# Monetary Policy and Household Portfolio Composition*


Tiago Bernardino† — IIES, Stockholm U.
Pedro Brinca‡ — Nova SBE
Ana Melissa Ferreira§ — Nova SBE
Hans A. Holter¶ — U. Delaware
Mariana N. Pires|| — Nova SBE
Luís Teles Morais** — Nova SBE


November, 2025


**Abstract**

How does monetary policy affect household portfolio composition? Resorting to highly granular data on the balance sheets of Norwegian households, we analyze how their wealth portfolios change in response to well-identified monetary policy shocks. We document new empirical facts about how household portfolios adjust to monetary tightening: i) total portfolio size rises initially but contracts after two years; ii) risky asset values decline, while housing wealth increases briefly before falling, with secondary residences showing a pronounced short-run rise; iii) financially active households rebalance by increasing their holdings of stocks and private-equity; iv) decreases in risky asset values are concentrated among the wealthiest households; v) housing responses are highly heterogeneous, with richer households expanding primary and secondary housing; vi) holding adjustments vary across the wealth distribution: stock holdings increase slightly more at the top, while private-equity increases are concentrated in the tails.



*We thank Thomas Jansson for an excellent discussion of this paper. We also thank, for comments and suggestions, Annette Alstadsæter, Gualtiero Azzalini, João B. Duarte, Elin Halvorsen, Martin B. Holm, Òscar Jordà, Kurt Mitman, and seminar and conference participants at Nova SBE, LSE, IIES, U. Oslo, Statistics Norway, SUDSWEC 2023, the 12th National PhD Workshop in Finance at SHoF, the 2024 RES Conference, the 17th PEJ Annual Meeting, and Skatteforsk seminar for helpful comments and suggestions. T. Bernardino acknowledges financial support from the Jan Wallanders & Tom Hedelius Foundation. P. Brinca, H. Holter, A. M. Ferreira, M. N. Pires, and L. Teles Morais acknowledge the financial support of the Portuguese Science Foundation. H. Holter also acknowledges the financial support from the Research Council of Norway.



†Email: tiago.bernardino@iies.su.se
‡Email: pedro.brinca@novasbe.pt
§Email: ana.ferreira@novasbe.pt
¶Email: hansholt@udel.edu
||Email: mariana.pires@novasbe.pt
**Email: luis.teles.m@novasbe.pt

# 1 Introduction

Despite the central role of household balance sheets in the transmission of monetary policy, our understanding of how these policy shocks affect the size and composition of households' portfolios remains limited. Recent developments have highlighted the critical need to grasp the implications of shifts in monetary policy stance for households wealth portfolios, bringing this issue to the forefront of academic research and policy discussions.

A growing body of research emphasizes that heterogeneity in household balance sheets, in particular in asset composition and risk exposure, plays a role in the transmission of monetary policy (Kekre & Lenel, 2022; Melcangi & Sterk, 2024). Although recent macroeconomic models increasingly incorporate heterogeneity in marginal propensities to take risk and in stock market participation, empirical evidence remains scarce regarding how households complete portfolios respond to monetary policy shocks.

At the same time, recent inflationary episodes have raised policymakers' concerns about the distributional consequences of monetary policy.[1] These concerns have become more salient as participation of retail investors in the financial markets has expanded. For instance, in the United States, the share of families with stock holdings increased from 49% in 2013 to 58% in 2022.[2] With greater household exposure to financial markets, a deeper understanding of how monetary policy reshapes their portfolios is essential for evaluating both risk transmission and inequality.

Even with the growing interest in this topic, empirical evidence on how households adjust their portfolios in response to monetary policy shocks remains notably limited. Much of the existing literature has focused on institutional investors, whose decision-making—shaped by greater scale and sophistication—likely diverges substantially from that of households. Moreover, existing studies that use micro data often focus on specific asset classes or restricted samples, and typically do not distinguish between passive valuation effects and active rebalancing choices.

[1] As noted by de Guindos (2024), "One important factor affecting transmission of monetary policy to inflation and growth relates to the distribution of income and wealth across households. Inflation surges, along with the response of monetary policy, can have significant distributional effects. This matters for central banks because both the distribution and sources of income and wealth influence households consumption and savings decisions, and ultimately, inflation."

[2] Source: Survey of Consumer Finances.

This paper fills this gap by using well-identified monetary policy shocks and highly granular wealth administrative records from Norway covering 1993–2016, a period when multiple episodes of sizable tightening occurred. Using local projections, we document how household portfolios change in size and in their composition between risky assets, safe assets, housing and other illiquid assets, and we evaluate wether these adjustments reflect passive or active rebalacing. Additionally, leveraging population-wide data allows us to examine how these portfolio responses vary across observable household characteristics. This way, we contribute to the above debate by employing comprehensive data that spans the entire population of an economy, overcoming the constraints of surveys or datasets restricted to individual banks or brokerage firms.

We document six empirical facts about household portfolio adjustments following monetary tightening. First, portfolio size initially increases but contracts two years after the shock, consistent with gradual deleveraging. Second, portfolio composition responds unevenly: the value of risky assets declines over time, while housing wealth rises initially and then falls. Among risky assets, stock and bonds, and mutual funds follow same direction as total risky assets responses. Within housing, primary residences mirror the aggregate pattern while secondary residences exhibit a pronounced early increase. Third, households that participate in financial markets rebalance by increasing the quantities of stocks and private equity they hold. Fourth, the decline in the value of risky assets is concentrated among the wealthiest households. Fifth, housing responses also display strong heterogeneity, with richer households experiencing larger increases in the value of primary residences and expanding their investment in secondary housing. Finally, responses in terms of holdings also differ across the wealth distribution: stock-holding participation exhibits limited heterogeneity aside from slightly larger increases at the top, whereas the largest rises in private equity holdings are concentrated in the tails of the wealth distribution.

Together, these findings offer novel evidence of the interplay between monetary policy and household balance sheets. They deliver granular empirical moments that can inform heterogeneous agent macro-finance models and guide policymakers in addressing the distributional and financial-stability consequences of monetary tightening.

**Related Literature** Our paper relates to three strands of the literature in macroeconomics and in finance. The first strand comprises a growing body of research that examines the linkages between monetary policy and household wealth portfolios, with a particular focus on how policy changes influence households' risk-taking in financial markets. A closely related study, Gomes et al. (2025), leverages high-frequency data from a major Chinese brokerage to track private clients accounts and transactions, testing whether "reaching for yield" behavior documented among institutional investors is also exhibited by households. They find that households increase their risky asset share and withdrawals in response to declines in a benchmark short-term rate, thereby increasing overall risk exposure.

Similarly, Agarwal et al. (2020) find that households rebalance their portfolios toward risky assets amid declining interest rates while employing proprietary administrative data from a large Indian bank. They exploit a natural experiment based on exogenous variation in the timing of term deposit expirations: when interest rates fall, households face reduced returns precisely upon expiry, prompting behavioral responses. In contrast, studies that use US survey data, more specifically, the Panel Study of Income Dynamics (PSID) yield mixed results. Bonaparte et al. (2024) find that rising rates lead households to expand risky asset holdings as an inflation hedge, while Alzuabi et al. (2020) document the inverse: expansionary monetary policy is associated with greater allocation to high-risk assets and reduced allocation to low-risk assets, consistent with "reaching for yield" behavior. Finally, Daniel, Garlappi, and Xiao (2021) employ individual-level portfolio holdings data from a large US discount brokerage to show that a decrease in the federal funds rate prompts investors to increase holdings of high-dividend stocks and inflows into high-income-yield mutual funds, consistent with "reaching for income" behavior.

Building on these empirical insights, recent theoretical models shed light on the broader implications of household risk-taking and stock market participation for monetary policy transmission through risky capital markets. Kekre and Lenel (2022), for instance, develop a heterogeneous-agent New Keynesian framework where an expansionary shock lowers the risk premium via redistribution: agents with high marginal propensities to take on risk (MPR) borrow from those with low MPR to boost risky asset holdings, raising capital prices and amplifying real economic stimulus through general equilibrium

channels. Likewise, Melcangi and Sterk (2024) employ a quantitative New Keynesian model to illustrate how wealthier stock market participants sharply rebalance portfolios in response to interest rate hikes—shifting from equities to bonds due to substitution and income effects that curb aggregate saving and investment—, thereby reinforcing contractions and exacerbating wealth inequality.

Our study contributes to this empirical and theoretical literature in four key ways. First, we leverage highly granular administrative data on household balance sheets with the near-universe of the Norwegian population, in contrast to existing studies that rely on data from a single brokerage or representative samples. This allows us to track the complete evolution of household wealth across all accounts, providing a comprehensive view of portfolio adjustments. Second, we advance the debate by focusing on unexpected, exogenous monetary policy changes, as opposed to predictable adjustments tied to long-run trends or the business cycle. To do so, we exploit well-identified monetary policy shocks.[3] Third, our rich dataset allows us to examine heterogeneity in responses to the same monetary policy shock across observable household characteristics, such as age and wealth. This heterogeneity is crucial for understanding the distributional effects of monetary policy and for informing policymakers about whether it amplifies or mitigates inequalities. Fourth, by documenting how households actually adjust their wealth portfolios in response to interest rate changes in a real-world setting, we provide empirical evidence on the relevance of the novel risk-taking and stock market participation channels highlighted in recent macroeconomic models of monetary transmission.

A second strand of research related to our work is a broader literature that uses micro data to study how monetary policy is transmitted to households. This literature does not examine households' wealth portfolios; instead, it focuses on how policy rate changes affect other household outcomes such as consumption and income (Di Maggio et al., 2017; Coibion et al., 2017; Beraja et al., 2019; Cloyne, Ferreira, and Surico, 2020; Flodén et al., 2021; Amberg et al., 2022; Andersen et al., 2023). In a setting similar to ours, Holm, Paul, and Tischbirek (2021) use well-identified monetary policy shocks in Norway to study households' consumption responses, emphasizing the role of interest-rate exposure in the spirit of Auclert (2019). By contrast, our analysis centers on the

[3] An exception in this literature is Daniel, Garlappi, and Xiao (2021), who build on Gertler and Karadi (2015)'s identification to examine mutual fund flows, uncovering a related reaching for income channel.

implications of monetary tightening for household portfolios. We document how policy shocks reshape the composition of households asset holdings and evaluate whether these adjustments reflect active rebalancing decisions or passive valuation effects. Moreover, we examine the extent of heterogeneity in portfolio responses across households. Taken together, our paper provides a micro-level picture of how monetary tightening reshapes household balance sheets.

Finally, we contribute to a broader literature that employs administrative data to study household financial risk-taking (Calvet, Campbell, and Sodini, 2009; Calvet and Sodini, 2014; Fagereng, Gottlieb, and Guiso, 2017). This literature investigates how households engage with financial markets and how characteristics such as wealth, risk tolerance, and financial sophistication shape exposure to financial risk. Related work also investigates household behavior in financial markets more broadly, often comparing it to institutional investors and highlighting patterns such as portfolio inertia and contrarian trading (Kaniel, Saar, and Titman, 2008; Choi et al., 2009; Bilias, Georgarakos, and Haliassos, 2010; Malmendier and Nagel, 2011). Our work complements these studies by focusing on the impact of monetary policy shocks on household portfolios, providing new evidence on how households adjust their asset holdings and respond following market downturns.

**Organization** The rest of the paper proceeds as follows. Section 2 describes the data sources. Section 3 focus on the monetary policy identification and how the shocks transmit to key rates and prices. Section 4 reports the responses to monetary policy shocks. Section 5 presents the heterogeneous responses along net wealth distribution. Section 6 concludes.

## 2 Data and Definitions

### 2.1 Data Sources

Our study uses the administrative records of Norway. The main data source is the Income and Wealth Tax Records (TR), which provide annual information on income sources, asset holdings, and liabilities for all residents from 1993 to 2016. Using unique personal identifiers, we merge the TR with two additional databases that characterize

households: (i) the Central Population Register (CPR), containing demographic data (date of birth, gender, marital status, region of residence); and (ii) the Norwegian Educational Database (NED), with the highest completed degree. We also use the Shareholder Registry (SR), which reports year-end share holdings at the individual-firm level.[4] For most of the paper, we focus on the TR data, which cover the period between 1993 and 2016. The SR data only starts in 2004.

Norwegian administrative datasets offer significant advantages over those available in other countries. First, they cover the entire resident population. Moreover, neither variable is top or bottom-coded, preventing biases arising from extreme wealth concentration at the top. This feature is particularly valuable in studying very wealthy individuals. Second, since the data cover the full relevant population, they are free from attrition, apart from unavoidable cases due to mortality and emigration. Third, the dataset spans a relatively longer period compared to other administrative records.[5] Fourth, most of the data are digitally reported by third parties (employers, banks, and other financial intermediaries), reducing the risk of tax evasion and measurement errors commonly found in self-reported household wealth surveys.

Although the data are particularly well-suited for studying household portfolio dynamics, there are some drawbacks to note. First, the data are of annual frequency. Our focus is on the dynamics of wealth variables in response to unexpected monetary policy changes. However, part of this response may occur at shorter horizons, which our annual data may not fully capture. Second, some wealth variables may not accurately reflect market values, as certain assets (e.g., housing and private equity) are not traded regularly. Third, data exclude the value of private and public pensions. In Norway, over 80% of all pensions are provided through a national insurance program—a pay-as-you-go scheme—while most of the remainder comes from employer-provided plans. Only about 0.3% of total pension wealth, held as personal pension plans, is reported on tax returns. Although pension wealth is not directly observed in our data, this omission is unlikely to affect our results because the vast majority of Norwegian pension wealth consists of defined benefits from the public system. These benefits depend on accumulated pension points rather than financial market performance or monetary policy

[4] Unlike the other datasets, the SR is reported at the personal level. We aggregate to the householdyear level and drop households missing from either source or with holdings below a minimum threshold.

[5] For example, Swedish wealth data used in Calvet, Campbell, and Sodini (2009) and Vestman (2019) cover only nine years, from 1999 to 2007.

(Holm, Paul, & Tischbirek, 2021; Ozkan et al., 2023).

## 2.2 Definitions and Sample Construction

Our data contains information about the composition of each household's balance sheet, including debt. We categorize the different asset variables into four broad classes. We define the total wealth of household $i$ in year $t$ ($W_{i,t}$), as the sum of risky assets ($W^R_{i,t}$), safe assets ($W^S_{i,t}$), housing ($W^H_{i,t}$) and vehicles ($W^V_{i,t}$):

$$W_{i,t} = W^R_{i,t} + W^S_{i,t} + W^H_{i,t} + W^V_{i,t}.$$

Another relevant measure of wealth is net wealth ($W^n_{i,t}$), given by the difference between total wealth and total debt ($D_{i,t}$):

$$W^n_{i,t} = W_{i,t} - D_{i,t}.$$

The risky asset category comprises stocks and bonds of listed companies directly held by households, investments in mutual funds, and private equity.[6] Safe assets include cash and bank deposits (both in domestic and foreign accounts), money market funds, and outstanding claims and receivables. Housing includes the value of properties used as primary residence, secondary residence (cabins), and other real estate. Finally, the "vehicles" category covers cars, boats, and other vehicles. Table A.2 in Appendix A provides more detailed definitions of the variables used to construct each of these categories.

**Book vs Market Housing Value:** The stock of housing includes both primary residences and secondary homes (e.g., cabins). Housing values in tax records are based on original purchase prices, which often diverge significantly from current market values. To address this discrepancy, we apply the annual, county-specific adjustment factors computed by Fagereng, Holm, and Torstensen (2020). These factors are computed in a machine learning algorithm that gives a higher precision in comparison with other

[6] We cannot separate stocks from bonds during the entire period; this series breaks in 1998 and 2005. Nevertheless, bonds only represent 0.3% of the total assets in the periods that it is possible to disentangle both.

models, with an out-of-sample root mean squared error of 11%.[7]

**Sample Restrictions:** We consider only adult residents of Norway, ranging in age from 20 to 75 years old. We focus on this age range to ensure that the financial decision-maker is the asset holder. Income and wealth are then aggregated at the household level. Household demographic characteristics are assigned based on the household head, defined as the oldest member or, when ages are equal, the individual with the highest income.

We also impose some minor sample restrictions. First, we drop households with after-tax income below the minimum threshold of the Norwegian social security scheme.[8] Second, we keep only households with financial assets exceeding NOK 1,000 (approximately USD 90 at early 2015 exchange rates). Third, we remove the bottom 1% of the net wealth distribution. Fourth, we include only households observed for at least five consecutive tax filings to be able to observe their dynamic responses to monetary policy. These criteria result in a final sample of 2,456,175 unique households, observed on average 16 years between 1993 and 2016. Table A.1 in Appendix A details all these steps.

### 2.3 Descriptive Statistics

Table 1 presents household-level summary statistics for our data, pooling all years. Panel A reports statistics on the demographic characteristics of household heads. The sample's demographic characteristics align with what is reported in the literature using data from Norway (see e.g., Fagereng et al. 2020 and Fagereng et al. 2021b). The average age in our sample is 49 years old, and the share of males as household head is 65%, with 47% of them married. In terms of education, 47% of the sample completed high school, nearly 30% held a college degree, and 4% had an economics or business-related degree. These figures align with Norway's consistently high and progressively improving educational levels during the 1990s and 2000s. The proportion of adults attaining

[7] To compute the adjustment factors, the authors use a regression model of the price per square meter on house characteristics, using the house transaction registry that has market prices. They then compare the predicted value from this model with the value registered in the tax records and compute the adjustment factor by year, county, and type of house (primary or secondary residence).

[8] In 2015, this was NOK 90,068 (about USD 8,000). See the Norwegian Tax Authority website with the values for each year.

tertiary education increased from approximately 25% in the mid-1990s to over 35% by 2016.[9]

**Table 1:** Summary Statistics

| | Mean | Std. Dev. | P25 | Median | P75 | % > 0 |
|---|---|---|---|---|---|---|
| A. Demographics | | | | | | |
| Age | 49 | 13.91 | 38 | 48 | 60 | – |
| Male | 0.65 | 0.48 | 0 | 0 | 1 | – |
| Married | 0.47 | 0.5 | 0 | 0 | 1 | – |
| Household size | 1.69 | 0.75 | 1 | 2 | 2 | – |
| Less than high school | 0.24 | 0.43 | 0 | 0 | 0 | – |
| High school | 0.47 | 0.50 | 0 | 0 | 1 | – |
| College degree | 0.29 | 0.45 | 0 | 0 | 1 | – |
| Econ/Business education | 0.04 | 0.18 | 0 | 0 | 1 | – |
| B. Wealth | | | | | | |
| 1. Total assets (=2+3+4+5) | 3 301 362 | 9 920 377 | 313 095 | 1 806 135 | 3 818 372 | 100 |
| 2. Risky assets | 282 561 | 6 990 714 | 0 | 0 | 35 749 | 44.37 |
| a. Stocks and bonds | 42 010 | 1 808 263 | 0 | 0 | 0 | 18.88 |
| b. Mutual funds | 34 017 | 280 360 | 0 | 0 | 4 893 | 29.45 |
| c. Private equity | 206 534 | 6 444 710 | 0 | 0 | 0 | 11.36 |
| 3. Safe assets | 365 167 | 1 490 757 | 292 293 | 109 871 | 345 841 | 99.94 |
| a. Deposits | 311 066 | 988 133 | 27 141 | 99 833 | 311 861 | 99.89 |
| b. MMFs | 8 644 | 206 349 | 0 | 0 | 0 | 6.48 |
| c. Out. claims and receiv. | 45 457 | 898 501 | 0 | 0 | 0 | 9.60 |
| 4. Housing | 2 571 031 | 4 894 357 | 33 486 | 1 418 563 | 3 179 049 | 77.15 |
| a. Primary | 1 797 110 | 2 923 946 | 0 | 1 072 622 | 2 583 622 | 69.77 |
| b. Secondary | 727 285 | 3 272 675 | 0 | 0 | 0 | 18.37 |
| 5. Vehicles | 82 603 | 1 092 506 | 0 | 25 516 | 87 774 | 61.76 |
| 6. Total debt | 934 718 | 1 646 146 | 88 735 | 546 066 | 1 330 346 | 86.48 |
| 7. Net wealth (=1-6) | 2 366 643 | 9 397 460 | 501 | 969 728 | 2 787 779 | 75.04 |

**Notes**: The table reports summary statistics (mean, standard deviation, 25th percentile, median, 75th percentile, and participation shares) for demographic characteristics of households in our data (Panel A), and wealth amounts (Panel B), pooling data for 1993–2016. The sample has, on average, 1,589,542 households per year. The values are denominated in NOK. The demographic information refers to the individual identified as the household head.

Panel B of the same Table shows statistics describing the wealth composition of households in the Norwegian local currency, NOK.[10] The average gross wealth of a household is around NOK 3.3 million. Most of this wealth takes the form of housing (77%). Risky assets represent 8.6% of the total wealth, while safe assets represent 11.1% of the total wealth. The average total debt is slightly below NOK 1 M, such that average net wealth is around NOK 2.4 M, with a debt-to-assets ratio of around 30%.

[9]Source: Statistics Norway. Refer to Appendix A.1 for further details on education attainment and financial literacy in Norway.

[10]Between 1993 and 2016, the average exchange rate was NOK 1 = USD 6.91

75% of households in the sample report positive net wealth, indicating that a substantial portion maintain high debt levels relative to their assets. Norway exhibits notably elevated household debt, with a debt-to-income ratio of around 218% in 2016.[11] This trend is primarily attributable to high homeownership rates, bolstered by tax incentives and a limited, unregulated rental market that promotes mortgage borrowing. Indeed, 70% of sampled households are homeowners, while an additional 7% hold housing assets without owning their primary residence.[12] 44% of the sample owns risky assets, mostly through mutual fund holdings, with less than half (19% of the total) directly participating in the stock market by owning stocks or bonds.

Figure 1 shows the composition of gross wealth along the net wealth distribution.[13] Each color (blue, green, orange, and yellow) represents the share of the four asset classes considered. We then show the asset decomposition within each class using shades of that color. We plot the average composition within population bins for each percentile group of the distribution of net wealth. The black line represents the ratio of debt to gross wealth. This line is only depicted for agents with a positive value of net wealth (in the 25th percentile of net wealth). Three patterns emerge in this figure.

First, wealthier households allocate a larger proportion of their portfolios to risky assets compared to less wealthy households. Up to the 80th percentile of the net wealth distribution, the share of risky assets remains below 10%. Beyond this point, the share increases, with the wealthiest households allocating more than 20% of their wealth to risky assets. The proportions of stocks and bonds in portfolios remain relatively stable across the wealth distribution, whereas the share of private equity increases alongside net wealth

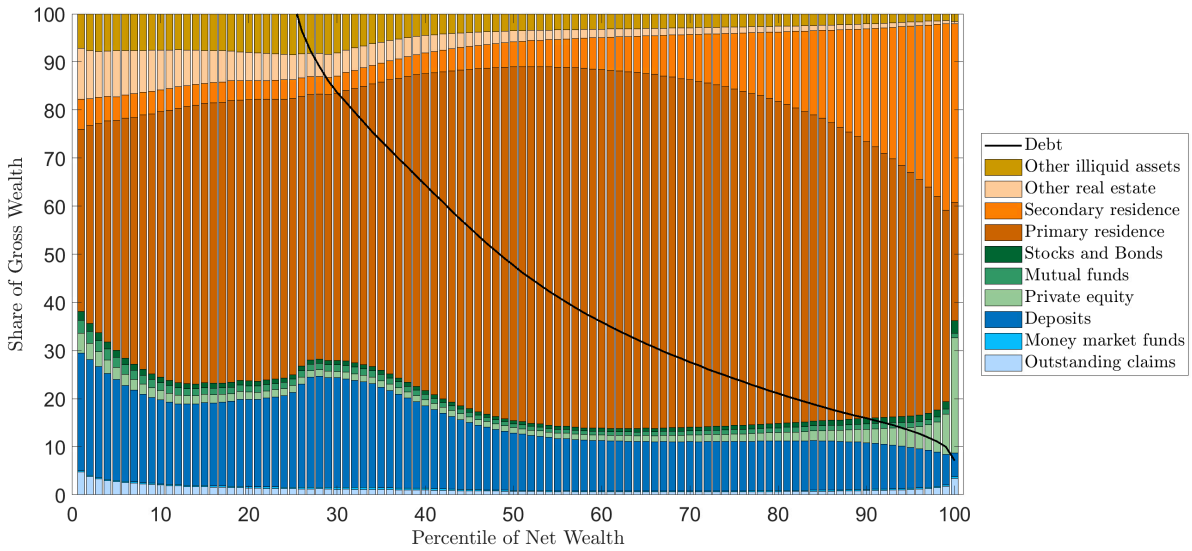
Second, the share of safe assets in the household's portfolios falls along the net wealth distribution. Low net wealth households have between 20 to 30% of their gross wealth in safe assets, whereas richer households have a smaller percentage. For all households, deposits (including savings accounts) are the main asset of this class of assets.

[11] Source: Statistics Norway.

[12] More details about household debt in Norway in Appendix A.1.

[13] The figure could differ from other papers using Norwegian household wealth data (e.g., Fagereng et al. 2021b) because of how we aggregate the data — we first aggregate the total value of assets for each percentile of the net wealth and then compute the shares of each asset. In Appendix B, we show the same distribution, where we first calculate the asset shares for all households and then the average for each percentile.

**Figure 1:** Household Wealth Portfolios Composition




**Notes**: Composition of household gross wealth along the net wealth distribution. Data are for 1993-2016.

Third, housing becomes increasingly important as we move along the distribution, stabilizing around 80% for households above the median of the net wealth distribution, and declining only at the top percentile, where it represents about 60%. Primary residence is, for all households, the component with the highest share in the portfolios, having its peak around the median of the distribution of about 70% of the gross wealth. Secondary residence (Summer cabins) gains relative importance along the net wealth distribution, whereas the other real estate (mostly forest and farms) loses relative importance over the net wealth distribution.

In Figure B.2 in the Appendix, we also plot the average composition of gross wealth by age. Younger households have around 20% of their wealth in safe assets. This share rapidly decreases, but at age 50 starts to increase again. On the other hand, risky assets follow the symmetric pattern with households around 40-50 years old being the ones with the largest share invested in risky assets, around 10%. The share invested in housing follows an inverted U-shaped pattern along the life cycle, peaking at around 40 years old.

# 3 Monetary Policy Identification and Transmission

## 3.1 Monetary Policy Identification

Monetary policy in Norway is conducted by the *Norges Bank*, following a price stability mandate and an inflation target of 2%. We are interested in the causal effects of changes to monetary policy on the portfolios of Norwegian households. We focus on conventional monetary policy, i.e., changes to the policy rate.

However, monetary policy changes are endogenous to the economic environment, as it responds to changes in variables driving inflation.[14] We proceed, therefore, by obtaining exogenous variations of the monetary policy stance. We use the residuals of the estimation of a Taylor rule, following Romer and Romer (2004) that are estimated by Holm, Paul, and Tischbirek (2021). The authors regress, at the meeting level, the change in the policy rate on the Central Bank's GDP and CPI forecasts, the revisions to these forecasts, and a binary variable capturing the adoption of an inflation targeting regime after March 2001. This series of shocks allows us to isolate the shifts of monetary policy that are orthogonal to expected policy responses given the observed behavior of the economy.

To align our analysis of monetary policy shocks with the annual frequency of our administrative records, we take the shocks that are estimated at the policy meeting frequency and aggregate them on an annual basis. This approach could lead to an aggregation bias, as summing shocks within the same year can hide short-term dynamics. However, as discussed in Holm, Paul, and Tischbirek (2021), estimating impulse responses using annual data can still yield accurate and informative results.[15] Moreover, the advantages of our data set—particularly its minimal attrition and entire population coverage—more than compensate for the limitation of annual frequency. The rich cross-sectional dimension of the data allows us to uncover valuable insights into household portfolio composition and how monetary policy shapes it.

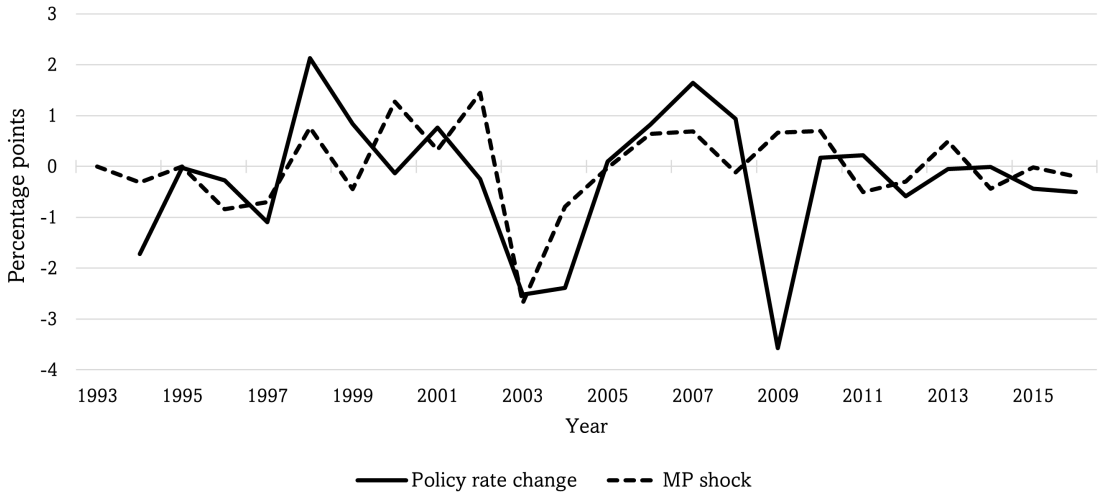
Figure 2 shows the time series of the monetary policy shocks employed. During this

[14] See Nakamura and Steinsson (2018) for a discussion on the identification challenges in macroeconomics, including monetary policy.

[15] Other works such as Amberg et al. (2022), Fagereng et al. (2021a), or Cao et al. (2023) also take advantage of Nordic administrative records that have an annual frequency and estimate responses to annually aggregated monetary policy shocks.

period, the policy rate in Norway never reached the zero lower bound, and monetary policy relied solely on conventional instruments, contrarily to the Euro Area. Hence, the series can be interpreted as surprise changes in conventional monetary policy (i.e., the policy rate), which is an additional advantage of focusing on Norway. Between 1993 and 2016, monetary policy had a few large shocks of more than 0.5 percentage points. For example, in 2002, there was a large contractionary monetary policy shock. This was followed by a sharp easing in 2003 because monetary policy was considered too tight (Bjørnland et al., 2004).

**Figure 2:** Monetary Policy Shocks




**Notes**: Change in the policy interest rate (solid line) and the monetary policy shocks estimated in Holm, Paul, and Tischbirek, 2021 (dashed line). Data are for 1993-2016.

### 3.2 Transmission of Monetary Policy to Key Rates and Asset Prices

Understanding how monetary policy shocks propagate through the financial system is important to evaluate how these shocks affect households' wealth portfolios. Some key rates and asset prices play an important role in this transmission, as they directly shape households' financial decisions, such as how much to save, invest, and borrow. In this part, we focus on deposit and mortgage rates, as well as stock and housing prices.

Deposit rates capture the direct pass-through of monetary policy to household savings, shaping the attractiveness of bank deposits relative to alternative investments and thereby influencing portfolio composition. Mortgage rates govern the cost of borrowing for home purchases and refinancing, affecting both access to credit and the affordability

of housing, with implications for leverage and long-term wealth accumulation. Stock prices affect the valuation of the financial assets held by households that participate in the stock market and, by changing expected returns, influence the allocation between risky and safe assets. Housing prices play a central role in the valuation of household portfolios since housing represents the largest share of household wealth, as mentioned in Section 2.3.

We obtain data on deposit and mortgage rates from Statistics Norway (SBB). For deposit rates, we combine a historical quarterly series of household deposit interest rates available since Q2 2001[16], with a more recent series that starts in Q4 2013.[17] Mortgage rates correspond to a quarterly series of interest rates on total loans (about 90% are loans with mortgages) from banks and mortgage companies to households.[18] Both datasets are aggregated to annual frequency by averaging quarterly observations. We obtain year-on-year changes for deposit rate between 2002 and 2016, and for mortgage rate between 2003 and 2016. For stock prices, we retrieve data from Bloomberg spanning the years between 1996 and 2016.[19] Housing price data are retrieved from SSB.[20] Both stock and housing price series are deflated using the Consumer Price Index (CPI) from SSB[21]. Using the deflated series, we obtain the year-on-year changes for stock prices between 1997 and 2016, and housing prices for the years 1993-2016.

We use a time series local projection approach (Jordà, 2005) to estimate how the chosen rates and asset prices respond to an unexpected increase in the policy rate:

$$y_{t+h} - y_{t-1} = \alpha + \beta^h \cdot \epsilon_t^M + \sum_{k=1}^{K} \gamma_k^h \mathbb{X}_{t-k} + u_t^h \quad , \quad \text{for } h \in \{0,1,2,3\}. \tag{1}$$

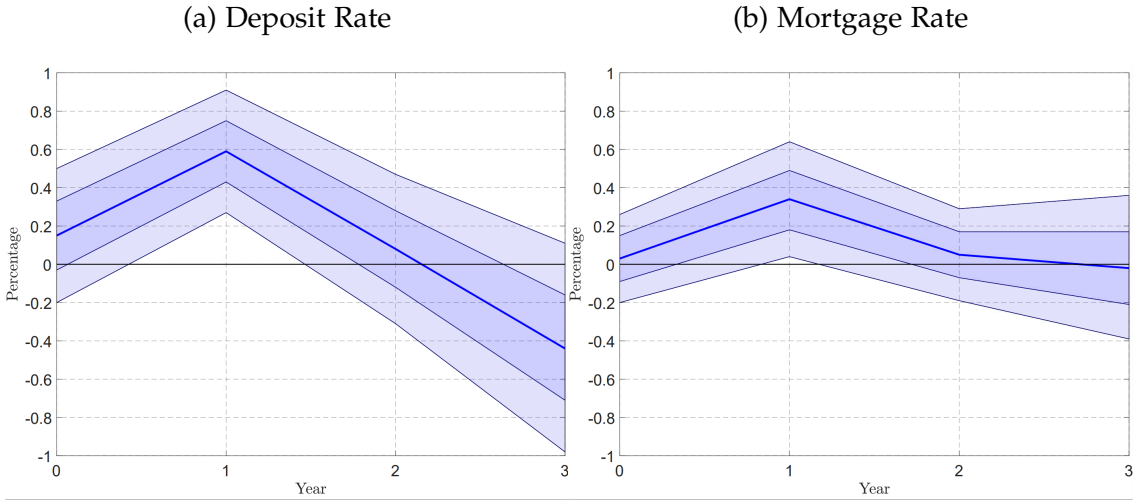
In the above equation, $y_t$ denotes the variable of interest in year $t$ (e.g., change in stock price). For example, when examining stock prices, we are effectively evaluating the cumulative change in stock returns following a monetary policy shock. $\epsilon_t^M$ is the monetary policy shock in year $t$ and $\mathbb{X}_{t-k}$ is a vector of controls that include three lags

[16]Table 07222: Interest rates on deposits, by type of deposit and sector.
[17]Table 11019: Interest rates on deposits, by type of deposit and sector.
[18]Table 07200: Interest rates on outstanding loans (per cent), by financial corporation, type of loans, sector, quarter and contents.
[19]Following Fagereng et al., 2020, we construct a composite stock price index with an 80% weight on the Oslo Stock Exchange (OSE) market index and a 20% weight on the MSCI World Index.
[20]Table 07230: Price index for existing dwellings, by region, type of dwelling, year and contents.
[21]Table 08981: Consumer Price Index (2015=100), by month, year and contents.

of the dependent variable and two lags of the monetary policy shock. The error term is $u_t^h$.

Figure 3 presents the estimated responses of deposit and mortgage rates to a 1 percentage point contractionary monetary policy shock. Deposit rates rise initially by 0.15 percentage points, peak at a 0.59 percentage point after one year, and then weaken, turning negative at year three. Mortgage rates follow a similar pattern, an initial increase by 0.08 percentage points, followed by an increase of 0.4 percentages points, before fading and turning negative by year three post-shock.

**Figure 3:** Monetary Policy and the Pass-Through to Key Rates

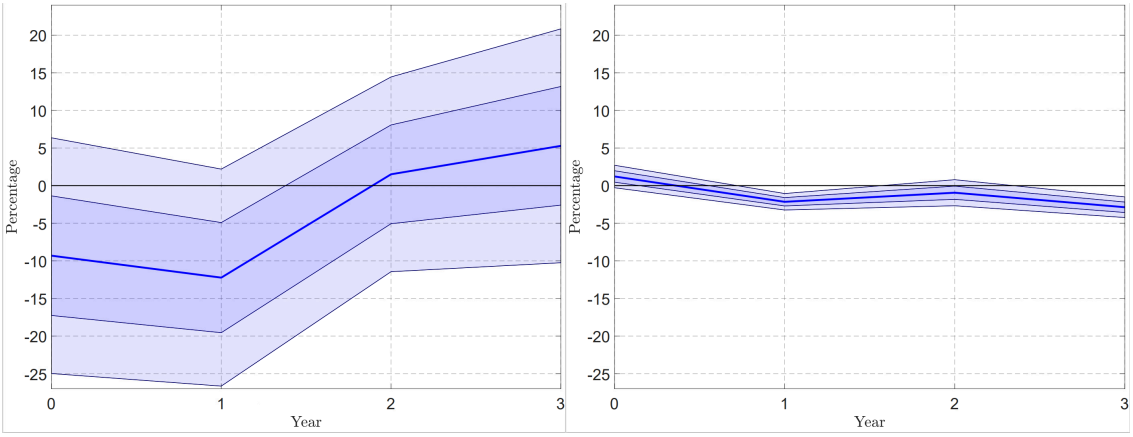



**Notes**: Estimated responses (in p.p.) to a 1 percentage point contractionary monetary policy shock. The darker and lighter areas correspond to the 95% and 68% confidence bands, respectively, using Newey-West standard errors.

Figure 4 displays the estimated responses of stock and housing prices to an unexpected 1 percentage point increase in the monetary policy rate. For stock prices, the initial impact is a notable decline of 9.31%, reflecting the immediate sensitivity of equity markets to higher interest rates. This decline deepens after one year to approximately 12%. This indicates a stronger negative effect through the economy as the policy shock propagates. In subsequent periods, we observe small and statistically insignificant fluctuations, suggesting that the initial shock's impact diminishes over time. In contrast, housing prices exhibit a different pattern. Initially, prices increase by 1.22%. However, this positive response reverses within one year, with house prices declining by 2.15%. This negative trend persists in later periods, with house prices falling by 0.94% after two years and by 2.87% after three years.

**Figure 4:** Monetary Policy and the Pass-Through to Asset Prices

(a) Stock Prices (b) Housing Prices




**Notes**: Estimated responses (in %) to a 1 percentage point contractionary monetary policy shock. The darker and lighter areas correspond to the 95% and 68% confidence bands, respectively, using Newey-West standard errors.

The responses estimated offer four main insights into how household portfolio composition can be affected by an unexpected change in monetary stance. First, an unexpected monetary policy tightening increases deposit rates, making savings accounts and similar safe assets more attractive. The higher rates boost the interest earned on existing deposits, increasing their effective value in households' portfolios. As rates peak and then decline, the reduced yield lowers this value. Second, higher mortgage rates raise borrowing costs, discouraging new mortgages or refinancing. This should restrain housing investments initially, but as rates decline, renewed interest in real estate may emerge.

Third, sharp stock price drops after the monetary shock reduce the market value of equities held by households, decreasing the value of stocks in the portfolios of market participants, assuming quantities are constant. However, some investors, seeing temporary declines in fundamentally strong firms, may view this as a buying opportunity, increasing their equity holdings in anticipation of a market correction or recovery. Fourth, housing prices briefly climb before facing ongoing declines. Homeowners should see an initial valuation of their houses followed by a devaluation of their property assets, while prospective buyers could find more affordable entry points into the housing market as prices adjust downward.

# 4 Aggregate Responses of Household Portfolios

In this Section, we examine how household portfolios respond on aggregate to changes in monetary policy. The baseline picture provides a backdrop for the heterogeneous responses analyzed in the following section. Using our identified policy shocks and the full-population administrative data, we trace out the dynamics of total household wealth and its allocation across major asset classes in response to monetary policy shocks. We first document the overall change in portfolio size, then study shifts in composition and individual asset categories, before distinguishing between active rebalancing and valuation effects.

## 4.1 Effects on the Aggregate Household Balance Sheet

We start to examine how different components of household wealth portfolios respond to changes in the monetary policy stance. Specifically, we estimate impulse responses of the aggregate value of different asset variables and liabilities to unexpected changes in monetary policy using local projections (Jordà, 2005):

$$\frac{y_{i,t+h} - y_{i,t-1}}{\bar{y}_{t-1}} = \delta_i^h + \beta^h \cdot \epsilon_t^M + \sum_{k=1}^{K} \gamma_k^h \mathbb{X}_{i,t-k} + u_{i,t}^h \quad , \quad \text{for } h \in \{0,1,2,3\}. \tag{2}$$

In the above equation, $y_{i,t}$ denotes the variable of interest for household $i$ in year $t$ (e.g., the value of risky assets), and $\epsilon_t^M$ is the monetary policy shock in year $t$. Our specification includes household fixed effects $\delta_i^h$ and a vector of controls $\mathbb{X}i, t-k$. We include three lags of the dependent variable and two lags of the monetary policy shock, chosen using the Akaike Information Criterion for the former and residual autocorrelation tests for the latter.The error term is $u_{i,t}^h$. The dependent variable is the change in $y_t$ from $t-1$ to $t+h$, normalized by the cross-sectional mean in $t-1$, such that $\beta^h$ measures the average cumulative growth rate between $t-1$ and $t+h$, which can be interpreted as the aggregate response.[22]

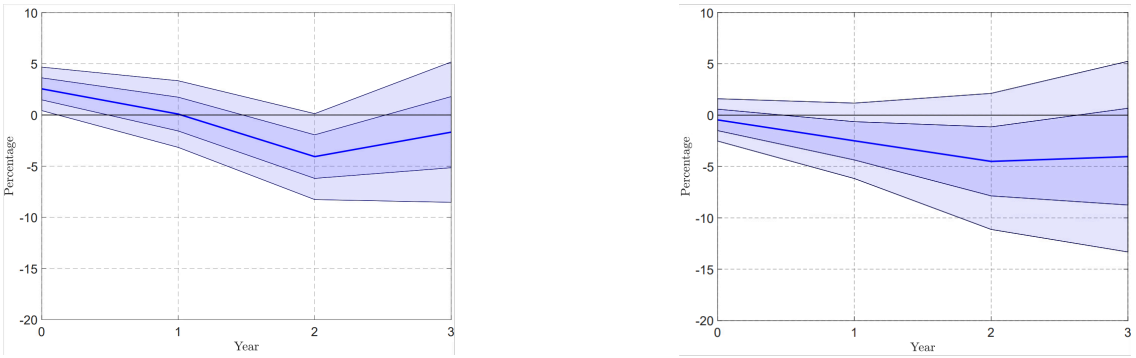
We begin by documenting the response of total assets, i.e., aggregate household wealth, to an unexpected increase in the policy rate. Panel (a) of Figure 5 reports the estimated impulse response. Following a 100-basis-point contractionary shock, total asset values

[22]We avoid log differences or standard growth rates to retain observations with zero values in $y_t$ or $y_{t-1}$.

rise by 2.6% on impact, but decline thereafter. After two years, the value of total assets is 4.1% below the initial level.

**Figure 5:** Monetary Policy and the Household Portfolios Size

(a) Total Assets ($W_{i,t}$) (b) Total Debt ($D_{i,t}$)




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The lighter and darker areas correspond to the 95% and 68% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

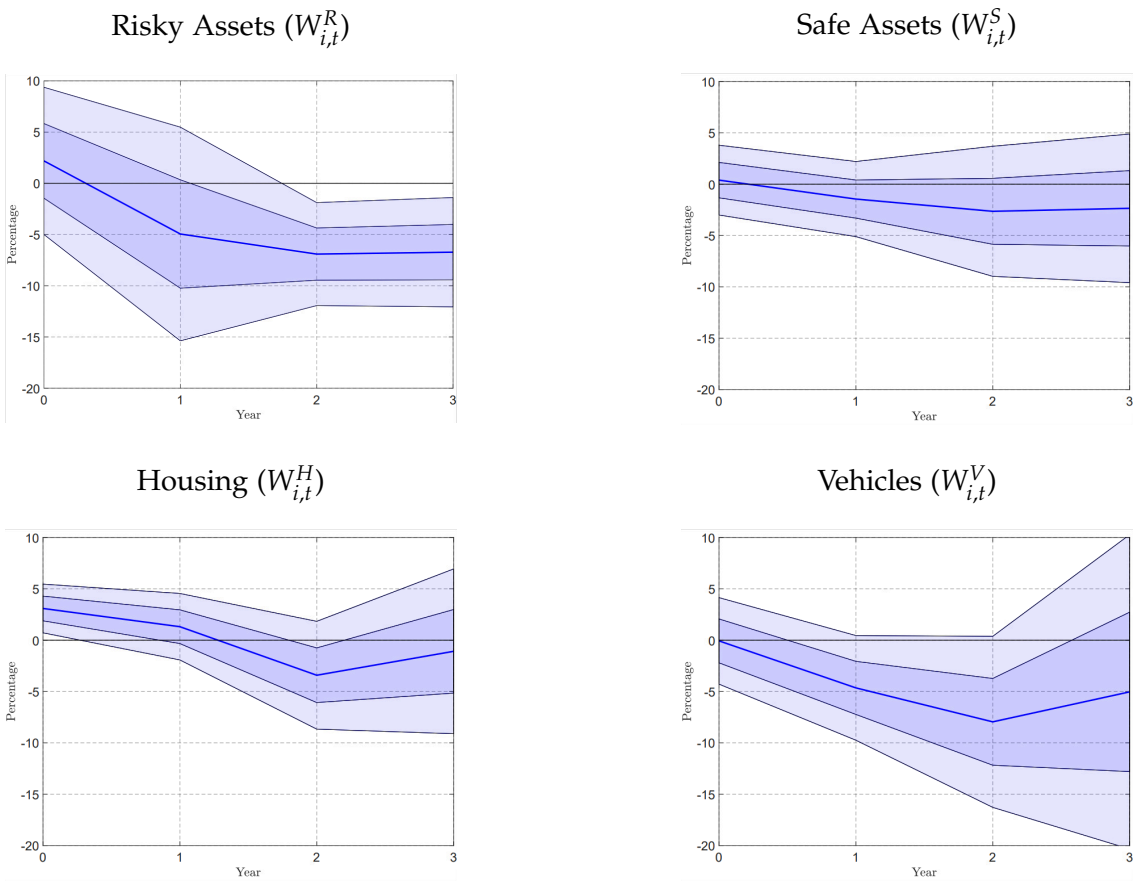
In panel (b) of Figure 5, we plot the response of total liabilities. Total household debt declines after a monetary policy tightening, although its response on impact is not statistically significant. After one year, total debt decreases by 2%, and by almost 5% two years post-shock, stabilizing around this value. The decline in liabilities exceeds the contraction in total assets, implying that higher policy rates lead households to deleverage. Combining these two impulse response functions allows us to understand how net wealth responds to monetary policy. After the change in the policy rate, the aggregate value of net wealth increases but declines thereafter. Figure C.3 in Appendix C shows the response.

### 4.2 Effects on Value of Different Asset Classes

We decompose the aggregate decline in total assets in response to a contractionary monetary shock by documenting the response of value across asset classes. Figure 6 presents the estimated impulse responses for the four broad asset categories following a 1 percentage point increase in the policy rate.

Risky financial assets show no significant change on impact but decline thereafter, falling to 6.9% after two years and remaining at similar levels thereafter. By contrast, there is no statistically significant response of safe assets (dominated by bank deposits)

**Figure 6:** Monetary Policy and Household Portfolios Composition




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The lighter and darker areas correspond to the 95% and 68% confidence bands, respectively, using clustered standard errors à la Correia (2017) at the year level.

at any horizon. The average household maintains its liquid, low-risk balances while other asset categories contract. Real assets also decline: housing exhibits a positive response of 3% immediately after the shock, but reverses fully within two years, leaving housing assets 1% below pre-shock levels. The response of vehicles is similar to that of risky assets, declining after one year by -4.6% and even further in subsequent periods.

Overall, aggregate results indicate that a monetary tightening episode changes the composition of household portfolios. On aggregate, households preserve liquid, safe asset holdings while illiquid, riskier assets contract. Part of the decline in risky assets and, housing (with a lag) reflects valuation effectsthe monetary shock depresses asset prices. The behavior of real assets, namely vehicles, points to a slowdown in large durable acquisitions as financing costs rise and income weakens. Despite higher yields on safe assets, their value remains roughly unchanged, so their portfolio share increases me-

chanically as other components contract. These patterns suggest that, on aggregate, households do not rebalance their portfolios to make up for the devaluation in their risky portfolios, and do not increase investments in housing in response to the devaluation (we return to the price-quantity decomposition in Section 4.3).

### 4.2.1 Individual Asset Responses

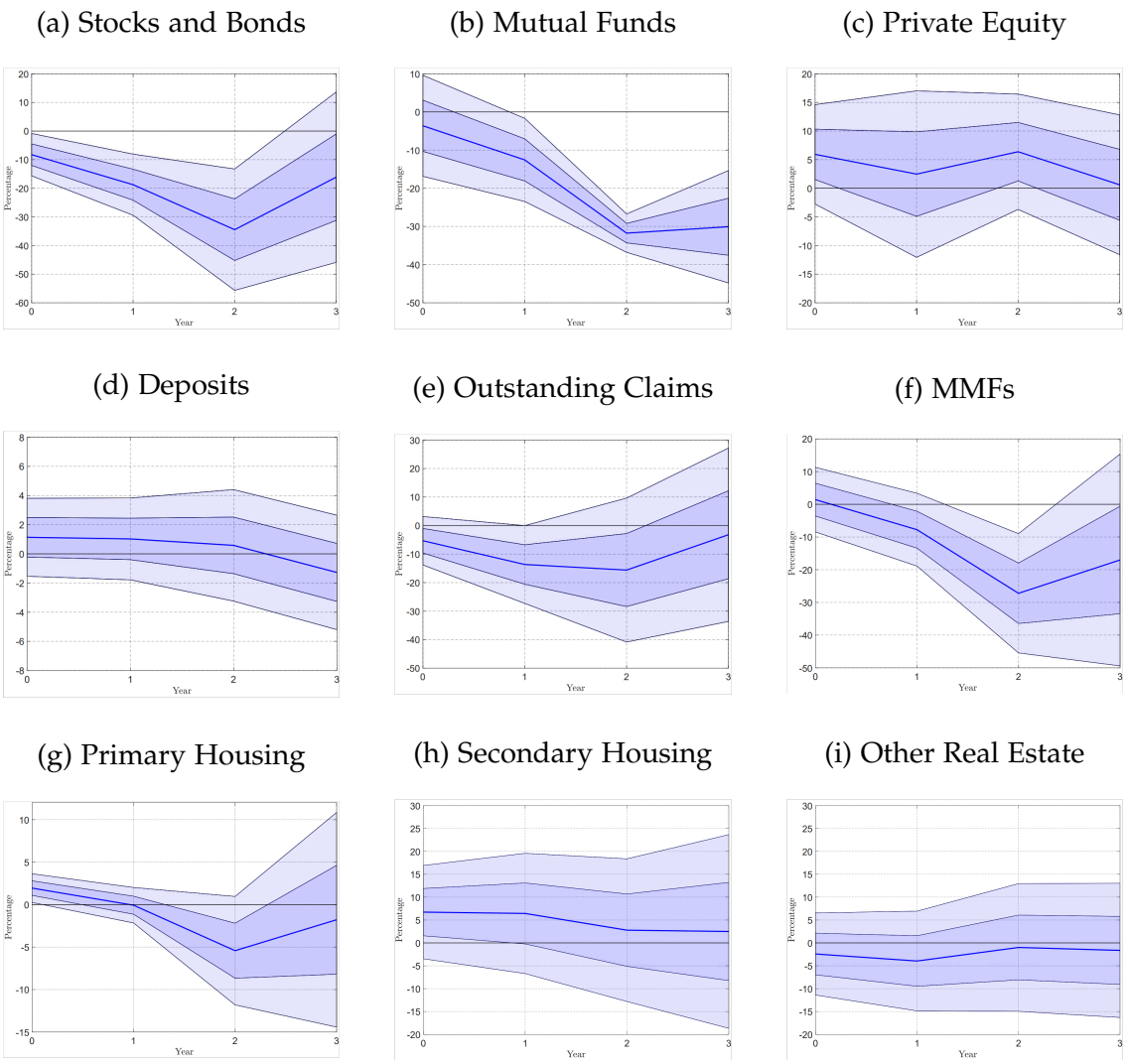
In Figure 7, we present the impulse responses for each component of the three broad asset categories – risky assets, safe assets, and housing.

**Risky assets** Panels (a)–(c) show that the aggregate decline of risky assets is driven by publicly traded instruments: stocks and bonds, which fall by about 18.7% one year after the shock, and mutual funds by around 12.5%. Private equity has a non-significant opposing effect, rising by 5.9% on impact, with the effect persisting two years after the shock (6.4%) before it dissipates at the 3-year horizon. Given the concentration of private equity holdings among wealthier households, this pattern is consistent with heterogeneous adjustment: while most households seem to be primarily subject to "passive" wealth effects driven by asset prices, some specific groups expand their investments through private equity holdings.

**Safe assets** Panels (d)–(f) of Figure 7 show the responses of different safe asset components. Deposits show no significant change at any horizon and, as they represent more than 80% of safe assets, as shown in Table 1, they drive the flat aggregate response of this category. The smaller components, outstanding claims, and money market funds, show a pattern similar to risky assets: the initial impact is negative (around -5.3%) and statistically significant for outstanding claims and together with money market funds, they experience progressively larger declines at longer horizons. In other words, the safe assets behavior is effectively observed in deposits, while these smaller components—which, like risky assets, are held mostly by the top (and to a smaller extent, bottom) groups of the net wealth distribution—behave more like risky assets.

**Housing** Finally, panels (g)–(i) of Figure 7 show the responses of the different components of housing, the largest asset in the aggregate portfolio, with a 78% share. The

**Figure 7:** Monetary Policy and Asset Value in the Household Portfolios




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The lighter and darker areas correspond to the 95% and 68% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

short-lived increase in the year of the shock is driven by both primary and secondary housing, which rise by 2.5% and 7%, respectively. Subsequently, only primary, i.e., owner-occupied housing declines, driving the significant decrease in the aggregate value two years after the shock, as it represents two-thirds of total housing wealth. In contrast, the response of secondary housing remains positive, although imprecisely estimated coefficients at longer horizons. If the reaction of house prices applies to both types of housing, this result suggests that some households may take advantage of post-shock price dynamics, increasing their net purchases of secondary homes. We do not observe significant changes in the value of other real estate.

Taken together, these results clarify how a contractionary monetary policy shock transmits to household wealth in Norway. Total assets exhibit a short-lived uptick on impact and then decline over the subsequent 2-3 years. This decline is largely accounted for by the owner-occupied (primary) residence, given its weight in the average household wealth. The pattern is consistent with a key role for effects on house prices, which are not met by any response among most households, suggesting these wealth effects are too small to induce moving behavior given the lumpiness of housing and likely only affect new homeowners and marginal buyers. This effect is somewhat offset by the largest financial assets in the aggregate household portfolio. Deposits do not respond, and two components move in the opposite direction immediately after the shock: secondary residences and private equity, both disproportionately held by wealthier households, increase significantly following the shock, suggesting a positive investment reaction.

Meanwhile, liabilities fall more than assets, consistent with the less wealthy households deleveraging faster after a monetary shock. We take this interpretation given that liabilities are mostly composed of mortgage loans, with a smaller role for student loans and even smaller auto loans, credit card and personal debt. While our data does not allow to decompose these different debt instruments, the dominance of mortgages, together with the housing response, suggests one response channel is through faster paying down of existing mortgage loans, given that a rise in interest rates transmits to mortgage payments. This interpretation also gives rise to a simple rationalization of the lag in household responses, as the pass-through to effective rates on mortgage payments takes one year. We next disentangle price/revaluation from quantity/rebalancing effects, before moving to a detailed heterogeneity analysis in Section 5.

### 4.3 Deconstructing Portfolio Composition Changes

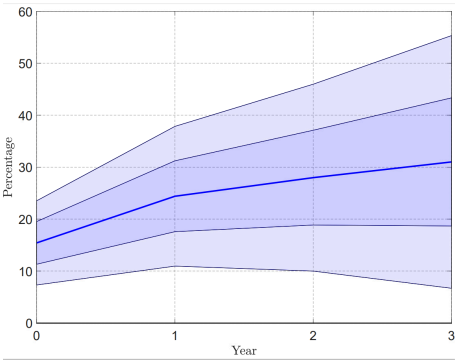
We have established that monetary policy tightening lowers the total value of household wealth and the share invested in risky assets after some years. We now turn our analysis to understanding where this response originates: is it an active behavior choice in decreasing investment in risky assets, or is it because the prices of risky assets (e.g., stock and bonds) decrease when the nominal interest rate is higher?

To unravel these two effects, we use data from the SR described in Section 2, which requires restricting our sample to the period between 2004 and 2016. In Appendix C.7

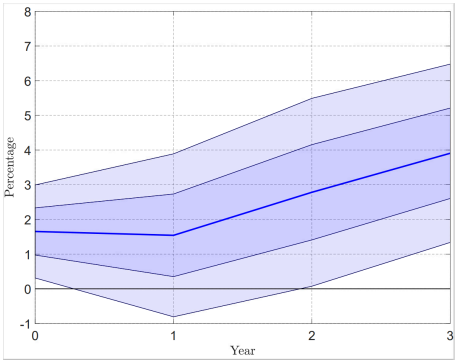
we show that the impulse response functions plotted above are robust to this restriction. Therefore, the results obtained using the more restricted time sample with the SR are comparable with the above impulse responses.

**Figure 8:** Monetary Policy and Household Portfolios Choice

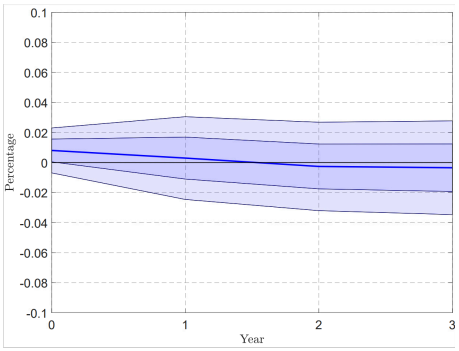
(a) Quantity of Stocks



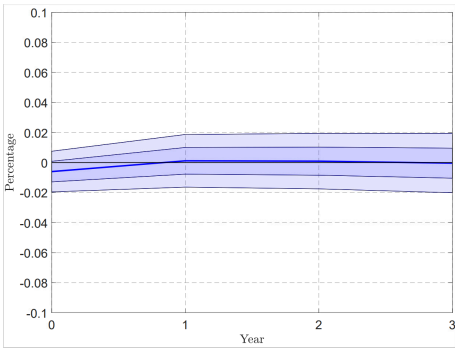

(b) Quantity of Private Equity




(c) Prob. of Holding Stocks




(d) Prob. of Holding Private Equity




**Notes**: Estimated responses of stocks and private equity in terms of quantities and participation status to a 1 percentage point contractionary monetary policy shock. The lighter and darker areas correspond to the 95% and 68% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

Panels (a) and (b) of Figure 8 plot the impulse responses of the number of stocks and private equity units held after a 1 percentage point increase in the policy rate by the Central Bank. Panels (c) and (d) present the impulse responses for households' participation status—defined as a binary value equal to 1 if the household owns stocks/private equity. This can be interpreted as the probability of holding stocks or private equity, respectively.

In contrast to the decline observed in the value of risky assets, the number of stocks *increases* after a tightening of the monetary policy. On impact, it increases by 8.2%, and

after 2 years, households who own stocks increase their holdings (in terms of quantity) by 34.4% on average. This implies that households who hold stocks increase the number of shares held substantially, even as the overall value of their stock portfolio declines as a result of the monetary policy shock. This is consistent with rational households investing further in stocks, given an increase in expected returns as a result of the monetary policy shock, even though their preexisting portfolios' value is hurt by the tightening. The different signs in the value and quantity responses also mean necessarily that the relevant stock prices declined as a result of the shock. Figure 4 plots the response of stock prices to the same monetary shock and confirms that there is a decrease following the shock. Overall, this would be consistent with the classic channel of Bernanke and Kuttner (2005).

Meanwhile, the quantity of private equity units has a smaller, but also positive and significant response to the monetary policy shock. The magnitude of the coefficients is smaller than that observed for the value response, but the latter is also measured less precisely. It appears that the value response may be explained by this investment response, but this cannot be firmly established.

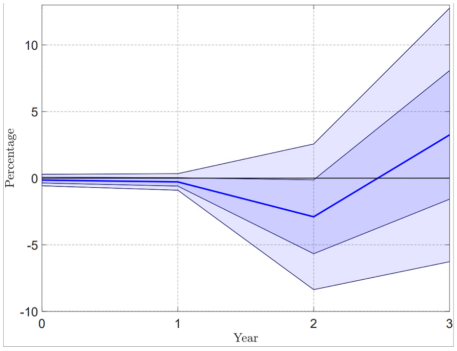
Consistent with the higher expected returns story, a tightening shock appears to encourage households on the margin to enter the stock market, increasing the likelihood of stock ownership by 0.5% on impact. However, this effect is only significant at the 68% level, and dissipates to zero at the 1-year horizon and beyond. The impulse response for the likelihood of holding private equity is even flatter, with the coefficient on impact being statistically insignificant.

We turn to looking at investment reactions in housing. Given higher transaction costs in housing, with some fixed components, namely the costs of moving, mortgage underwriting, etc., it is natural to expect more muted reactions as only changes of a sufficient size would induce a response by many households, affecting only those close to the decision margin. To confirm this hypothesis we look again at linear probability models where, in the same setting, we consider the effect of the monetary shocks on the likelihood of owning, respectively, primary and secondary housing, in Figure 9.

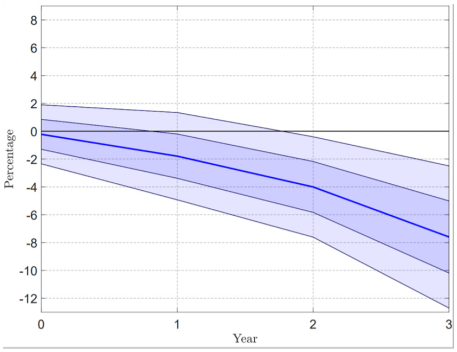
The results show no significant effect in the case of primary housing, indicating that households do not enter or exit homeownership in response to monetary policy shocks. As expected, for example due to transaction costs and the necessity good properties of

**Figure 9:** Monetary Policy and Household Portfolios Choice

(a) Prob. of Owning Primary Residence




(b) Prof. of Owning Secondary Residence




**Notes**: Estimated responses of stocks and private equity in terms of quantities and participation status to a 1 percentage point contractionary monetary policy shock. The lighter and darker areas correspond to the 95% and 68% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

owner-occupied housing, primary housing is not affected on the extensive margin. The case of secondary housing is different, with the results showing a clearly significant negative effect at the second and third horizons. The likelihood of owning a secondary housing declines as a result of the monetary shocks, indicating that some households, on the margin, are less likely to buy or more likely to sell off existing secondary houses. This is reasonable in the perspective that secondary housing does not have the necessity good properties of the owner-occupied house, and high switching costs from owning to renting.

### 4.4 Robustness checks

**Monetary shocks as an instrument** Another approach commonly used in the empirical literature on monetary policy (e.g., Gertler and Karadi, 2015) is to use the series of monetary shocks as an external instrument for changes in the policy rate. We estimate impulse responses using this method in a LP-IV framework, where monetary policy is measured by the *Norges Bank*'s policy rate and instrumented by the series described in Section 2. The resulting impulse responses closely align with those obtained using our baseline approach, both for broad asset categories and individual assets, as shown in Figures C.4 and C.5 in Appendix C.

**Sensitivity to sample period** As mentioned in Section 2, the SR is available only from 2004 onward. Consequently, our analysis of the intensive margin that relies on this dataset considers a sample starting in 2004 rather than 1993. In contrast, the responses that do not disentangle between quantities and prices presented in Section 4.1 and 4.2 are estimated using the full sample starting in 1993. To ensure that our results are not driven by the broader sample period, we reproduce these responses using the restricted subsample and find that, overall, our conclusions remain unchanged. Figure C.7 in Appendix C presents the responses in terms of total value for the individual assets using the 2004-2016 subsample.

## 5 Heterogeneity Over the Wealth Distribution

Does monetary policy affect all households uniformly, or are responses different across the net wealth distribution? If heterogeneity exists, does it arise mechanically from portfolio composition, or from differential behavioral responses to the same shock?

These questions matter on three grounds. First, the distributional consequences of monetary policy—who gains, who loses—carry direct normative implications and shape political economy constraints on central banks. Second, recent heterogeneous-agent models of monetary transmission assign portfolio rebalancing a central role (Kekre & Lenel, 2022; Melcangi & Sterk, 2024), but their quantitative relevance hinges on whether households with high marginal propensities to take risk actually adjust portfolios as predicted. Third, wealth heterogeneity can indirectly shed light on the mechanisms at play. If responses are identical, this is more consistent with a role of passive valuation effects, conversely, if responses diverge even conditioning on initial composition, rebalancing actions may be more relevant.

We partition households into wealth quartiles based on lagged $(t-1)$ net wealth. Equation (3) is estimated separately within each group:

$$\frac{y_{i,t+h} - y_{i,t-1}}{\bar{y}_{t-1}} = \delta_i^h + \beta_g^h \cdot \epsilon_t^M + \sum_{k=1}^{K} \gamma_{g,k}^h \mathbb{X}_{i,t-k} + u_{i,t}^h, \ \forall i \in g, \tag{3}$$

where $g$ indexes wealth quartiles and $\mathbb{X}_{i,t}$ includes three lags of the dependent variable and two lags of the monetary policy shock. Classification is fixed at $t-1$, ensuring

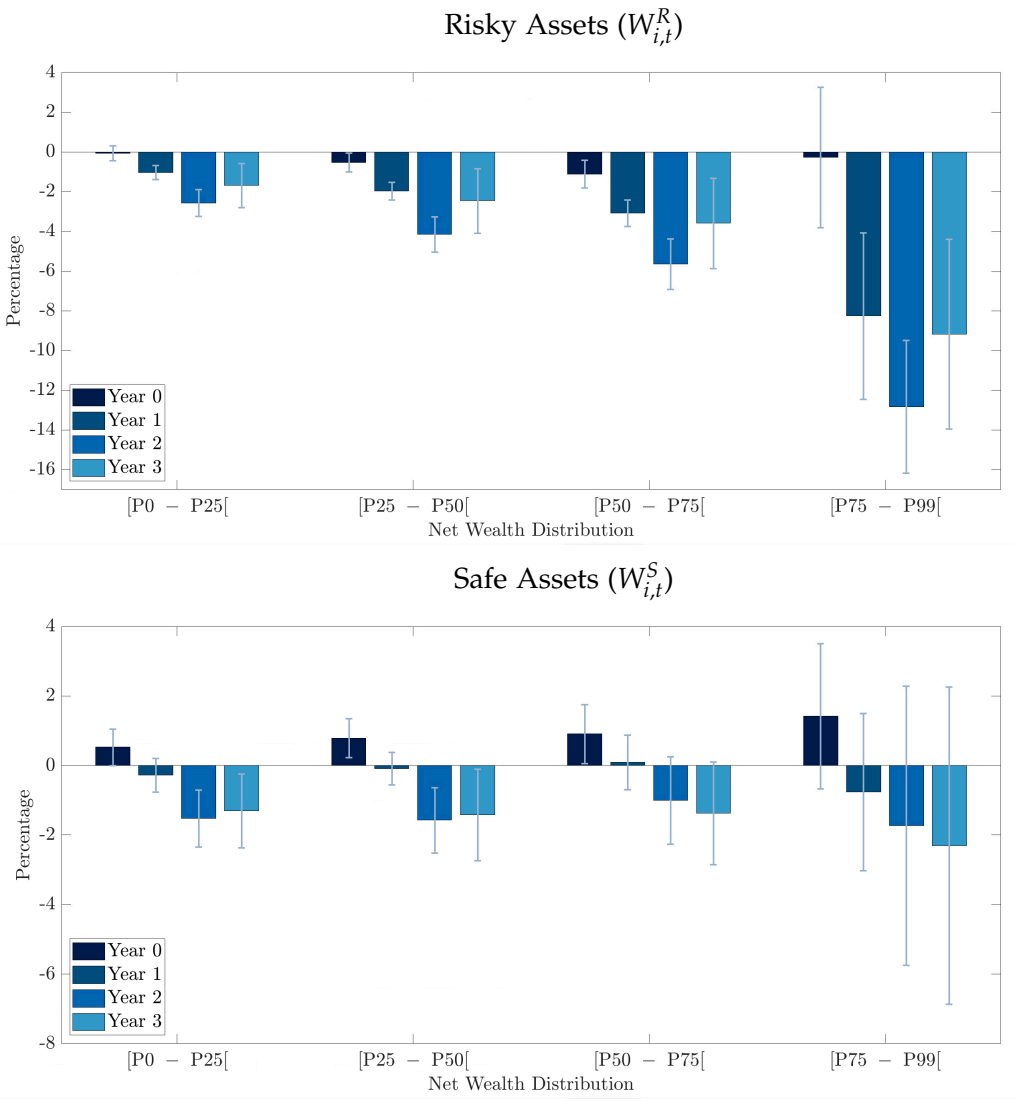
group assignment is exogenous to the shock itself.

Three key findings emerge. First, while total assets respond uniformly across groups, risky assets contract sharply only among the wealthy, driven by both greater initial exposure and larger proportional declines. Second, this divergence masks active rebalancing: wealthy households seem to reduce publicly-traded securities while expanding private equity holdings, with responses far beyond those of prices. Third, quantity data confirm this interpretation: stock holdings increase across all groups (consistent with higher expected returns), but private equity investment concentrates among tails of the distribution.

### 5.1 Broad Asset Categories

Figure 10 presents impulse responses for risky and safe assets. Risky assets contract sharply among the wealthy, falling 12.8% two years post-shock versus the 6.9% aggregate decline. Lower quartiles show muted, statistically insignificant responses. This concentration reflects both composition—the top quartile holds disproportionate more risky assets—and behavior: even scaling by initial exposure, proportional declines exceed those of poorer households. Whether this reflects greater sensitivity to valuation losses or active portfolio restructuring remains an open question, addressed below through quantity decompositions. Safe assets exhibit no differential response across groups. Deposits, comprising over 80% of safe assets, remain unchanged at all horizons for all wealth levels. The aggregate null result applies uniformly, indicating neither flight to safety among constrained households nor opportunistic accumulation among the wealthy.

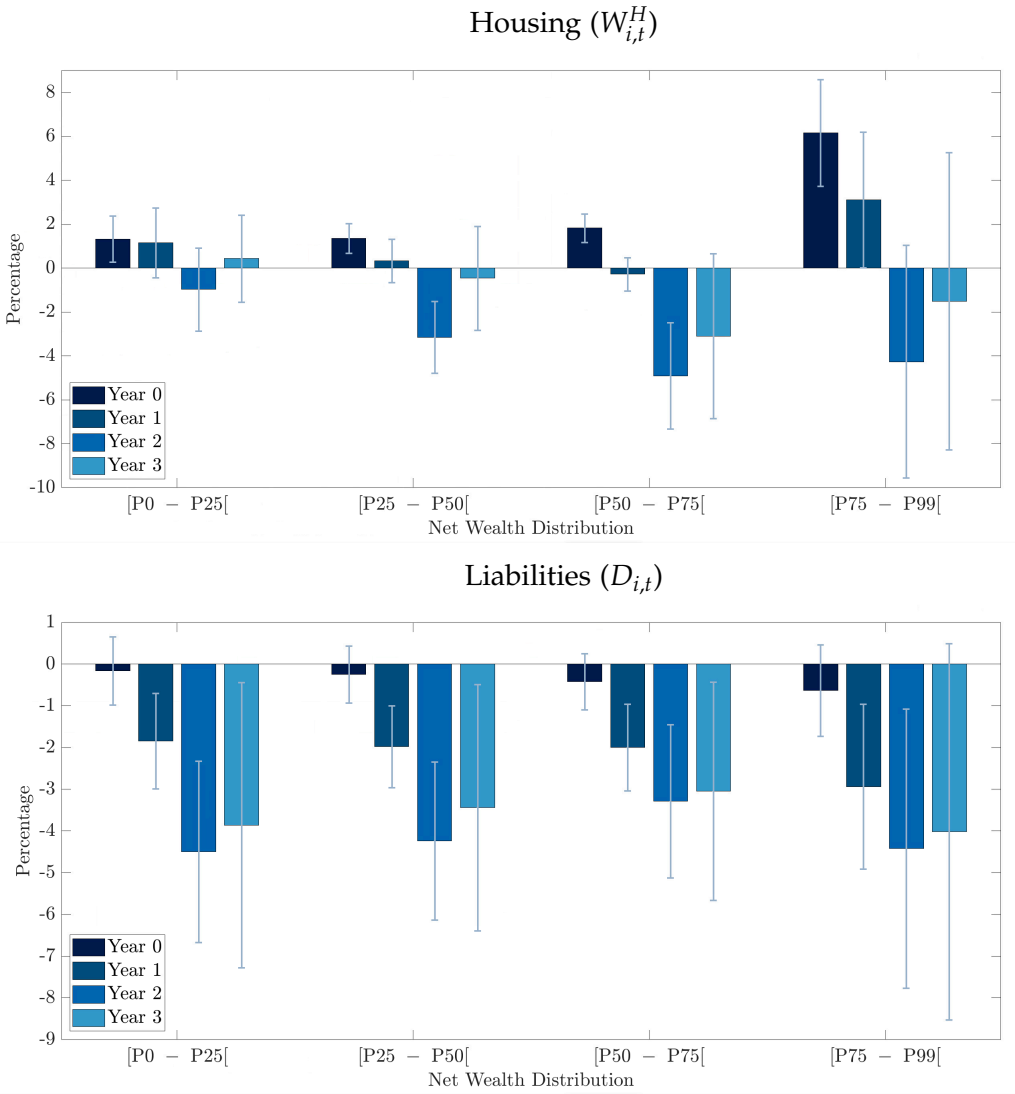
**Figure 10:** Heterogeneity along Net Wealth - Financial Asset Classes




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

We now turn to look at the heterogeneity in the response of total housing assets and of liabilities (Figure 11). Housing responses appear surprisingly uniform above the median, despite housing comprising 60-80% of middle-class portfolios but under 40% for the wealthy. All groups until P75 exhibit the characteristic pattern: a modest positive impact response (1-2%), dissipating within one year, followed by declines to 3-5% at longer horizons. The exception is the top quartile's larger on-impact response (6.1%), suggesting differential investment behavior explored in the housing decomposition below. The uniformity of the medium-run contraction indicates broad-based exposure to house price movements rather than heterogeneous active adjustments.

**Figure 11:** Heterogeneity along Net Wealth - Housing and Debt




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

Liabilities decline uniformly across all groups. All quartiles deleverage by around 2-4% over the years, with statistically indistinguishable point estimates. Given that mortgages dominate household debt and contractionary shocks raise mortgage payments mechanically, this pattern is consistent with accelerated repayment among all mortgagors, proportional to outstanding balances. No evidence emerges of differential financial distress forcing sales or constraining consumption.

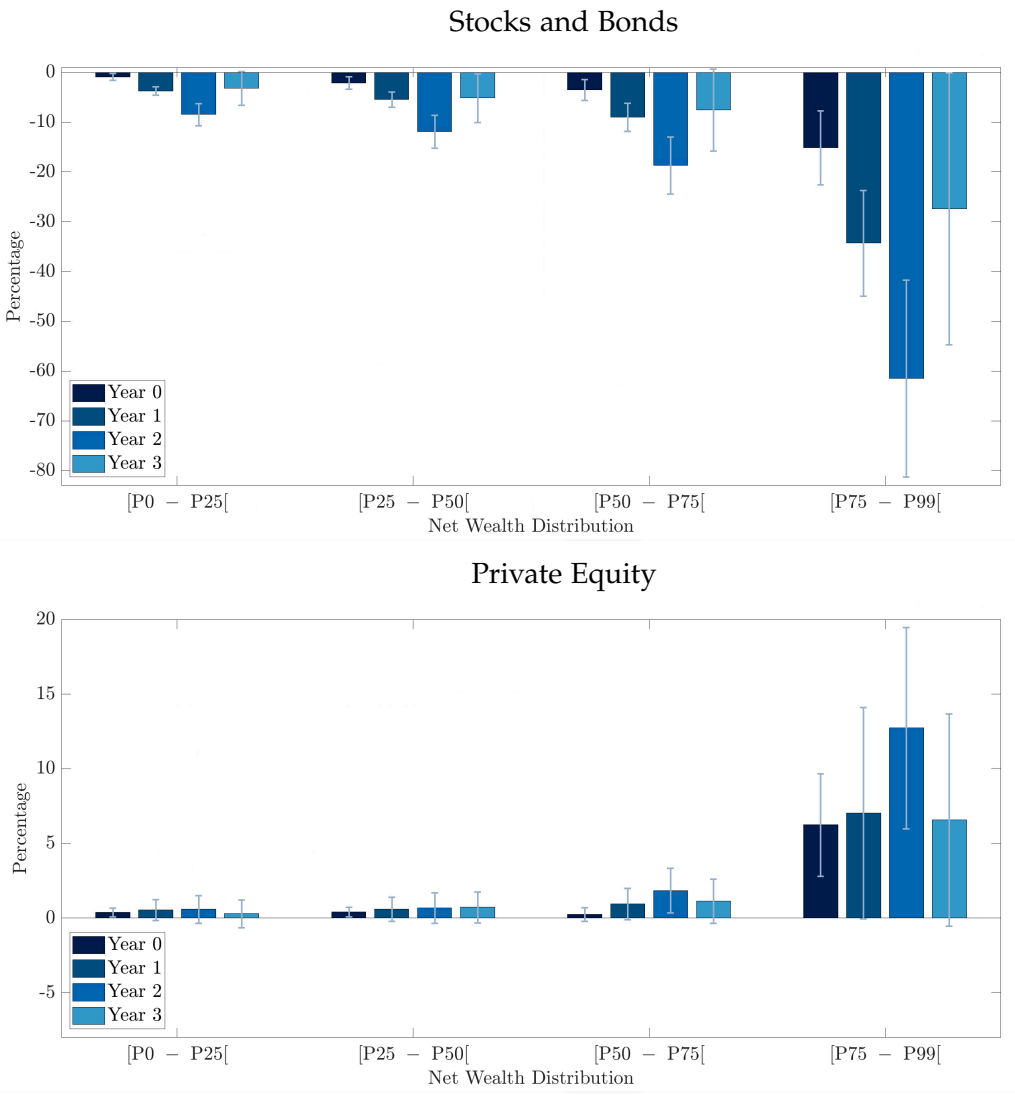
The liability result carries two implications. First, it rules out differential liquidity crises as an explanation for heterogeneous risky asset responsesif constrained households were forced sellers, debt responses would diverge. Second, combined with uniform

safe asset holdings, it suggests the wealthy face no binding borrowing constraints that would prevent active rebalancing.

## 5.2 Within Asset Categories

We disaggregate the risky asset response to distinguish uniform price effects from differential rebalancing across asset types. Figure 12 reveals a stark divergence between publicly-traded securities and private equity.

**Figure 12:** Heterogeneity along Net Wealth - Risky Asset Types

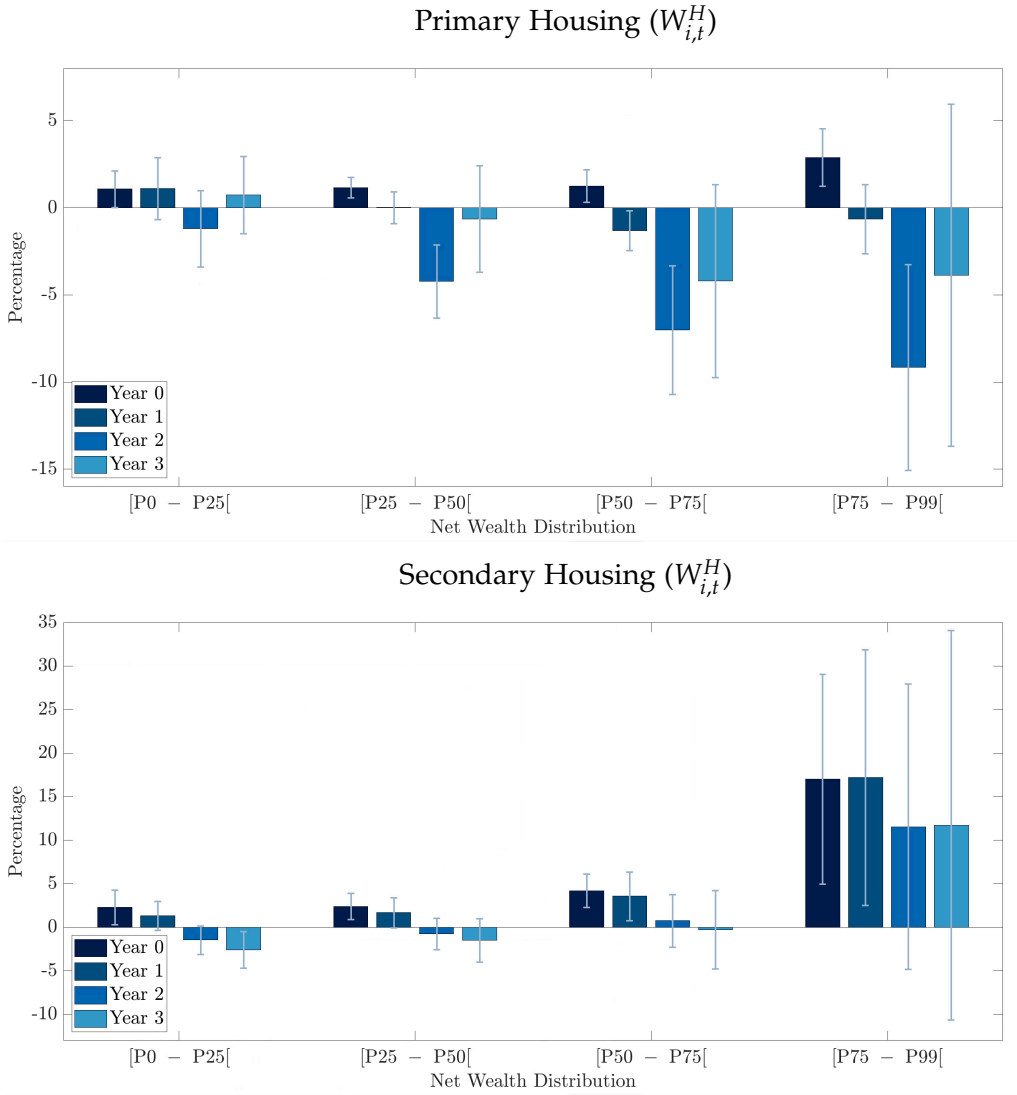



**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

The value of stocks and bonds holdings collapse among the wealthier group. The top

quartile experiences a 15.1% decline on impact, accelerating to 34.3% after one year, 61.5% by year two and then slightly recovering at year three. Lower quartiles show modest declines of 8-18% at horizon two, and also reverting at horizon three. The aggregate 30% contraction masks extreme concentration: virtually the entire effect originates from the top quartile. In stark contrast, private equity moves countercyclically exclusively among the wealthy. The top quartile increases holdings 6.2% on impact, 7% at year one, peaking at 12.7% in year two. All other groups exhibit economically and statistically zero responses. Altogether, wealthy households simultaneously shed public equity holdings while expanding private equity positions. This pattern cannot reflect passive valuation effects alone.

**Figure 13:** Heterogeneity along Net Wealth - Housing Types




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

We now decompose housing responses into primary (owner-occupied) and secondary residences. Figure 13 reveals the aggregate housing pattern conceals opposing forces. Primary housing responses remain modest and relatively uniform across groups above P25: small positive impacts (1-3%) fade within one year, followed by declines of 3-10%. The top quartile's steeper medium-run contraction (-10%) likely reflects valuation given high transaction costs. No evidence emerges of differential adjustment behavior.

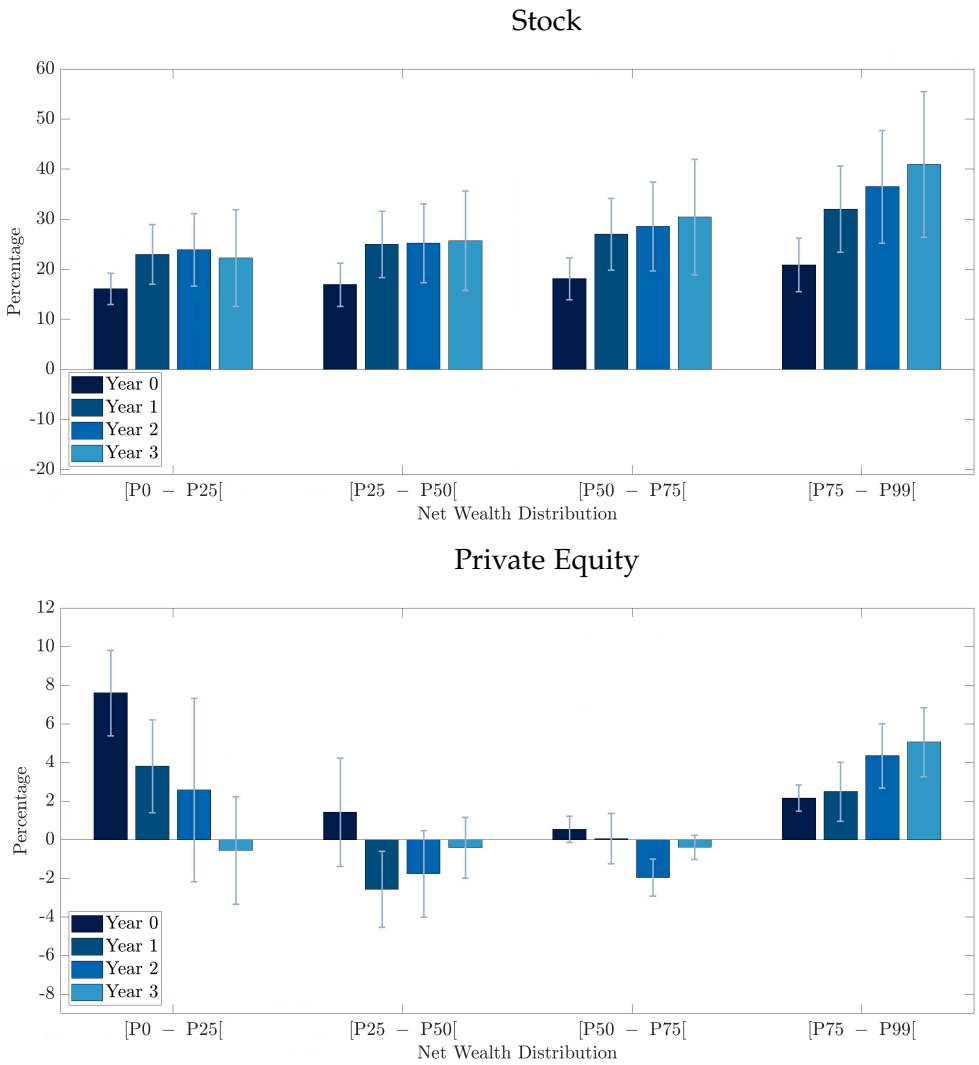
Secondary housing reveals the source of the aggregate on-impact increase. The top quartile expands holdings 17% immediately, sustaining this through year one before moderating to 11.5% at longer horizons. All other quartiles show zero response. The aggregate positive impact documented in Section 4 originates entirely from wealthy households opportunistically investing in secondary properties, presumably exploiting post-shock price dynamics. This concentration seems consistent with the private equity pattern: wealthy households actively deploy capital into illiquid assets following monetary tightening, while the middle class absorbs only valuation effects on existing holdings.

### 5.3 Active Rebalancing

As discussed in Section 4.3, the negative response of risky assets to a monetary policy shock may result from falling asset prices or changes in the amount invested in these assets. Data from the SR enable us to isolate the effects from quantity changes. We proceed now with analyzing how the responses of stocks and private equity vary across the net wealth distribution to better understand the drivers behind the observed aggregate patterns in these assets.

Figure 14 plots the responses in quantities for stocks and private equity along the net wealth distribution. For stocks, responses are broadly consistent across the net wealth, with stronger responses among wealthier households. The responses also align closely with the positive point estimates observed in the aggregate over time. For private equity holdings, the pattern is U-shaped: strong positive responses at the bottom and top quartiles, near-zero in the middle.

**Figure 14:** Heterogeneity along Net Wealth




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

The bottom quartile increases private equity holdings 7.5% on impact, declining thereafter but remaining positive. This group includes highly leveraged entrepreneurs whose private equity holdings largely reflect ownership stakes in their own businesses. The positive response may reflect new business formation or increased investment in existing ventures following the shock. The middle two quartiles exhibit negligible responses, statistically and economically indistinguishable from zero. These households hold minimal private equity initially and appear unable or unwilling to adjust on this margin. The top quartile increases holdings persistently: 2% on impact, accelerating to 4.5% by years two and three. Combined with the 12% value increase documented above, this confirms active investment drives the aggregate private equity expansion. This is con-

sistent with the interpretation of the large value changes as wealthy reallocating from public to private equity following monetary tightening.

The quantity evidence is decisive: the divergent value responses across wealth groups reflect genuine portfolio restructuring, not differential valuation effects. Wealthy households actively rebalance toward illiquid assets; the middle class absorbs valuation losses on fixed positions.

# 6 Conclusion

In light of recent developments in macroeconomic theory, the surge in inflation, the rapid pace of monetary tightening, and the rising participation of retail investors in the financial markets, understanding how monetary policy affects household balance sheets is of utmost importance. This paper studies how monetary policy shapes the composition of household portfolios. To do so, we use detailed wealth data from Norwegian household wealth from 1993 to 2016 and well-identified monetary policy shocks.

We document six empirical facts on how household portfolios adjust to monetary tightening. Portfolio size initially rises but contracts two years after the shock, consistent with gradual deleveraging. Portfolio composition adjusts unevenly: risky-asset values decline, while housing wealth initially increases before falling. Among risky assets, stocks and bonds, and mutual funds follow the pattern of total risky assets' responses. For housing, primary residences follow the aggregate pattern, while secondary residences exhibit a pronounced increase on impact. In terms of holdings, households that have stocks and/or private equity rebalance by increasing the amount invested into these assets.

Concerning heterogeneity facts, the decline in the value of risky assets is concentrated among the wealthiest households, and housing responses display similarly strong heterogeneity, with richer households experiencing larger gains in primary residences and expanding their investment in secondary housing. Finally, trading patterns vary across the wealth distribution: stock-market holdings shows only limited heterogeneity aside from slightly larger increases at the top, whereas private-equity holdings rise most sharply in the tails of the distribution.

## References


Agarwal, S., Chua, Y. H., Ghosh, P., & Song, C. (2020). Consumption and Portfolio Rebalancing Response of Households to Monetary Policy. *Available at SSRN 3585541*.

Alzuabi, R, Brown, S, Kontonikas, A, & Montagnoli, A. (2020). Household Portfolios and Monetary Policy. *The Sheffield Economic Research Paper Series (SERPS)*, (2020001).

Amberg, N., Jansson, T., Klein, M., & Picco, A. R. (2022). Five Facts About the Distributional Income Effects of Monetary Policy Shocks. *American Economic Review: Insights*, *4*(3), 289–304.

Andersen, A. L., Johannesen, N., Jørgensen, M., & Peydró, J.-L. (2023). Monetary Policy and Inequality. *The Journal of Finance*, *78*, 2945–2989.

Auclert, A. (2019). Monetary Policy and the Redistribution Channel. *American Economic Review*, *109*(6), 2333–2367.

Beraja, M., Fuster, A., Hurst, E., & Vavra, J. (2019). Regional Heterogeneity and the Refinancing Channel of Monetary Policy. *The Quarterly Journal of Economics*, *134*(1), 109–183.

Bernanke, B. S., & Kuttner, K. N. (2005). What explains the stock market's reaction to federal reserve policy? *The Journal of finance*, *60*(3), 1221–1257.

Bilias, Y., Georgarakos, D., & Haliassos, M. (2010). Portfolio inertia and stock market fluctuations. *Journal of Money, Credit and Banking*, *42*(4), 715–742.

Bjørnland, H. C., Ekeli, T., Geraats, P. M., & Leitemo, K. (2004). Norges Bank Watch 2004.

Bonaparte, Y., Korniotis, G. M., Kumar, A., & Vosse, M. (2024). Inflation, monetary policy, and portfolio decisions of us households. *Management Science*, *70*(9), 6438–6460.

Calvet, L. E., Campbell, J. Y., & Sodini, P. (2009). Fight or Flight? Portfolio Rebalancing by Individual Investors. *The Quarterly Journal of Economics*, *124*(1), 301–348.

Calvet, L. E., & Sodini, P. (2014). Twin picks: Disentangling the determinants of risk-taking in household portfolios. *The Journal of Finance*, *69*(2), 867–906.

Cao, J., Hegna, T., Holm, M. B., Juelsrud, R., König, T., & Riiser, M. (2023). The Investment Channel of Monetary Policy: Evidence from Norway. *Norges Bank Working Paper*, (5).

Choi, J. J., Laibson, D., Madrian, B. C., & Metrick, A. (2009). Reinforcement learning and savings behavior. *The Journal of finance*, *64*(6), 2515–2534.

Cloyne, J., Ferreira, C., & Surico, P. (2020). Monetary Policy when Households Have Debt: New Evidence on the Transmission Mechanism. *The Review of Economic Studies*, *87*(1), 102–129.

Coibion, O., Gorodnichenko, Y., Kueng, L., & Silvia, J. (2017). Innocent bystanders? monetary policy and inequality. *Journal of Monetary Economics*, *88*, 70–89.

Correia, S. (2017). Linear Models with High-Dimensional Fixed Effects: An Efficient and Feasible Estimator. *Available at http://scorreia.com/research/hdfe.pdf*.

Daniel, K., Garlappi, L., & Xiao, K. (2021). Monetary Policy and Reaching for Income. *The Journal of Finance*, *76*(3), 1145–1193.

de Guindos, L. (2024, November). Economic developments and monetary policy in the euro area [European Central Bank].

Di Maggio, M., Kermani, A., Keys, B. J., Piskorski, T., Ramcharan, R., Seru, A., & Yao, V. (2017). Interest Rate Pass-Through: Mortgage Rates, Household Consumption, and Voluntary Deleveraging. *American Economic Review*, *107*(11), 3550–3588.

Fagereng, A., Gottlieb, C., & Guiso, L. (2017). Asset Market Participation and Portfolio Choice over the Life-Cycle. *The Journal of Finance*, *72*(2), 705–750.

Fagereng, A., Guiso, L., Malacrino, D., & Pistaferri, L. (2020). Heterogeneity and Persistence in Returns to Wealth. *Econometrica*, *88*(1), 115–170.

Fagereng, A., Gulbrandsen, M. A., Holm, M. B., & Natvik, G. J. (2021a). How Does Monetary Policy affect Household Indebtedness? *Norges Bank Working Paper*, (5).

Fagereng, A., Holm, M. B., Moll, B., & Natvik, G. (2021b). Saving Behavior Across the Wealth Distribution: The Importance of Capital Gains. *NBER 26588*.

Fagereng, A., Holm, M. B., & Torstensen, K. N. (2020). Housing Wealth in Norway, 1993–2015. *Journal of Economic and Social Measurement*, *45*(1), 65–81.

Flodén, M., Kilström, M., Sigurdsson, J., & Vestman, R. (2021). Household Debt and Monetary Policy: Revealing the Cash-Flow Channel. *The Economic Journal*, *131*(636), 1742–1771.

Gertler, M., & Karadi, P. (2015). Monetary Policy Surprises, Credit Costs, and Economic Activity. *American Economic Journal: Macroeconomics*, *7*(1), 44–76.

Gomes, F., Peng, C., Smirnova, O., & Zhu, N. (2025). Reaching for yield: Evidence from households. *Journal of Financial Economics*, *168*, 104057.

Holm, M. B., Paul, P., & Tischbirek, A. (2021). The Transmission of Monetary Policy under the Microscope. *Journal of Political Economy*, *129*(10), 2861–2904.

Jordà, Ò. (2005). Estimation and Inference of Impulse Responses by Local Projections. *American Economic Review*, *95*(1), 161–182.

Kaniel, R., Saar, G., & Titman, S. (2008). Individual investor trading and stock returns. *The Journal of finance*, *63*(1), 273–310.

Kekre, R., & Lenel, M. (2022). Monetary Policy, Redistribution, and Risk Premia. *Econometrica*, *90*(5), 2249–2282.

Malmendier, U., & Nagel, S. (2011). Depression babies: Do macroeconomic experiences affect risk taking? *The quarterly journal of economics*, *126*(1), 373–416.

Melcangi, D., & Sterk, V. (2024). Stock Market Participation, Inequality, and Monetary Policy. *Review of Economic Studies*.

Nakamura, E., & Steinsson, J. (2018). Identification in Macroeconomics. *Journal of Economic Perspectives*, *32*(3), 59–86.

Ozkan, S., Hubmer, J., Salgado, S., & Halvorsen, E. (2023). Why are the wealthiest so wealthy? a longitudinal empirical investigation.

Romer, C. D., & Romer, D. H. (2004). A New Measure of Monetary Shocks: Derivation and Implications. *American Economic Review*, *94*(4), 1055–1084.

Vestman, R. (2019). Limited Stock Market Participation among Renters and Homeowners. *The Review of Financial Studies*, *32*(4), 1494–1535.

# Monetary Policy and Household Portfolio Composition

## Appendix

Tiago Bernardino (IIES, Stockholm University)

Pedro Brinca (Nova SBE)

Ana Melissa Ferreira (Nova SBE)

Hans A. Holter (U. Delaware)

Mariana N. Pires (Nova SBE)

Luís Teles Morais (Nova SBE)

# A Data Appendix

## A.1 Institutional Background

Understanding household financial behavior requires some knowledge of the broader environment in which households make their decisions. In Norway, a combination of high homeownership, accessible credit, high levels of educational attainment, and a comprehensive tax system shape incentives to borrow, save, and invest. This sub-section provides an overview of institutional and economic features that influence household financial decisions, including the structure of household debt, tax system, participation in financial markets, financial literacy, and taxation of capital income and wealth.

**Household debt** In Norway, household debt is notably high, with a debt-to-income ratio of around 218% in 2016, compared with 81% in Germany for the same year. This is largely driven by high homeownership (83% in 2016), supported by tax incentives and a small, unregulated rental sector, which encourages mortgage borrowing. Household debt consists in about 85% of Norway's secured housing loans from banks and mortgage companies, with the remainder made up of other loans such as consumer and student debt. The mortgage market is dominated by variable-rate loans, which accounted for 95% of outstanding contracts in Q2 2025, carrying an average interest rate of 5.73% (Statistics Norway, SSB). Norway introduced loan-to-value (LTV) limits similar to other European countries. In 2010, Norwegian authorities introduced a guideline limiting LTV ratios on mortgagess to 90%. The LTV ceiling was tightened to 85% in 2011 and formalized as a regulatory cap in 2015, with additional provisions for debt-to-income ratios and amortization. Most recently, at the end of 2024, the LTV ceiling was raised back to 90%.

**Secondary housing (cabins)** In 2023, one in six Norwegians owned a secondary residence, according to SSB. These properties are predominantly located in rural or semi-rural areas and serve as seasonal retreats. Cabin ownership is subject to specific tax rules. Capital gains from the sale of a holiday home are taxed as capital income at 22%, unless exemption criteria are met; for cabins primarily used for rental, gains may be reclassified and taxed as business income at rates up to 50.6%. Rental income is gener-

ally taxable, though properties mainly used for the owners leisure benefit from a NOK 10,000 tax-free allowance, while rental properties are fully taxed. In addition, cabins are included in the national and municipal wealth tax, levied on estimated market value at rates that in 2024, varied between 0% and 0.7%.

**Private equity** According to Norges Bank, most investors access private equity by allocating capital to funds that invest in private held companies—or in publicly listed companies that are taken private—to increase their value through active ownership and later selling at a profit. The share of investors portfolios allocated to private equity has grown steadily, averaging more than 7%.

In Norway, private equity is typically invested through transparent fund structures such as limited partnerships (KS) or general partnerships (ANS), hence capital income and gains are taxed directly to investors rather than at the fund level. Corporate investors benefit from the participation exemption, where most dividends and capital gains on qualifying shareholdings are tax-exempt, while losses are generally non-deductible. Individual investors are taxed under the shareholder model, with dividends and capital gains subject to ordinary income tax (22%) after a "risk-free return allowance", which leads to an effective rate of about 37.8%. Additionally, individuals are liable for wealth tax on unlisted shares, and exit tax may apply to unrealized gains if they leave Norway.

**Financial intermediation** Norwegian households have several options to invest in stock markets, primarily through direct stock purchases, equity mutual funds, and exchange-traded funds (ETFs). These assets are accessible via brokers such as Nordnet or DNB. The Aksjesparekonto (ASK) is a popular tax-advantaged account that allows investors to trade shares, equity funds, and ETFs with deferred capital gains tax (only taxed at 37.84% upon withdrawal, compared to immediate taxation otherwise). Dividends within ASK accounts are also tax-deferred, encouraging long-term investing. Alternatively, retail investors can use regular brokerage accounts, though these face immediate capital gains tax.

**Financial literacy and education** Educational attainment and general literacy levels in Norway were consistently high throughout the 1990s and 2000s, and continued to

improve over time. During this period, roughly one-third of adults had completed tertiary education, with the share rising from about 25% in the mid-1990s to over 35% by 2016 (Statistics Norway, SSB). Around 3540% held upper-secondary qualifications, while fewer than 30% had below upper-secondary education.

Norwegian students also performed above the OECD average in international assessments. In the first PISA wave (2000), 15-year-olds in Norway scored slightly above the OECD average in reading and mathematics, a pattern that persisted through 2015. Among adults, results from the International Adult Literacy Survey (IALS, 1998) and the OECD Survey of Adult Skills (PIAAC, 2013) show that Norwegian adults ranked among the top performers in literacy, numeracy, and problem-solving. These indicators suggest that both educational attainment and functional literacykey determinants of financial competencewere comparatively strong and stable across the 19932016 period.

**Taxation of capital income and wealth** Norway employs a dual income tax system, in which labor income is taxed progressively while capital income—which includes interest, dividends, and capital gains from the sale of shares—is taxed at a uniform flat rate. Wealth is taxed jointly for married couples, but the asset report is at the individual level. A tax reform was announced in 2004, and implemented beginning of 2006, which increased the tax from 0% to 28% of dividends and capital gains exceeding a threshold return determined by the Ministry of Finance. During the 2005 transition period, personally held shares could be transferred to holding companies without triggering capital gains tax.

In addition to income taxes, Norway levies a net wealth tax, which is relatively rare among European countries (only Spain and Switzerland also have a net wealth tax). This tax comprises both municipal and state components: the municipal rate in 2016 was 0.7%, and the state rate was 0.15% for net wealth exceeding NOK 1,400,000 for single taxpayers. In 2024, the municipal rate remained unchanged at 0.7%, although the threshold increased to NOK 1,700,000. The state tax in 2024 increased to 0.3% for wealth between NOK 1,700,001 - 20,000,000 and 0.4% for wealth above NOK 20,000,000. Norway used to have an inheritance tax but it was abolished in 2014.[23]

[23]For a more detailed discussion, see Ozkan et al. (2023).

## A.2 Data Cleaning

Our data relies on administrative records from four different Norwegian databases. The main data source is the Central Population Register (CPR), which covers all residents in Norway since 1964. The dataset is updated annually and contains demographic information such as date of birth, gender, marital status, and region of residence.

For this study, we focus on Norwegian adults aged 20 to 75 years. This age range is chosen to ensure that the financial decision-maker in each household is the holder of the assets. Income and wealth are then aggregated at the household level, with the household head defined as the oldest member, or in cases of equal age, the individual with the highest income. We merge the CPR data with three additional datasets: (i) the Norwegian Educational Database (NED), (ii) the Income and Wealth Tax Records (TR), and (iii) the Shareholder Registry (SR), which is available starting in 2004. After merging these datasets, we apply a set of sample restrictions.

We start with a sample of 3,995,942 households and 47,311,909 observations over time. First, we exclude households with after-tax income below the minimum threshold of the Norwegian social security scheme, which in 2015 was NOK 90,068. This restriction removes 160,389 households, resulting in 45,576,399 observations. Second, we retain only households with financial assets greater than NOK 1,000, as those with lower financial assets tend to exhibit volatile wealth that can distort estimates and may not reflect true portfolio adjustments due to monetary policy. This exclusion reduces the sample by an additional 66,859 households, leaving 42,438,800 observations. Third, we remove the bottom 1% of the net wealth distribution, eliminating 3,120 households, and keeping 42,014,412 observations. Fourth, we limit our analysis to households observed for at least five consecutive tax filings, which results in the exclusion of 1,309,399 households, yielding a final sample of 38,149,028 households between 1993 and 2016. Table A.1 summarizes the above information.

**Table A.1:** Data Cleaning Steps for the Baseline Specification

| Step | Description | Households | Observations |
|---|---|---|---|
| 0 | Initial sample | 3,995,942 | 47,311,909 |
| 1 | Exclude HH with after-tax income below NOK 90,068 | 3,835,553 | 45,576,399 |
| 2 | Exclude HH with financial assets below NOK 1,000 | 3,768,694 | 42,438,800 |
| 3 | Exclude HH in bottom 1% of net wealth distribution | 3,765,574 | 42,014,412 |
| 4 | Exclude HH observed less than 5 consecutive years | 2,456,175 | 38,149,028 |

**Notes**: This table shows the cleaning steps performed for the baseline specification present in Section 4. The last two columns contain the number of households and total observations after exclusions.

## A.3 Variables and Definitions

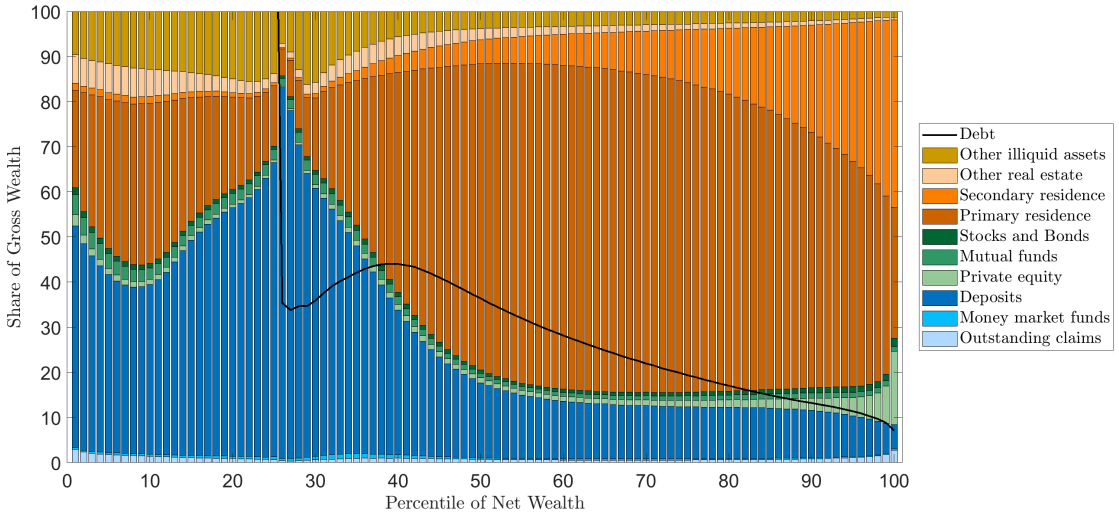
**Table A.2:** Detailed Information on Variables

| Code | Name | Definition |
|---|---|---|
| | | *I. Risky Assets* $(W^R)$ |
| TR 4.1.4 | Mutual funds | Collective investment undertakings through which an indefinite circle of investors pool funds for investment mostly in securities such as listed shares, equity certificates, bonds, and short-term debt securities |
| TR 4.1.7 | Stocks and bonds (VPS) | Ownership stake in a limited liability listed company and forms part of the company's equity. The holder of the shares is entitled to a share of the profit in the company as well as a share of the assets in the event of liquidation |
| TR 4.1.8 | Stocks and bonds (not VPS) | Shares in non-listed Norwegian firms plus non-listed bonds and options, also known as private equity |
| | | *II. Safe Assets* $(W^S)$ |
| TR 4.1.1 | Deposits | Includes deposits in the central bank and other banks. Typical forms of deposits are transferable deposits, time deposits, and contractual deposits. We also include deposits held in foreign institutions, and notes and coins, including both domestic and foreign currencies |
| TR 4.1.3 | Cash | Notes and coins, including both domestic and foreign currencies |
| TR 4.1.9 | Deposits abroad | Deposits held in foreign institutions |
| TR 4.1.5 | Money market funds | Type of mutual fund that only invests in short-term debt securities. These funds do not invest in bonds with a maturity date of longer than 1 year |
| TR 4.1.6 | Outstanding claims and receivables | Loans to friends and family, salary and maintenance payments owed, and/or advances paid for a service not yet received as of 31 December. Also, include secured receivables such as mortgage bonds, debt certificates, etc. which must be valued at their market value. |
| | | *III. Housing* $(W^H)$ |
| TR 4.3.2 | Primary residence | Owner-occupied housing used as main residence. |
| TR 4.3.3 | Secondary residence | Owner-occupied holiday home. |
| TR 4.3.4 | Other real estate | Real estate apart from housing and holiday homes. |
| | | *IV. Vehicles* $(W^I)$ |
| TR 4.2.5 | Vehicles | - |
| TR 4.2.6 | Car | - |
| TR 4.2.4 | Boats | - |
| | | *Other Variables* |
| BEL484 | Total debt | Includes mortgages, consumer debt, and student debt |

**Notes**: VPS, short for *Verdipapirsentralen*, is Norway's central securities depository responsible for managing the settlement of securities transactions and the registration of ownership rights associated with these securities. The codes of the variables correspond to the ones attributed in the TR database.

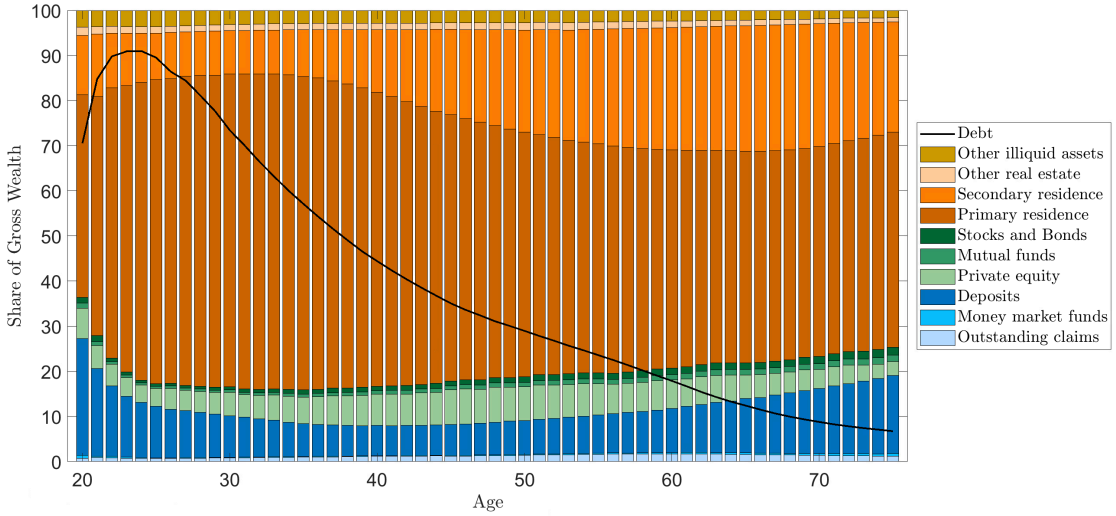
# B Additional Descriptive Plots

**Figure B.1:** Gross wealth composition along the net wealth




**Notes**: Composition of household gross wealth along the net wealth distribution with additional shares for main components of risky and safe financial wealth. Data are for 1993-2016.

**Figure B.2:** Gross wealth composition along the life-cycle

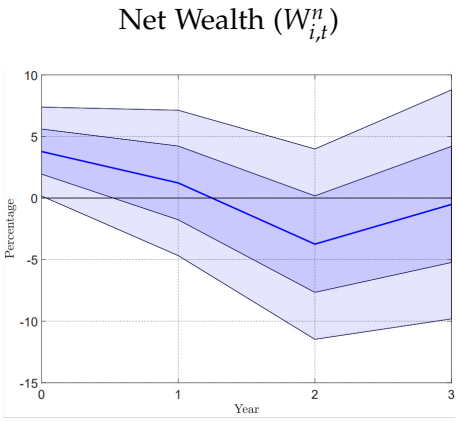



**Notes**: Composition of household gross wealth along age distribution with additional shares for main components of risky and safe financial wealth. Data are for 1993-2016.

# C Results Appendix

## C.1 Additional Figures

**Figure C.3:** Monetary Policy and the Household Portfolios Size



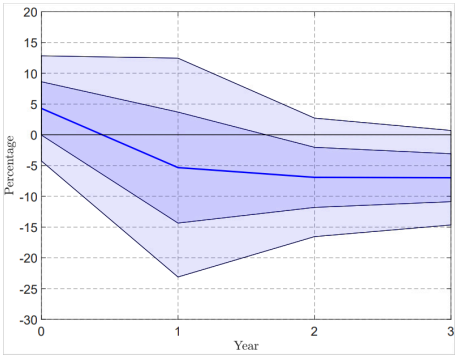

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The darker and lighter areas correspond to the 95% and 68% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

## C.2 Robustness

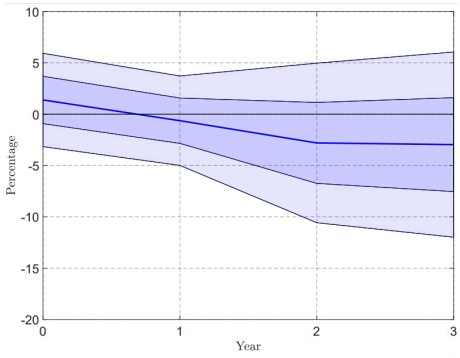
### C.2.1 Robustness: Monetary shocks as an instrument

**Figure C.4:** Impulse Responses by Asset Category to a Monetary Policy Shock

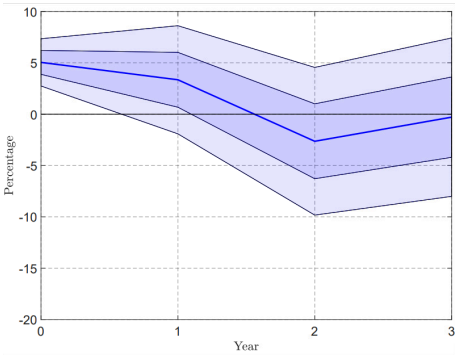
Risky Assets ($W^R_{i,t}$)



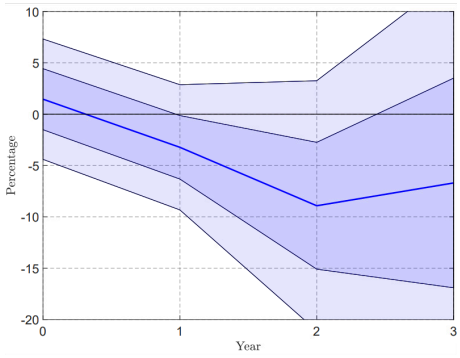

Safe Assets ($W^S_{i,t}$)




Housing ($W^H_{i,t}$)



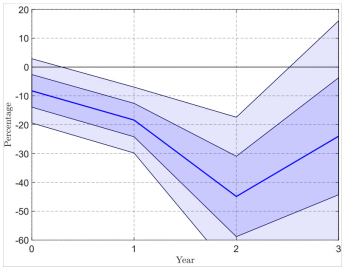

Other Illiquid Assets ($W^I_{i,t}$)



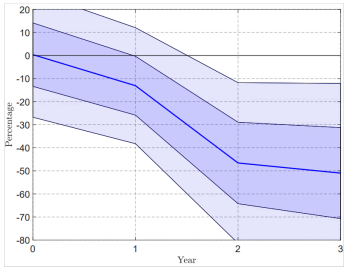

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The darker and lighter areas correspond to the 95% and 90% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

**Figure C.5:** Impulse Responses by Individual Asset to a Monetary Policy Shock

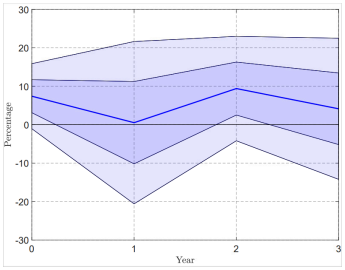
(a) Stocks and Bonds



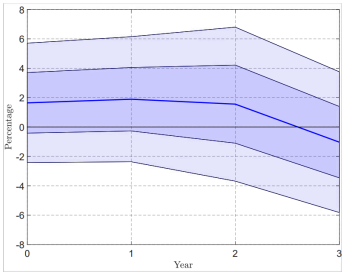

(b) Mutual Funds



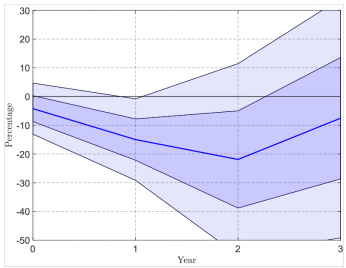

(c) Private Equity



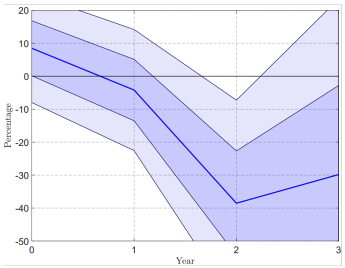

(d) Deposits




(e) Outstanding Claims




(f) MMFs

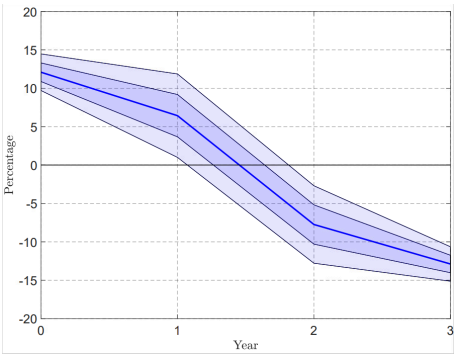



**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The darker and lighter areas correspond to the 95% and 90% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

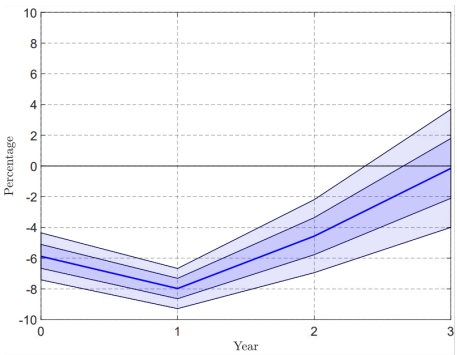
### C.2.2 Robustness: Sample Period

**Figure C.6:** Impulse Responses by Asset Category to a Monetary Policy Shock

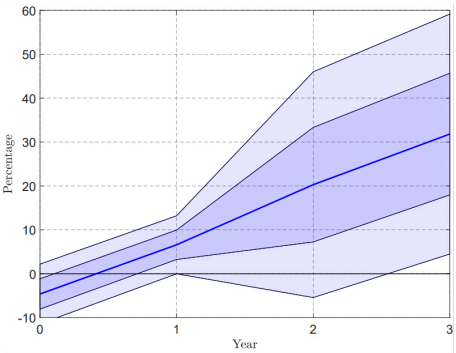
Risky Assets ($W^R_{i,t}$)



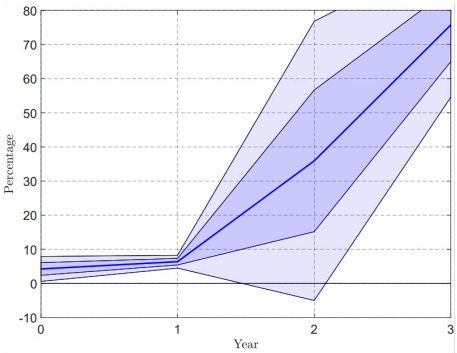

Safe Assets ($W^S_{i,t}$)




Housing ($W^H_{i,t}$)



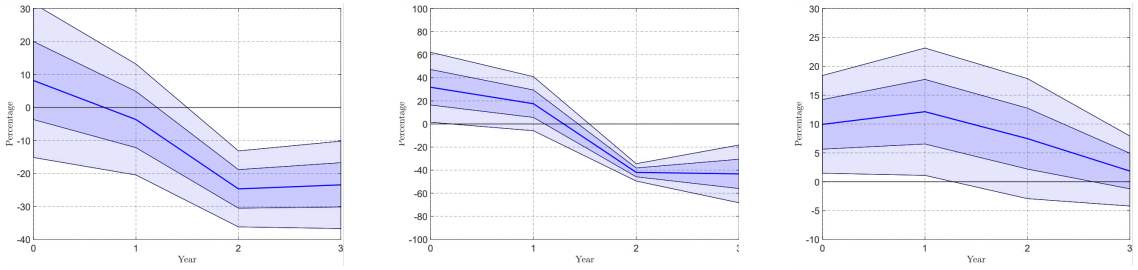

Other Illiquid Assets ($W^I_{i,t}$)



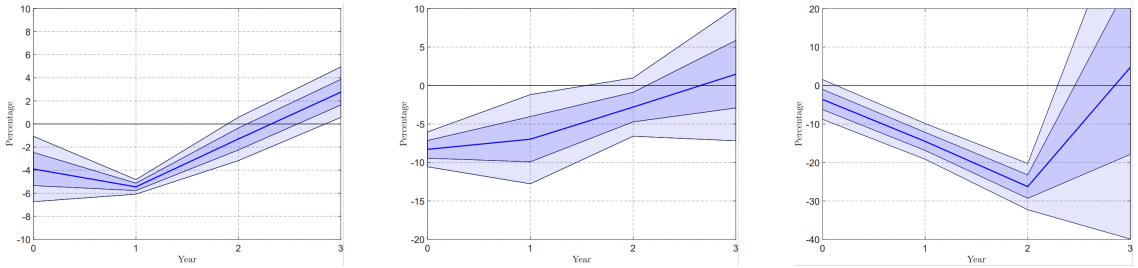

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The darker and lighter areas correspond to the 95% and 90% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

**Figure C.7:** Impulse Responses by Individual Asset to a Monetary Policy Shock

(a) Stocks and Bonds (b) Mutual Funds (c) Private Equity



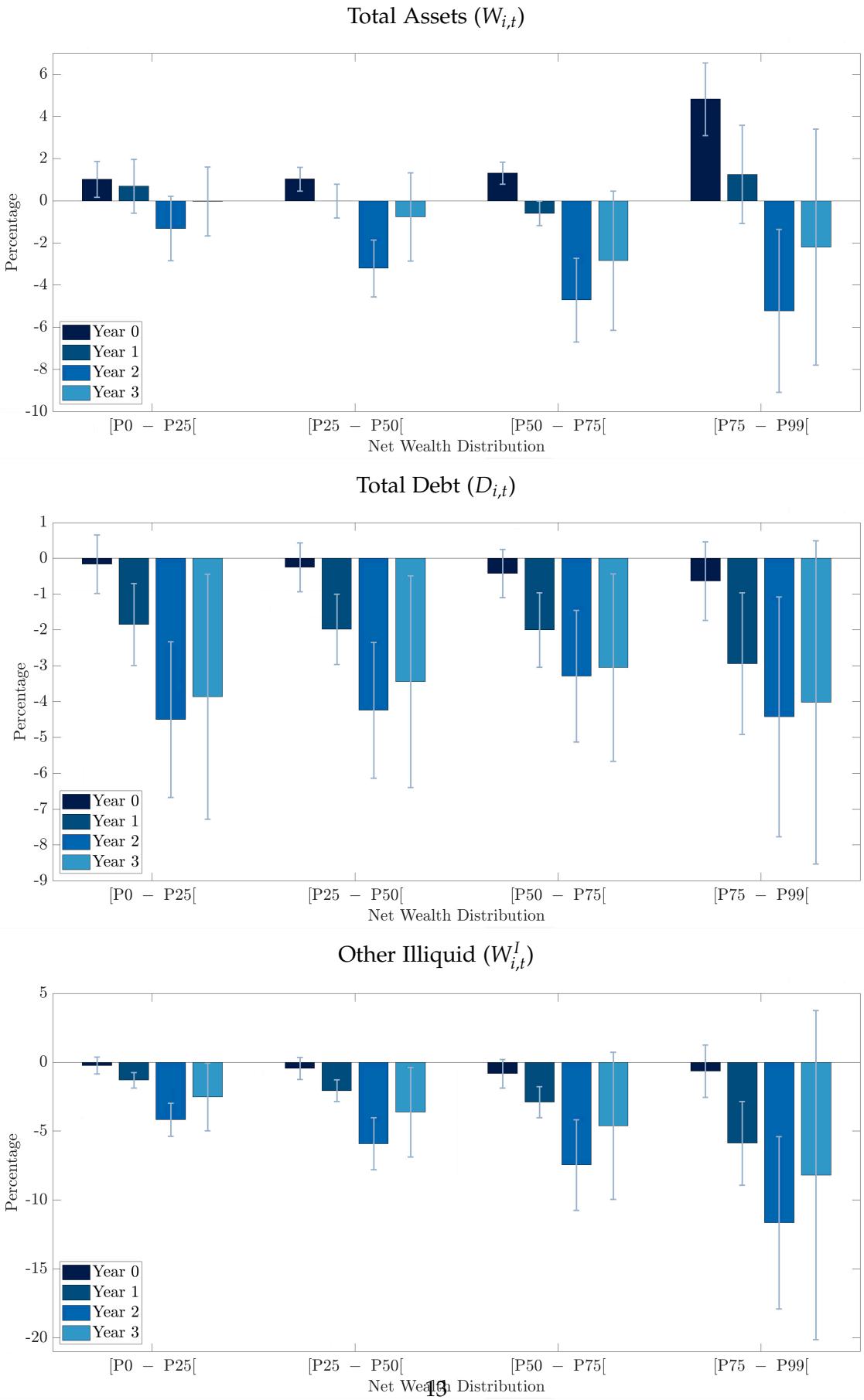

(d) Deposits (e) Outstanding Claims (f) MMFs




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The darker and lighter areas correspond to the 95% and 90% confidence bands, respectively, using clustered standard errors a la Correia (2017) at the year level.

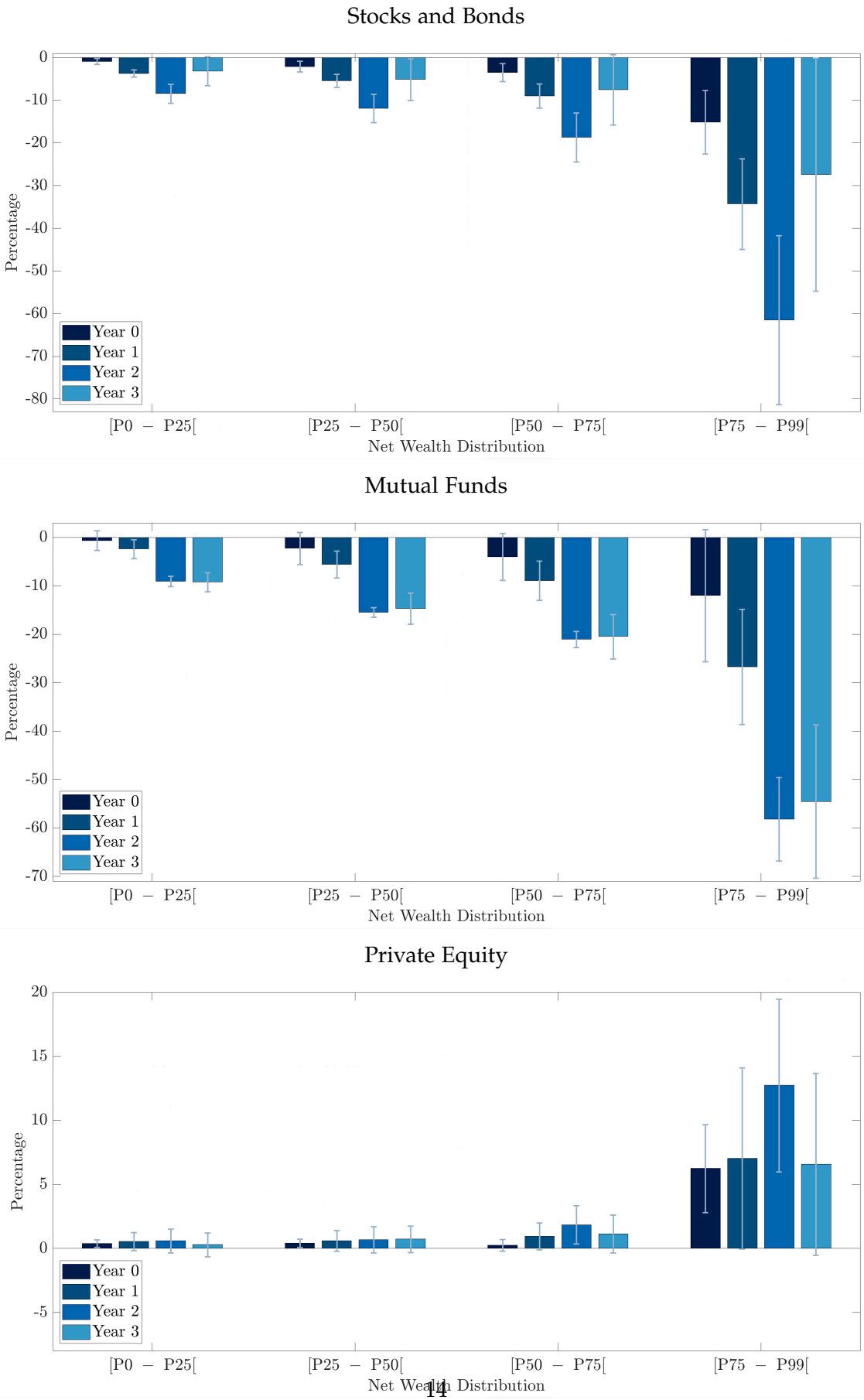
## C.3 Heterogeneity

**Figure C.8:** Heterogeneity along Net Wealth



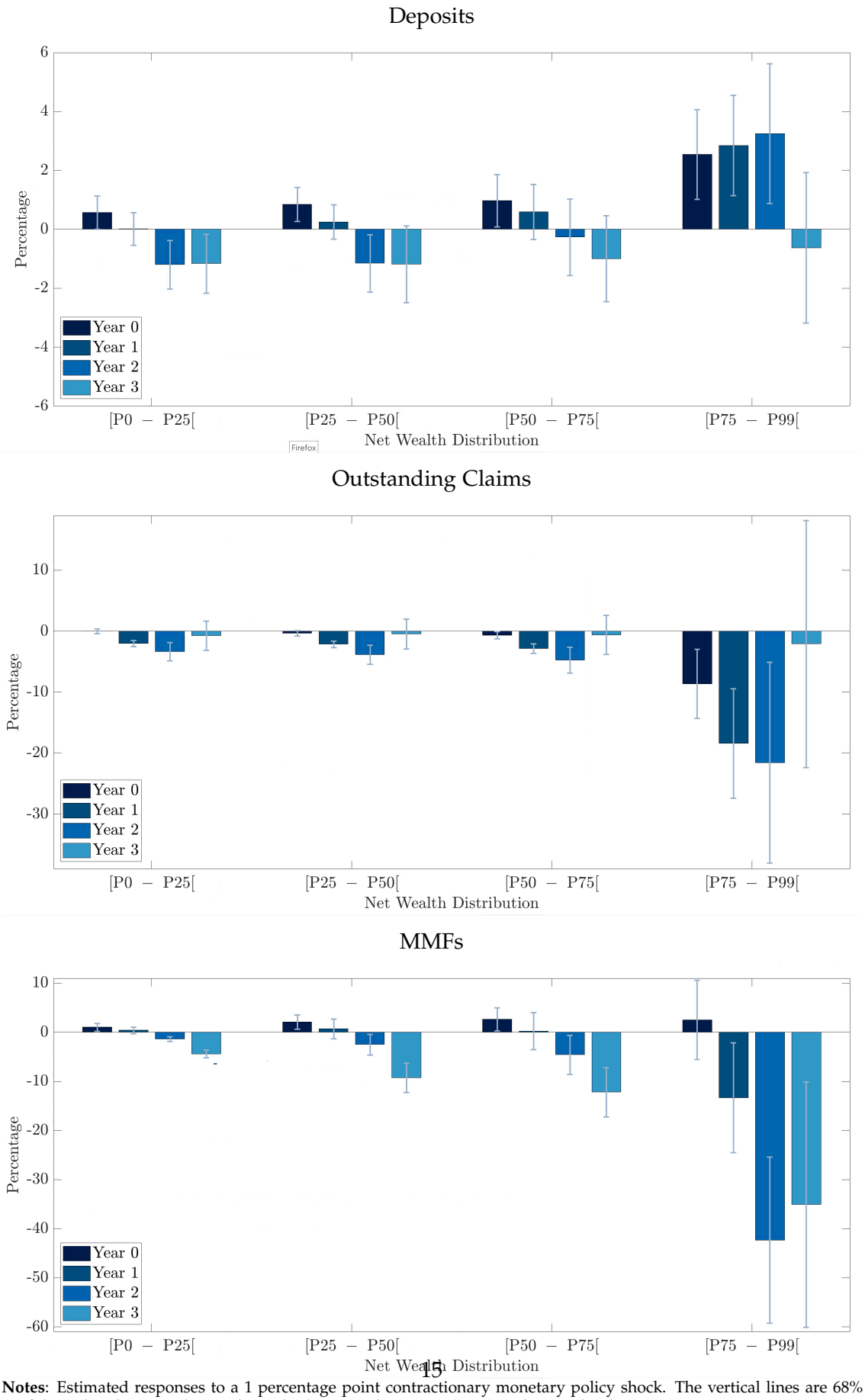

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

**Figure C.9:** Heterogeneity along Net Wealth - individual risky assets



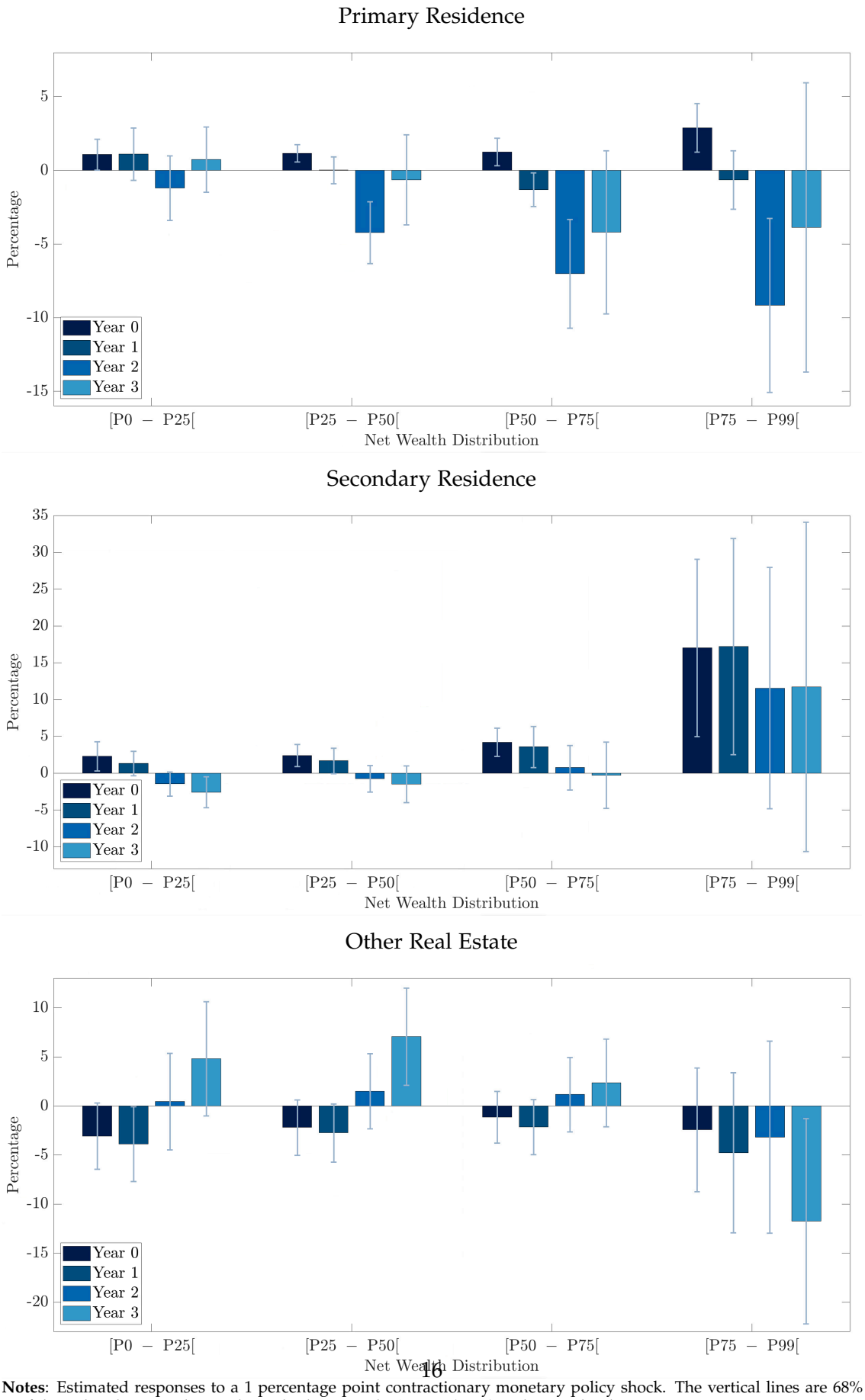

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

**Figure C.10:** Heterogeneity along Net Wealth - individual safe assets



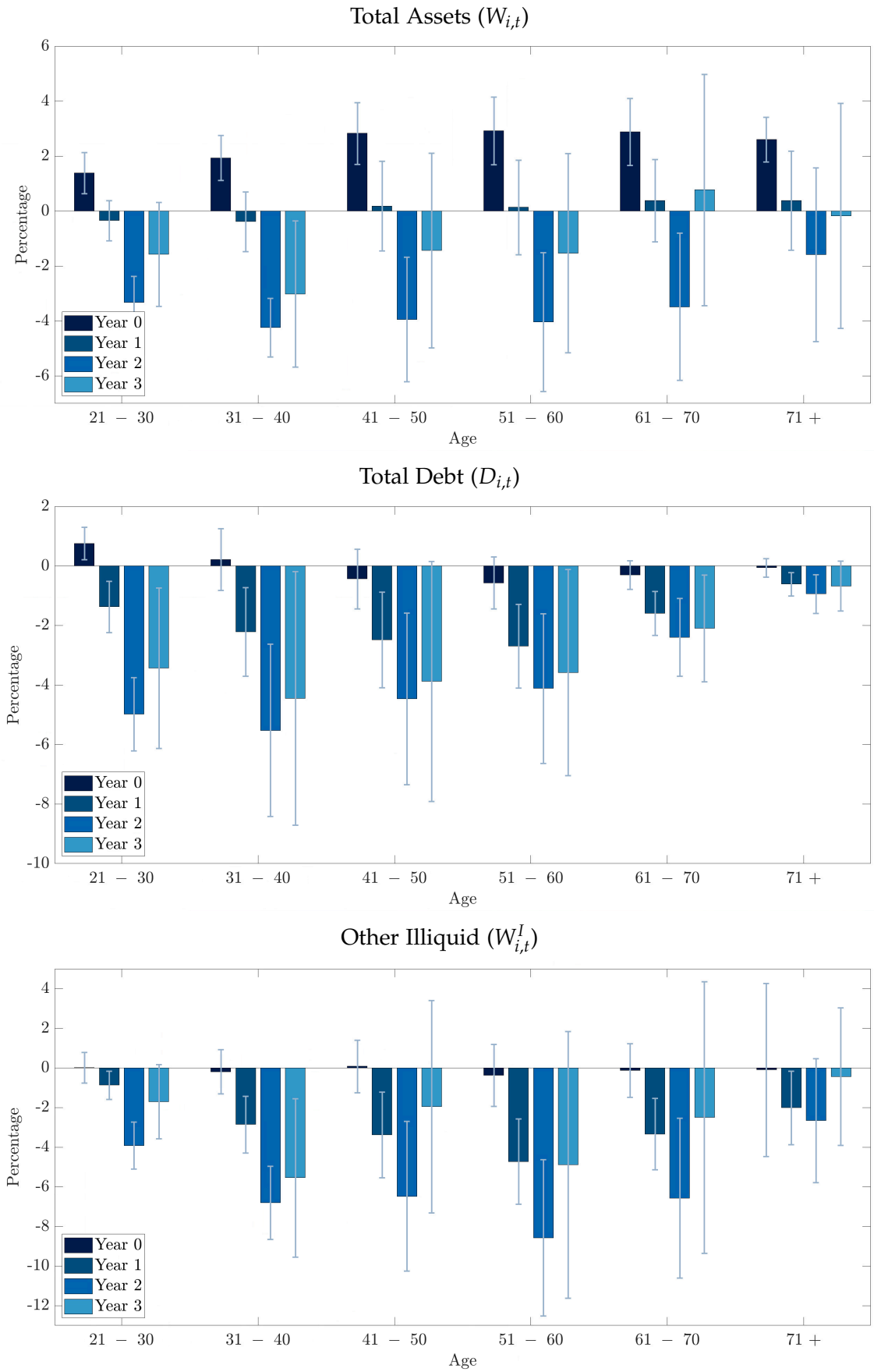

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

**Figure C.11:** Heterogeneity along Net Wealth - housing



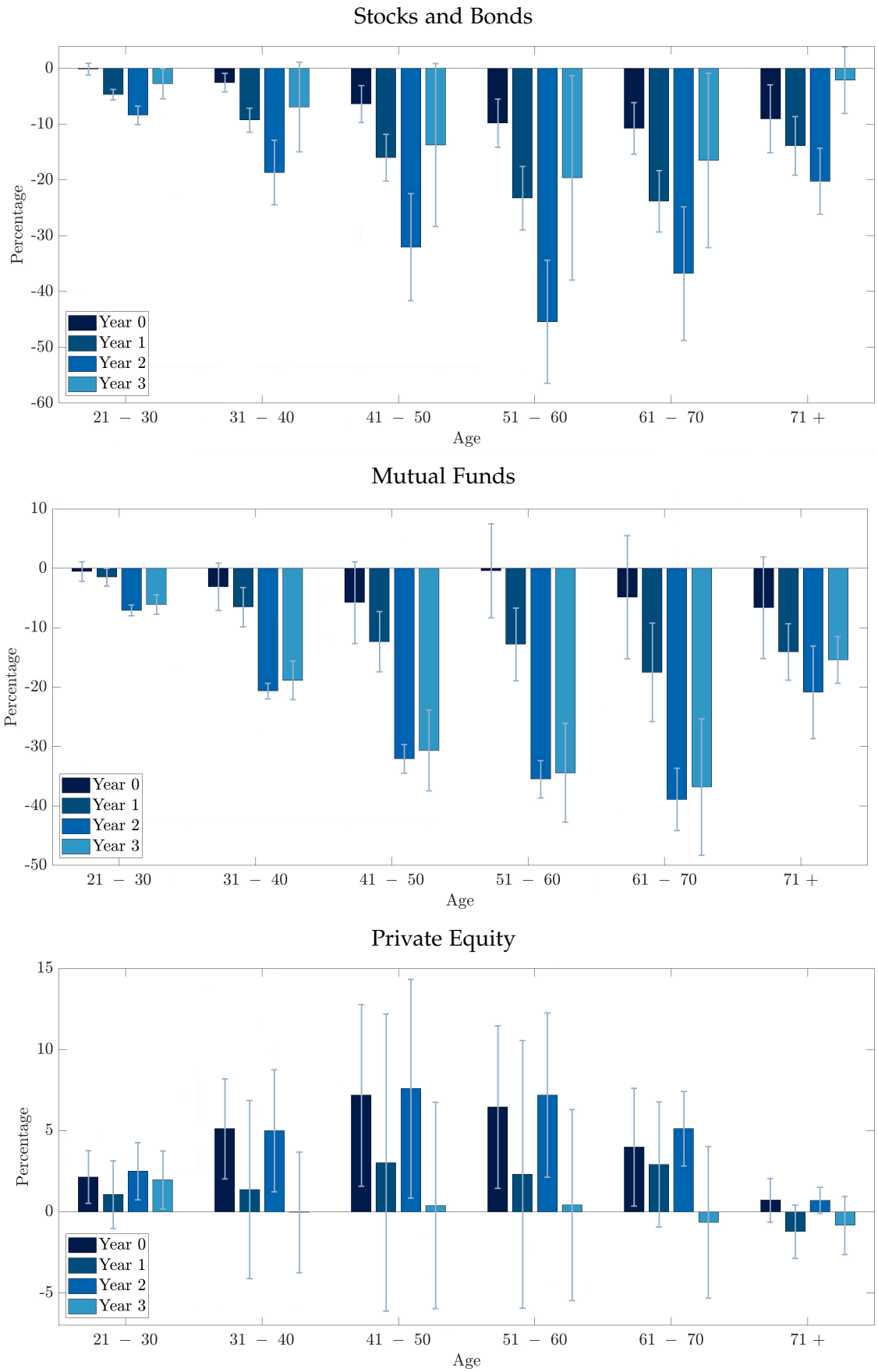

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

**Figure C.12:** Heterogeneity along Age



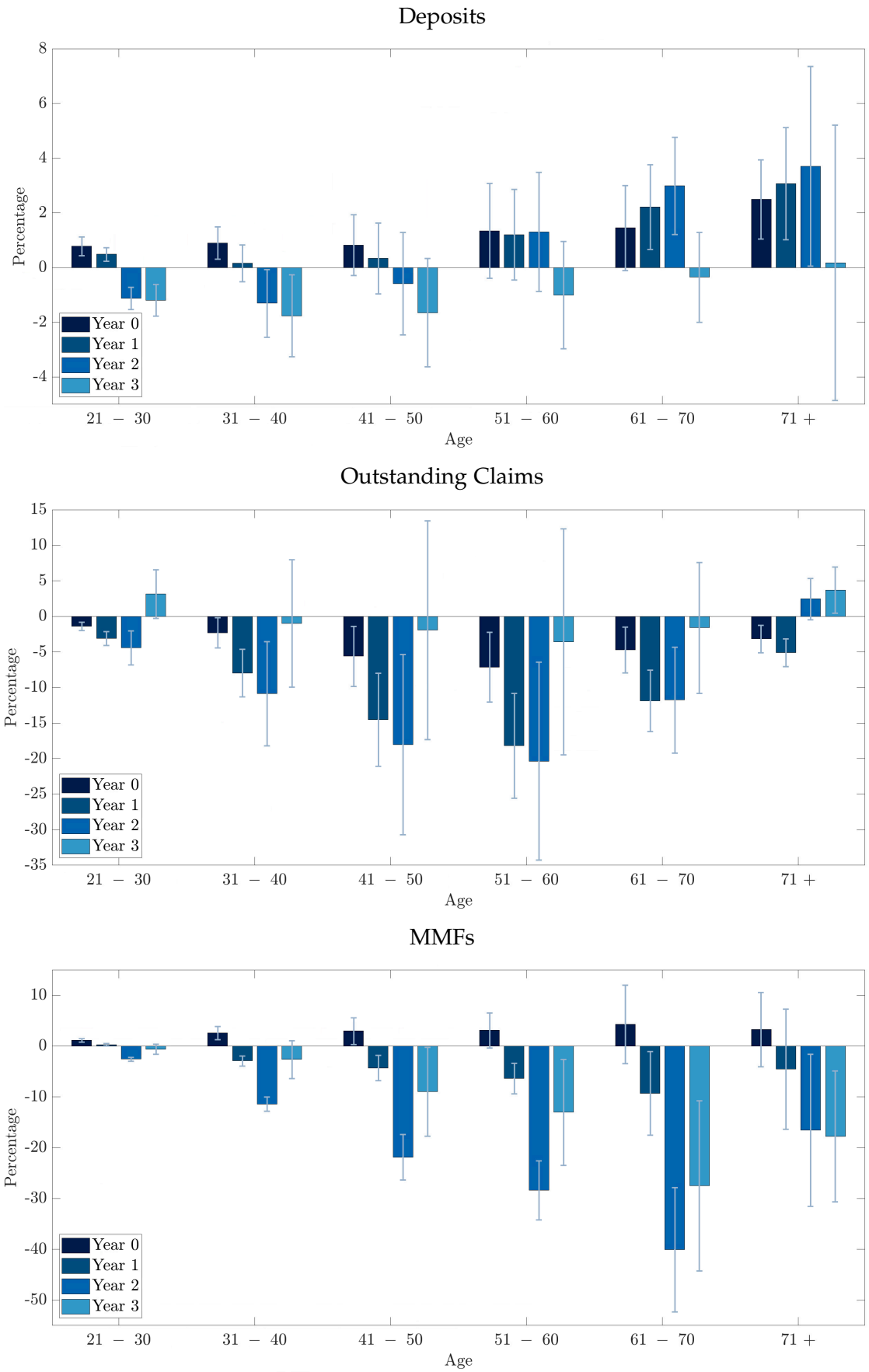

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Cortes (2017) at the year level.

**Figure C.13:** Heterogeneity along Net Wealth - individual risky assets



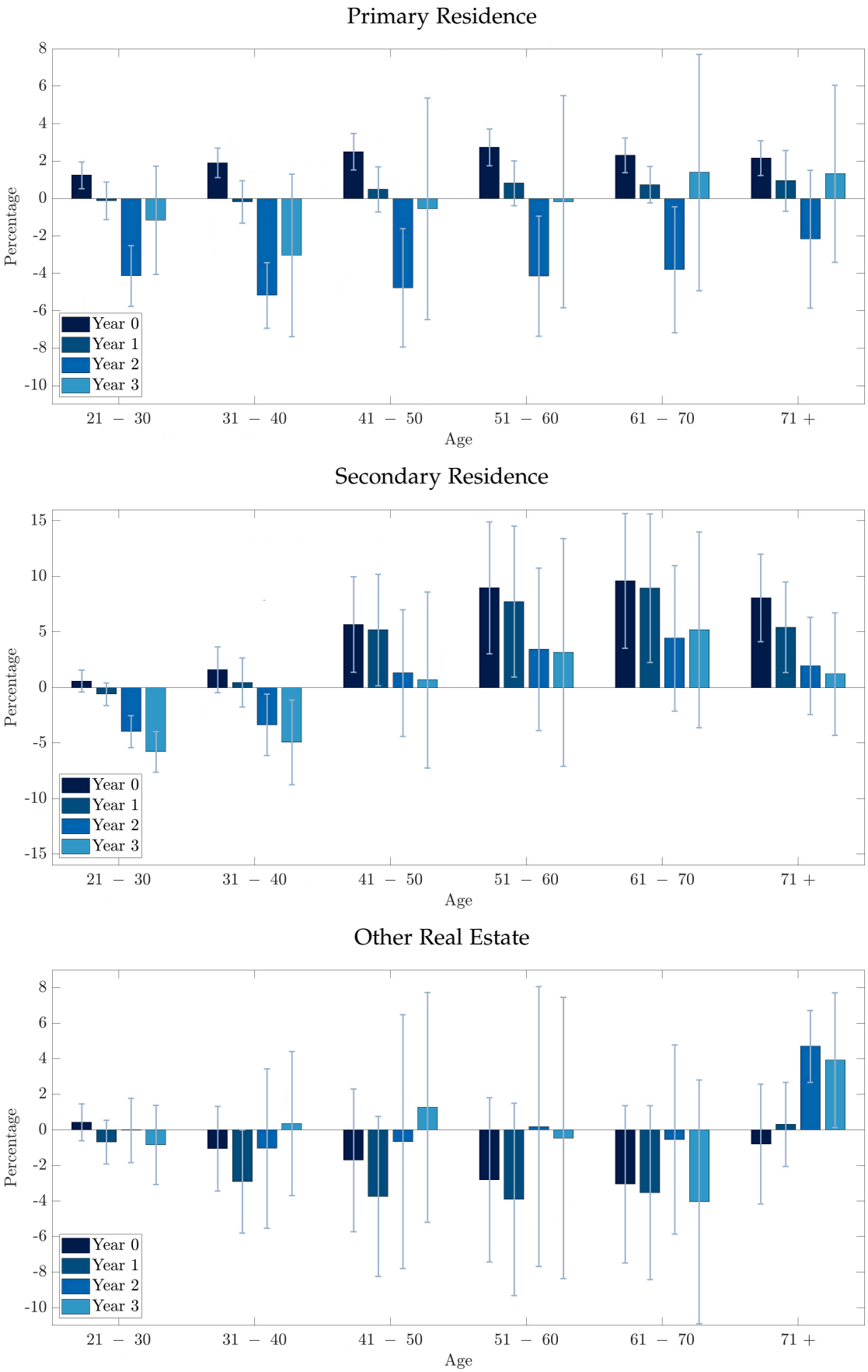

**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Conley (2017) at the year level.

**Figure C.14:** Heterogeneity along Net Wealth - individual safe assets




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.

**Figure C.15:** Heterogeneity along Net Wealth - housing




**Notes**: Estimated responses to a 1 percentage point contractionary monetary policy shock. The vertical lines are 68% confidence bands using clustered standard errors a la Correia (2017) at the year level.