further erodes affordability. As Hick et al. (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 them from accumulating wealth, while rental income flows to landlords, who are disproportionately in the top wealth deciles. This dynamic especially affects first-time homebuyers, as high rents make it harder to save for down payments, delaying homeownership and deepening the divide between those who have housing wealth and those who don't.

The divergence between the "haves" and "have-nots" is illustrated in the Figure 7. The graph illustrates the tenant-to-owner wealth ratio in European countries. In many countries, the ratio has increased sharply, indicating that homeowners have experienced much stronger wealth growth relative to renters. Croatia has the largest ratio, with homeowners owning approximately 20 times as much wealth as tenants, up from 10.23 in the second quarter of 2017.

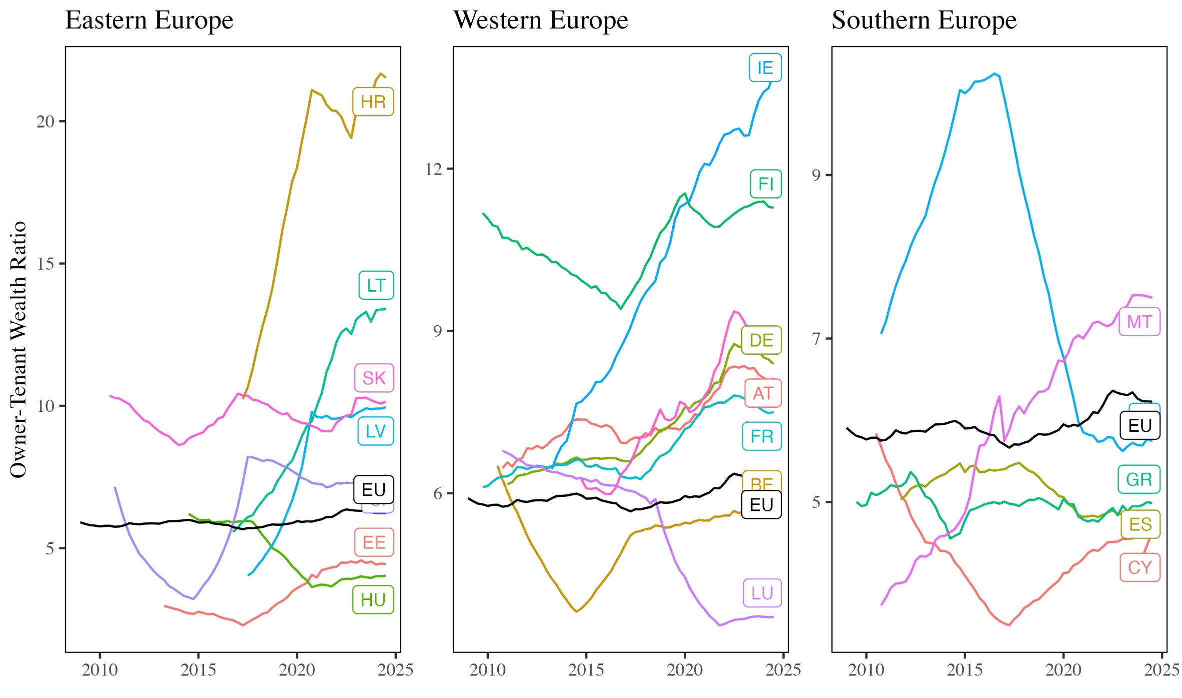



Figure 7: Owner-Tenant Wealth Ratios

This aligns with the argument proposed by Kaas et al. (2019), who employed a decomposition approach to analyze european wealth Gini coefficients.

They analyse the groups of renters and tenants and distinguish between sub-group inequality and between-group inequality. Their analysis revealed that the between-group component contributed significantly to the overall inequality observed (2019, p. 34).

The importance of asset ownership for inequality also matters in the context of monetary policy. Since monetary interventions strongly influence asset prices, their effects are transmitted differently to owners and non-owners, and across wealth groups more broadly. 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). Battistini et al. (2025) highlight the considerable heterogeneity in the housing channel, due to long-run economic and institutional circumstances.

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 (Fratzscher et al., 2016). House prices on the other hand remained stable 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 et al. (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.

Taken together, the discussion highlights the importance of asset prices in shaping recent wealth dynamics across Europe. While short-term valuation effects appear to drive much of the observed wealth 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 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 results shows 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. There is considerable heterogeneity across european countries, reflecting differences in portfolio structures and institutional settings.

The counterfactual simulations illustrate how different price paths would have reshaped the wealth distribution. They show that rising house prices can partly offset stock-driven concentration at the top, but even the strongest booms were insufficient to stop the rise of the top decile.

The contribution of this thesis lies in combining the ECB's new Distributional Wealth Accounts with panel methods to capture both short-term valuation effects and heterogeneity across European countries.

The findings carry important implications for housing and monetary policy. Housing market regimes determine who can access the property ladder, while monetary policy decisions shape asset valuations and, through them, the distribution of wealth. Recognizing these effects is essential for understanding the broader consequences of policy interventions.

Finally, the analysis points to several avenues for further research. A deeper decomposition of savings and valuation effects on the country level would clarify their relative roles in driving inequality. The influence of leverage on wealth dynamics remains underexplored and could be investigated with the DWA. More detailed country-level studies are also needed to explain the heterogeneous effects of asset prices across Europe.

# Appendix

## Appendix A: Housing Wealth across Europe

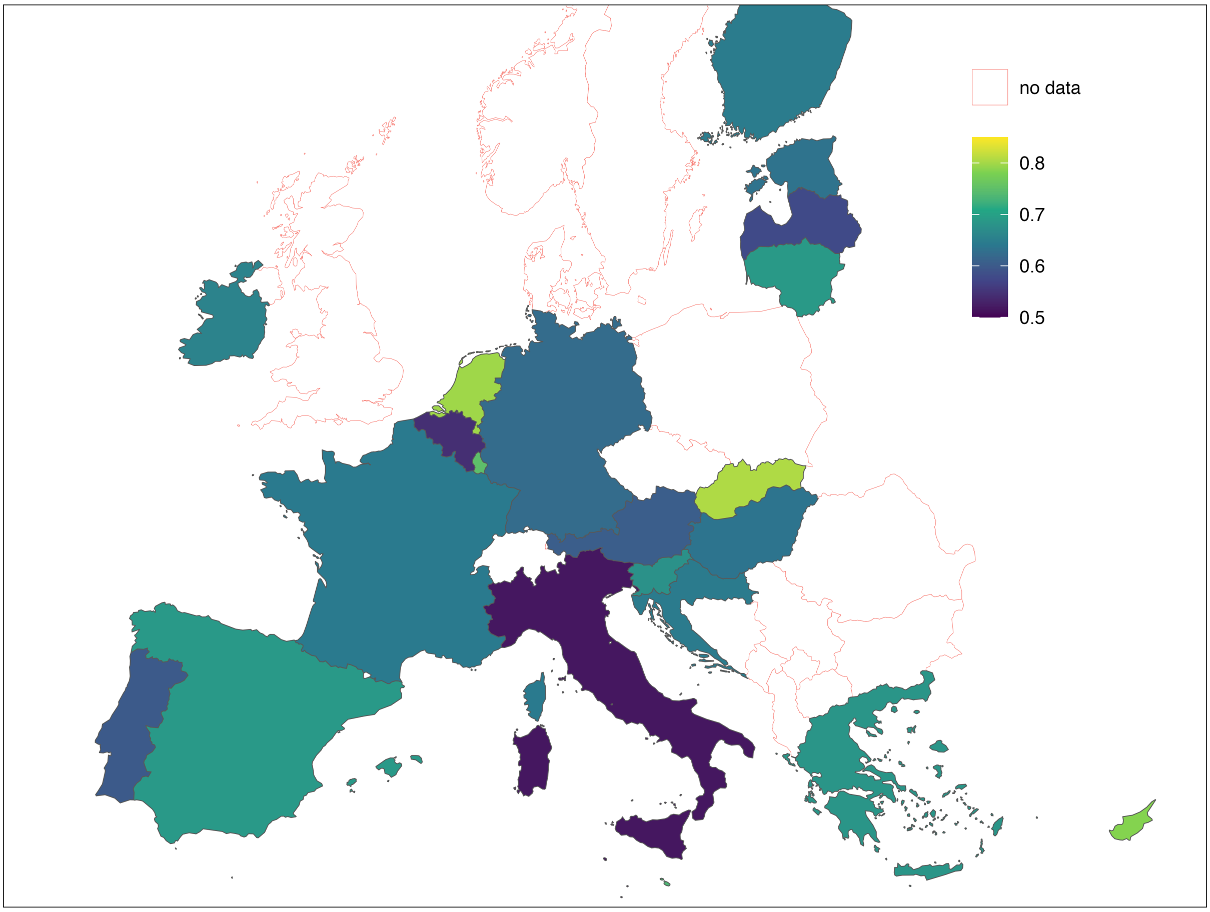



Figure 8: Housing wealth as share of total net wealth

## Appendix B: 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 C: Portfolio and Asset Distribution across Europe

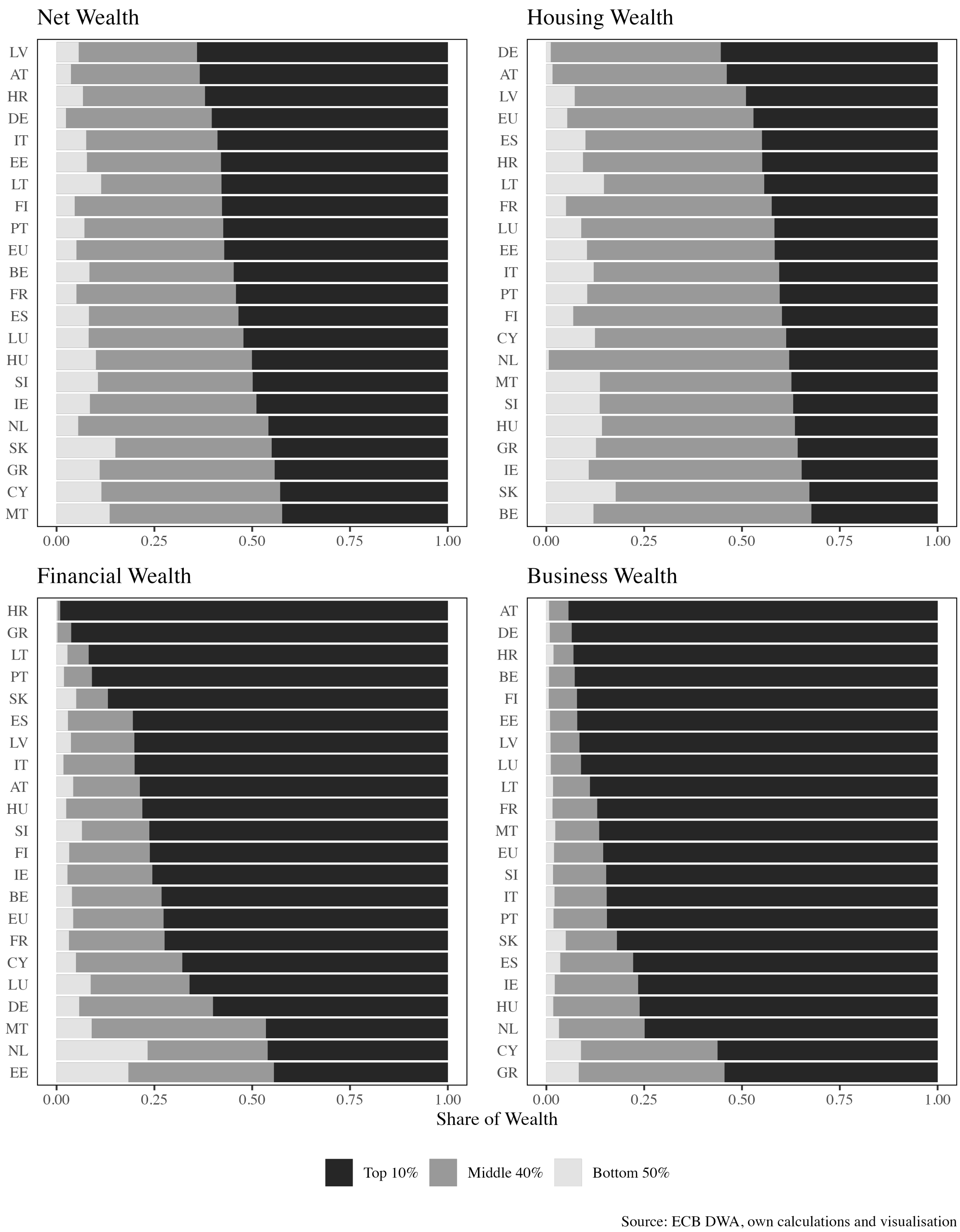
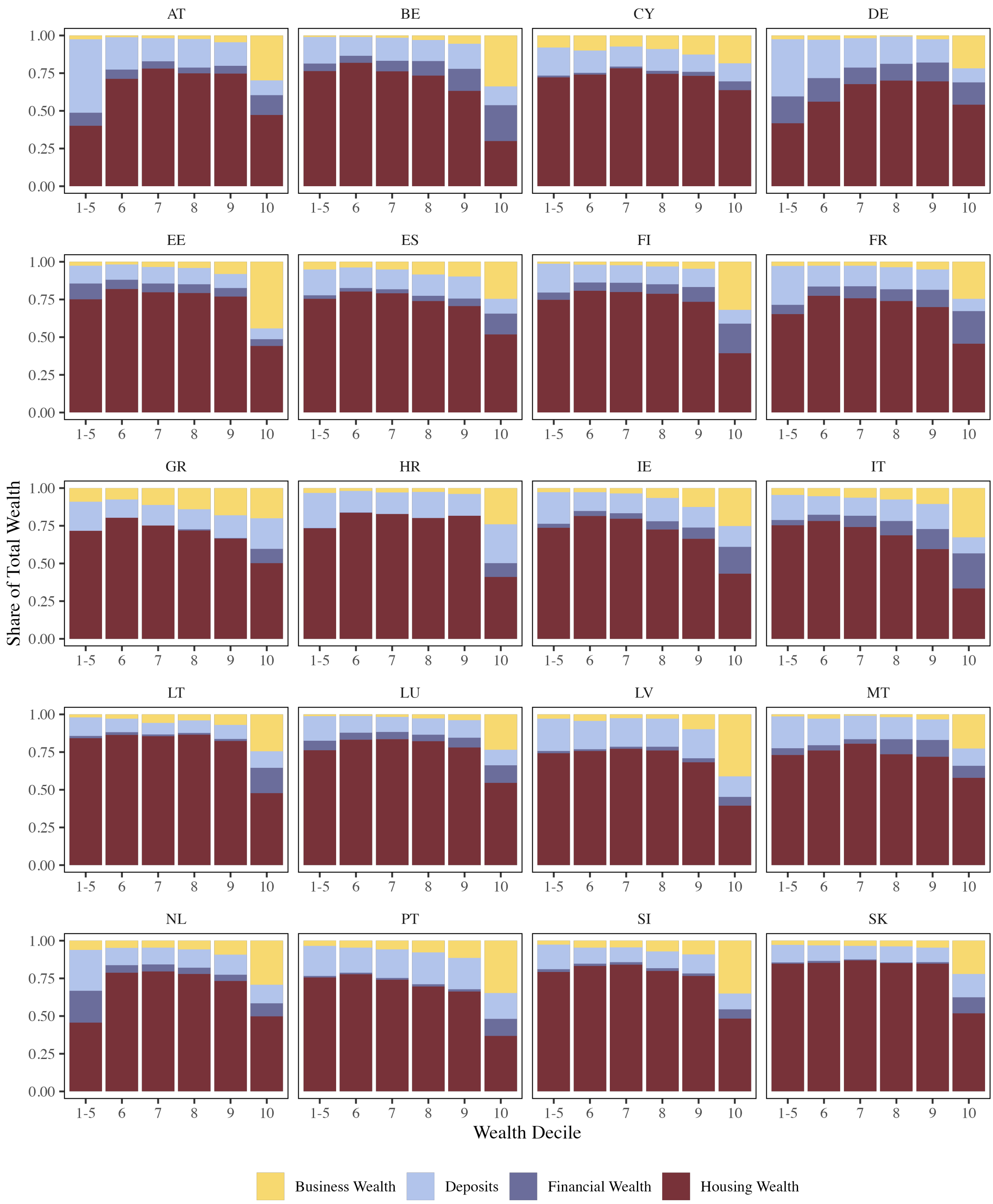



Figure 9: Asset Distribution among Deciles




Source: ECB DWA, own calculations and visualization

Figure 10: Portfolio Composition of Deciles

## Appendix D: Dynamic Panel Regression

Table 7: 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 7 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: Individual regressions results

Table 8: 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 9: 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 10: 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 F: Stock Prices Coefficient Plot

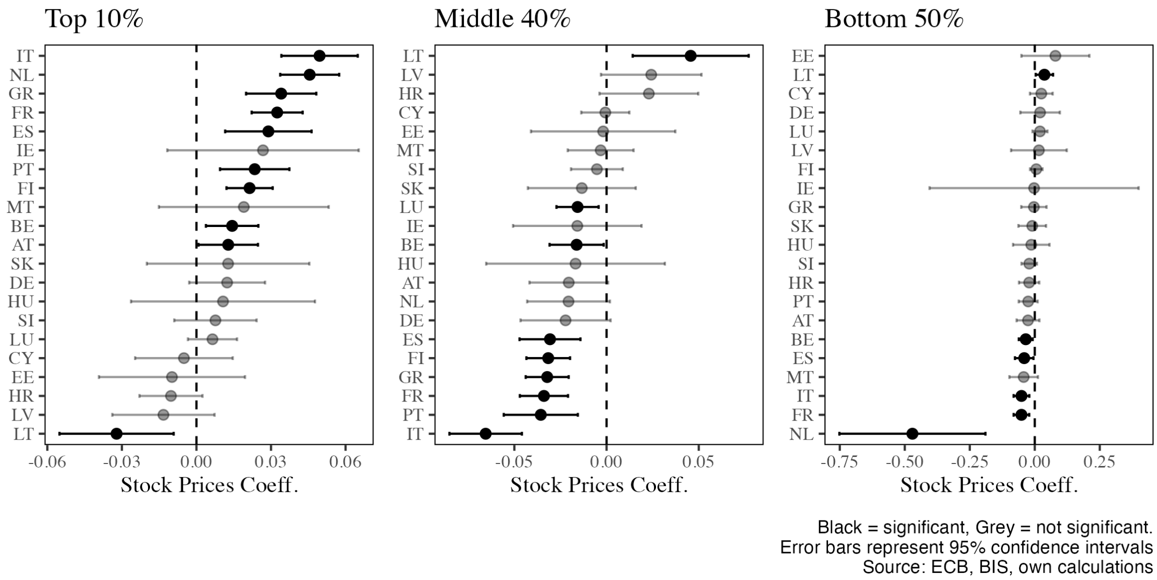


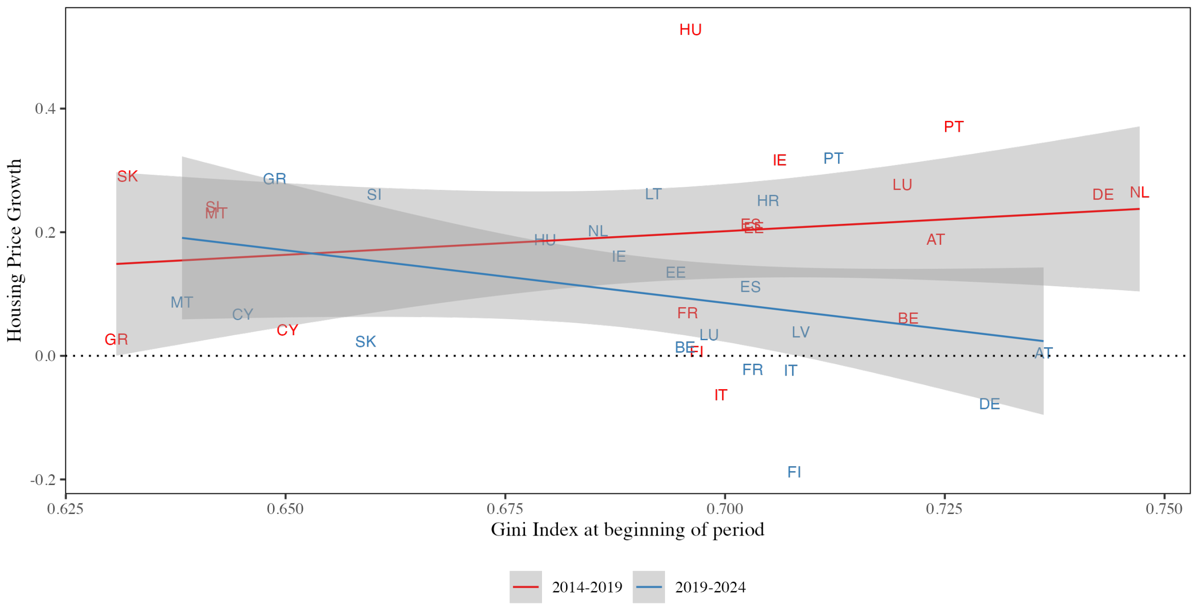

Figure 11: Stock Prices Coefficient Plot

## Appendix G: 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 suggests that higher initial inequality does not robustly predict stronger house price growth.

## Appendix H: Data and Code

The data and code used in this thesis are available online at https://doi.org/10.5281/zenodo.15856334 or as a GitHub Repository.




Grey bars represent 95% confidence intervals.
Source: Eurostat, ECB, own calculations and visualization

Figure 12: Inequality and Housing Price Growth

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