Portfolio Flows, Household Rebalancing, and House Prices*

Daniel Marcel te Kaat† Chang Ma‡ Alessandro Rebucci§

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Abstract

We study how cross-border portfolio flows affect households' portfolio rebalancing and house price expectations. Estimating both a difference-in-differences regression around a specific inflow episode and continuous treatment specifications on household-level data from the ECB's Household Finance and Consumption Survey over the period 2009-2018, we find that portfolio flows induce households with larger ex-ante bond and equity shares to rebalance more strongly towards housing. The effect is not driven by higher pre-treatment access to credit or higher credit growth during the treatment period. The effects are stronger for wealthier and less risk-averse households. We also find that portfolio flows, unlike direct investments or credit flows, predict aggregate house prices and that portfolio rebalancing is associated with higher household-level house price expectations.

Keywords: Capital Flows, Portfolio Flows, Household Portfolio Rebalancing, House Prices, Real Estate, Credit channel
JEL Classifications: F32, G11, G12, G51, R30

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†University of Groningen (d.m.te.kaat@rug.nl)
‡Fanhai International School of Finance, Fudan University (changma@fudan.edu.cn)
§Corresponding author: JHU Carey Business School, ABFER, CEPR and NBER (arebucci@jhu.edu)

1 Introduction

International capital flows correlate positively with house prices (Favilukis, Kohn, Ludvigson and Van Nieuwerburgh 2013, In't Veld, Kollmann, Pataracchia, Ratto and Roeger 2014, Jordà, Schularick and Taylor 2017). This paper proposes a mechanism to interpret this correlation in European post-Global Financial Crisis household data that does not necessarily hinge on credit. In a standard portfolio problem, exogenous foreign portfolio equity and debt inflows can decrease the risk premium on these assets, which induces domestic households to rebalance towards other assets, such as housing. Higher household housing portfolio demand bids up house prices and lowers the housing risk preimum. Such a household rebalancing channel can take place alongside the traditional credit and collateral channel, but it is not necessarily reliant on higher credit supply or financial market liberalization.

When we investigate this rebalancing channel in euro area household survey data, we find that a 10-percentage point increase in portfolio flows as a share of national nominal GDP raises the household-level share of housing wealth of households with larger initial bond and equity holdings (at the 75^{th} percentile of the distribution) relative to those with fewer holdings (25^{th} percentile) by an additional 0.38 percentage points. We also document that country portfolio flows, unlike foreign direct and credit flows, predict aggregate house prices with a 1-2-year lag. Finally, we find that portfolio inflows lead to higher household house price expectations. Importantly, we find that the portfolio rebalancing that we document is not driven by higher pre-treatment access to credit or higher mortgage borrowing during the treatment period.

We obtain these results utilizing a panel of household data from the European Central Bank's Household Finance and Consumption Survey (HFCS). This survey data contains detailed information on the composition of household wealth, borrowing activity, income, and other household characteristics of households in euro area countries over three survey waves in 2009-11, 2013-14, and 2017-18. We combine this data with national capital flow data from the IMF's International Financial Statistics. Given the significant variation in capital

flows across countries, as well as the differential impact of the European sovereign debt crisis on these dynamics in the euro area in the 2000s and 2010s, and the wide heterogeneity of household survey data, this setting provides an interesting backdrop for our empirical analysis relative to the well-researched US case.

To establish a causal relationship between portfolio flows and households' portfolio rebalancing and their house price expectations we estimate difference-in-differences specifications around the European sovereign debt crisis of 2010-12 that exploit both cross-country variation in capital flows and cross-household heterogeneity in the exposure to such flows, whereas exposure is measured as the pre-treatment share of the wealth that a household invests in equity and bonds. We externally validate our main results through a battery of regressions employing pooled cross-section data from a larger sample of euro area countries in the HFCS.

Our main result is that cross-border portfolio inflows drive more exposed households to rebalance their portfolios from bonds and equities to housing, also causing an increase in individual house price expectations. More specifically, a 10-percentage point increase in portfolio flows as a share of national nominal GDP (about half a standard deviation in our sample) raises the share of housing wealth for households with larger initial bond and equity holdings (at the 75^{th} percentile of the distribution) relative to those with fewer holdings (25^{th} percentile) by an additional 0.38 percentage points. The more exposed households also increase the number of owned properties, which unambiguously controls for valuation effects.

We further show that our results are stronger for wealthier households in the upper decile of the country-wave-specific net wealth distribution and for less risk-averse households. We also gauge that households with larger initial deposit shares rebalance more significantly, indicating that more exposed households also use some of their deposits to rebalance towards housing.[1] Additionally, we find that rebalancing happens also toward second homes, suggesting that it might be driven by a buy-to-let motive of wealthier households.

[1]This latter result is unlikely to be driven by the ECB's negative interest rate policy (which should also have a stronger effect on high-deposits households) because banks only passed on negative rates to retail customers after the end of our sample period in 2018.

Importantly, we show that the rebalancing that we document is not driven by credit access or mortgage borrowing. In particular, we show that (i) more exposed households do not raise their borrowing during the treatment period; (ii) households with better pre-treatment credit access or (iii) a stronger credit increase after portfolio inflows do not rebalance more significantly than other households; and (iv) our main results survive when controlling for the country-level change in banks' credit standards to households (a measure for financial market liberalization as in Favilukis et al. 2013).

Finally, we provide evidence that households more exposed to this channel also increase their house price expectations following portfolio inflows. When we compare the house price expectations across different sides of this rebalancing trade by using households not owning real estate at all during the sample period as a reference group, we find that both buyers and owners have higher house price expectations, while sellers, especially those that sell their first home, have lower price expectations.

Our results are very robust. First, they hold when we separate portfolio flows into equity and debt flows. In contrast, they disappear for FDI flows that account for direct purchases of residential real estate and other investment flows, which consist mainly of cross-border interbank lending. Second, when we estimate our difference-in-differences specification during a placebo episode without significant cross-country heterogeneity in portfolio flows, our coefficients turn statistically insignificant. Third, our results are also robust to controlling for interactions between country-level portfolio flows and other household characteristics, such as income, net worth, age, and tenure status. Fourth, our results also survive when we use alternative ways to compute the bond and equity share by imputing missing observations. Finally, the pooled cross-sectional fixed-effects regressions that we estimate allow considering a larger number of countries in the analysis and externally validate our benchmark results.

Our empirical analysis suggests that the post-GFC euro area house price expansion was also driven by household portfolio rebalancing, and not only by the credit recovery or its heterogeneous distribution across countries. These findings add a new dimension to the

policy discourse, echoing the existing literature that documents that house price booms can also occur without credit booms (e.g., Cerutti, Dagher and Dell'Ariccia, 2017). In fact, our findings imply that macroprudential policy interventions targeting leverage and credit growth might not be enough to contain excessive house price growth and boom-bust cycles in housing markets and could be complemented by house transaction taxes that several countries have started to adopt.

Related Literature Our paper relates to the literature along multiple dimensions. First, we contribute to the literature investigating the two-way relationship between cross-border capital flows and house prices that mainly focuses on the US case. Ferrero (2015), Aizenman and Jinjarak (2009), Gete (2009), and Adam, Kuang and Marcet (2012) investigate the causal channel from house prices to the current account balance. As Sá and Wieladek (2015), we focus on the impact of capital flows on house prices, but unlike that paper, we study this relationship by exploiting data variation at both the country and the household levels.

In the literature on capital flows and the US housing boom, two papers closely related to ours are Favilukis, Kohn, Ludvigson and Van Nieuwerburgh (2013) and Favilukis, Ludvigson and Van Nieuwerburgh (2017). Favilukis et al. (2017) set up a quantitative general equilibrium model with aggregate risk and household heterogeneity in which cross-border capital flows into the US bond market, modeled as a safe asset, lower the risk-free rate but increase the risk premium on both equities and housing. This framework cannot explain the US housing boom without a concomitant exogenous relaxation of borrowing constraints that lower equity and housing risk premia more than the increase triggered by the lower risk-free rate. In this setting, an exogenous cross-border capital inflow crowds domestic households out of safe asset markets and exposes them to riskier equity and housing markets. Conversely, an exogenous relaxation of collateral constraints that enhances households' access to mortgage credit pushes up house prices by leading to lower aggregate risk and risk premia. Furthermore, Favilukis et al. (2017) empirically establish that lower real interest rates driven by foreign capital inflows into the United States do not explain the house price boom in the

United States once adjustments for a credit supply increase are made.

In contrast, in this paper, we treat long-term bonds as risky assets. We then empirically document that, in European data, cross-border portfolio inflows into *risky* bonds and equities can lead to higher house price expectations through portfolio rebalancing from risky financial assets to housing, assuming that the latter are substitute assets in household portfolios. Thus, the portfolio rebalancing channel that we document in European household data also operates through risk premia, but the mechanism differs compared to Favilukis et al. (2017). As in the portfolio model in Boddin, te Kaat, Ma and Rebucci (2022), in our setting, the housing risk premium can decline as a direct consequence of an exogenous inflow of capital into other risky financial assets, as opposed to the relaxation of credit constraints, if we assume that risky financial assets and housing are substitute assets in household portfolios. In this transmission mechanism, foreign investors crowd out domestic households from risky bond and equity markets rather than markets for safe assets, inducing them to rebalance their portfolios toward housing. Furthermore, and differently from the US case studied by Favilukis et al. (2013), our empirical evidence shows that, in European data, this mechanism can operate independently of any surge in credit supply typically associated with capital inflows or financial market liberalizations. In fact, we find that our mechanism is present and salient even after carefully controlling for the potential role of credit in the transmission of portfolio flows to European countries.

Second, there is an important literature on the effects of foreign home buyers on the residential real estate markets of "superstar" cities, such as London, New York, San Francisco, and Vancouver. For instance, Favilukis and Van Nieuwerburgh (2021) show that out-of-town home buyers and related capital inflows affect housing prices and rents in US metropolitan areas. Badarinza and Ramadorai (2018) estimate that about 8% of the house price variation in London can be attributed to foreign demand, an impact that is consistent with the results in Sa (2016). Deng, Liao, Yu and Zhang (2022) exploit a quasi-natural experiment in China showing that out-of-town housing demand leads to local house price increases. Barcelona,

Converse and Wong (2021) document that large US cities with stronger exposure to Chinese investors experienced higher house price growth. Finally, Chow and Xie (2016) find that higher FDI inflows into the real estate sector in Singapore (as a proxy for foreign purchases of houses) raise real estate prices, consistent with Li et al. (2021), who show that real estate capital flows into the US raise local housing prices and employment. In contrast to these studies that focus on the *direct* effects of out-of-town buyers (and associated capital inflows) on house prices, we quantify the *indirect* impact through portfolio rebalancing, whereas foreign investors in domestic equity and bond market "crowd out" wealthy domestic households, inducing them to raise their exposure to real estate holdings.

Third, this paper contributes to the literature that focuses on households' portfolio choices conditional on their real estate exposure. For instance, Flavin and Yamashita (2002) relate housing consumption to optimal investments in other asset classes and particularly equity. In a similar fashion, Yao and Zhang (2005) highlight the relevance of housing in shaping household portfolio structures in a model that allows households to choose between renting and owning. Cocco (2005) shows that housing affects the cross-household variation in stock market participation. Chetty, Sándor and Szeidl (2017) show that the effect of housing on equity portfolio shares depends on the prevalence of home equity and mortgage financing, with only greater home equity wealth (given constant property wealth) increasing the participation in the stock market. Our paper contributes to this literature by documenting how household portfolios respond to cross-border portfolio flows.

Finally, we also contribute to the literature on capital flows in the euro area—see Lane (2013) for an overview of their dynamics pre- and post-crisis. For example, Bergant, Fidora and Schmitz (2020) study the impact of monetary policy on household portfolio rebalancing across listed securities and find that it leads to capital outflows. Beck, Georgiadis and Gräb (2016) gauge that investors during the European debt crisis rebalanced their portfolios towards less affected countries, thus affecting within-euro area capital flows. Faia, Salomao and Veghazy (2022) highlight the importance of distinguishing among different types of

investors, with insurance companies and pension funds having a stronger preference for local assets than mutual funds. Related to this body of work, and similar to Favilukis et al. (2013), Bednarek, Kaat, Ma and Rebucci (2021) document that, while banks' portfolio rebalancing from Southern Europe to Germany during the European debt crisis contributed to expanding the credit supply to firms with more tangible collateral, causing an increase in commercial real estate prices, this mechanism is not at work in the residential real estate market in Germany. Our contribution, here, is to identify the impact of capital flows on housing portfolio shares, focusing on households rather than institutional investors or firms, and also to document an alternative channel of transmission of exogenous capital flow shocks on house price expectations that does not depend on the credit and collateral channel.

The rest of the paper is organized as follows. Section 2 discusses the data used and reports summary statistics. Section 3 provides some aggregate stylized facts related to the proposed transmission mechanism. Section 4 discusses the identification strategy and reports our main empirical results. Section 5 investigates the impact of portfolio flows and rebalancing on households' house price expectations. Section 6 concludes. An Online Appendix provides additional details on data sources, variable definitions, and supplementary results.

2 Data

We combine European household-level data from the ECB's Household Finance and Consumption Survey (HFCS) with national capital flow data from the IMF's International Financial Statistics and house price data from Eurostat. We describe the main data source and report selected summary statistics, with details reported in the appendix.

2.1 Household Data

The HFCS data include detailed wealth, borrowing, and income information for households in 22 European countries. They were interviewed in three survey waves in 2009-2011 (wave

1), 2013-2014 (wave 2), and 2016-2018 (wave 3).[2] For identification purposes, we estimate our benchmark regression, i.e., a difference-in-differences specification around the European sovereign debt crisis of 2010-12, with HFCS data for six of these countries that compile their surveys as panels. The six-country panel covers the first two waves of the HFCS and includes more than 8,000 households in Belgium, Cyprus, Germany, Italy Netherlands, and Spain—three core and three periphery countries of the euro area.

To externally validate our main difference-in-differences results, however, we also estimate a pooled, cross-sectional fixed effects model using cross-section data for 11 countries. This part of the analysis uses data from more than 25,000 households.[3]

The HFCS relies on imputing techniques to manage households' non-responses. Specifically, it predicts missing values for a particular variable based on non-missing data from other related variables. We only use the first (of five) imputed value (henceforth "implicate"), because most variables that we use are populated, and all five implicates take the same value. In unreported regressions, we obtain virtually unchanged results when using the other four implicates. Note that we do not use survey weights provided by the HFCS, which can help align the representativeness of households in the survey with the actual population. As Cameron and Trivedi (2005) point out, one does not need to use sample weights when a regression is correctly specified—they are only necessary when a regression model is misspecified or when researchers take a purely descriptive approach. Nevertheless, in unreported specifications, we re-estimate our main specifications using a household's sampling weight, and most results are qualitatively similar.

The main outcome variable is the change in a household's housing share, defined as the share of housing wealth in equity, houses, bonds, and mutual funds. We replace missing

[2]See Finance and Network (2020) and the HFCN website https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html for further information on how the survey is set up and how to access. The HFCS features different versions of the second and third survey waves. We use the following versions: DOI10.2866/177251 (Wave 2), and DOI10.2866/776370 (Wave 3).

[3]To work with a homogeneous sample of households in countries with the same exchange rate and monetary policy, we drop three countries in the HFCS that are not part of the euro area (Croatia, Hungary, and Poland). We further lose eight countries in this estimation because the outcome variable is constructed as the change of housing shares, where the remaining countries do not supply the necessary data.

values for a household's main residence with zeros if households declare to rent their main residence. Similarly, we replace missing values for other real estate property data with zeros if households declare *not* to own any other property apart from their main residence. We correct all wealth variables by valuation changes, as detailed in Appendix A.1, because we are interested in capturing portfolio rebalancing towards real estate (i.e., actual transactions). As robustness, we also use the change in the number of properties that a household owns as an outcome variable, which cannot be affected by valuation changes. To study whether our portfolio rebalancing channel is related to a buy-to-let motive, we also use the share of wealth invested in second homes as an outcome variable.

As some households do not hold any houses, bonds, mutual funds, or equity, we show the robustness of our results by using two alternative definitions of the housing share, i.e. dividing housing wealth (i) by houses, bonds, equity, mutual funds, and deposits or (ii) by *total* wealth that also includes other real assets, such as vehicles, jewelry, and the value of self-employment businesses and other financial assets, such as insurances, managed accounts, and money owed to households.

To control for the potential credit channel, we run specifications which net out the housing share by the portion of housing wealth financed by mortgage credit, i.e., *net* housing wealth. We also construct outcome variables for credit dynamics at the household level, defined as the log difference in either the outstanding total credit or mortgage credit volumes.

We also study the effect of portfolio rebalancing on households' house price expectations. In particular, the third wave of the HFCS asks households to allocate 10 points to the following five categories: expecting a sharp decrease, a slight decrease, unchanged, a slight increase, or a sharp increase in housing prices over the next twelve months.[4] We define a household as optimistic about future house prices when s/he allocates at least 5 points to categories 4 and 5 (slight or sharp increase).

Household-level control variables include the logarithm of a household's net wealth, a

[4]The HFCS does not ask this question in waves 1 and 2.

dummy variable for the richest 10% households (in terms of net wealth) in the same country and wave (in some specifications), the logarithm of income, the age of the household's head, a dummy which measures whether a household is risk seeking (households self-report their risk attitude from 1 to 4, with the most risk-averse households being assigned a 4; we define a household risk-seeking if it has a self-reported risk attitude of 1-3), the number of household members, and a tenure status dummy variable indicating whether a household is a renter or owner of the main residence.[5] We also add a dummy variable that measures whether a household is credit-constrained, i.e., whether s/he applied for a loan but was rejected or whether s/he did not apply due to a high chance of being rejected. To control for the potential rebalancing of a household from other liquid assets (i.e., deposits) towards housing, we also use a household's share of total wealth invested in deposits as a household's covariate.

Our exposure measure to cross-border portfolio flows at the household level is the ex-ante share of wealth invested in equity and bonds, directly or indirectly via mutual funds, as will be explained in greater detail in Section 4.1. As several households do not report data on the three asset categories, our benchmark analysis replaces missing observations with zeros. For robustness, we either drop the missing observations or impute them by first computing the average bond and equity share in each of the ten deciles of the net wealth distribution and then replacing missing observations with these averages in each decile.

2.2 Country Data

We use the IMF's balance-of-payments statistics to calculate *net portfolio* flows over GDP as our main country-level regressor in the empirical specifications. We also report results using *gross* portfolio inflows and outflows and those dividing portfolio flows by either equity or bond. As a placebo test, we also use foreign direct investments (FDI) and other investment flows (which to large extents comprise cross-border credit flows).[6] All the flow variables are

[5] In all of our specifications, we drop from the sample households with non-positive net wealth.

[6] Note that FDI flows also include cross-border purchases and sales of real estate, which might crowd domestic households out of the housing market. Such transactions, however, typically represent only a

averaged between 2012 and 2013 (see Section 4.1 on details regarding the empirical strategy).

For robustness, we calculate portfolio flows based on the September 2021 version of the External Wealth of Nations database of Lane and Milesi-Ferretti (2018). Specifically, we compute portfolio flows as the change in the stock of foreign portfolio debt and equity liabilities less the change in the stock of foreign portfolio debt and equity assets, scaled by GDP. Our results are largely unaffected and are available upon request.

We use the annual, country-level house price indexes from Eurostat (2015=100). The database does not cover Greece, for which we instead use the annual average dwellings price index from the Bank of Greece. The indexes are then deflated using national CPI indexes from the World Economic Outlook Database (April 2022).

Finally, we estimate robustness checks which control for country-level real GDP growth, sovereign debt to GDP ratios and change in bank lending standards to households, all of which are averaged during 2012-13. The latter measures the percentage of banks in a country tightening their lending standards to households (for housing purchases) less the percentage of banks easing them, a measure for financial market liberalization following Favilukis et al. (2013). These variables stem from the IMF's World Economic Outlook Database (April 2022), the ECB's Bank Lending Survey and the Dutch Central Bank.

2.3 Summary Statistics

Table 1 reports summary statistics, most of which are based on the sample used in the difference-in-differences specifications. Depending on how we scale total housing wealth, the average housing shares changed by 0.2-1.2%. The change in second-home shares is even more pronounced with an average of 1.9%. The average household in our sample includes 2.5 members, rents the main residence, the household head is aged 61, the bonds and equity shares, our exposure measure, is 4.2%, with a range between 0 and 25%, and households' average deposit share is 8.3%. While the growth rate in total credit is quite high with

relatively small portion of total FDI. It is therefore an empirical question of whether FDI flows have an effect on domestic households' housing shares or not.

Table 1 Summary Statistics

Variable	Observations	Mean	SD	5^{th}	95^{th}
ΔHousing	8,371	0.7	15.1	-12.8	16.1
ΔSecond homes	4,468	1.9	31.9	-49.8	71.8
ΔHousing Alt. 1	8,371	0.2	16.9	-23.0	23.4
ΔHousing Alt. 2	8,371	1.2	19.3	-28.5	33.2
ΔUnits	8,371	0.1	2.0	-2.0	2.0
Optimistic household	38,066	0.4	0.5	0	1
Net wealth	8,371	12.7	1.2	11.0	14.7
Rich	8,371	0.1	0.3	0	1
Income	8,333	10.6	0.9	9.2	11.9
Renter	8,371	0.1	0.2	0	1
Household members	8,371	2.5	1.2	1	5
Age	8,371	61.3	13.7	38	83
Risk seeking	8,371	0.3	0.5	0	1
Bonds and equity shares (Exp)	8,371	4.2	10.7	0.0	24.6
Deposit shares	8,141	8.3	11.7	0.0	32.0
ΔCredit	8,371	53.9	260.2	-100	829.4
ΔMortgage	8,371	39.0	236.8	-100	222.2
Constrained	8,371	0.04	0.2	0	0
Portfolio flows	8,371	4.8	14.3	-4.7	51.0
Gross portfolio inflows	8,371	0.8	1.8	-0.1	5.9
Gross portfolio outflows	8,371	-4.1	14.4	-51.1	5.8
Debt flows	8,371	-0.0	1.0	-0.7	3.2
Equity flows	8,371	0.0	1.0	-1.9	1.3
FDI flows	8,371	-2.1	5.4	-18.7	1.4
Other flows	8,371	-5.3	8.3	-31.8	0.1
Growth	8,371	-1.7	1.6	-5.1	0.6
Gov. debt	8,371	99.0	19.9	67.1	129.5
CS	8,371	16.9	11.3	6.6	49.4
HP index	188	95.2	13.6	77.5	117.8

Note. The table reports summary statistics of variables used in the difference-in-differences analysis for the sample of 8,371 households in six euro area countries. Only the variables HP Index and Optimistic Household are not based on our benchmark difference-in-differences sample, as we only use these variables in other specifications. See Table A1 for variable definitions and data sources.

an average of 54%, mortgage credit only grows by 39% (and an unreported median of 0). Moreover, 30% of households are risk-seeking, only 4% are credit-constrained and the average fraction of households being optimistic regarding future housing prices in wave 3 is 40%.

Table 1 further shows that portfolio flows as a share of GDP take an average value of 4.8% in the specific difference-in-differences sample that we study, and there is a significant variance, as can be seen from the high standard deviation of 14.3%. The positive average value is driven by both positive gross portfolio inflows and negative outflows. FDI and other

investment flows are both negative with means of -2.1 and -5.3%, respectively. The real house price index is 95.2 on average. Finally, GDP growth is negative on average for this sample, government debt ratios take an average value of 99% and the positive mean for credit standards (CS) implies that banks on average during our sample period tightened their loan supply to households.

3 Capital Flows and House Prices in the Euro Area

In this section, we review aggregate capital flow dynamics in the euro area during our sample period and their association with national house price indexes.

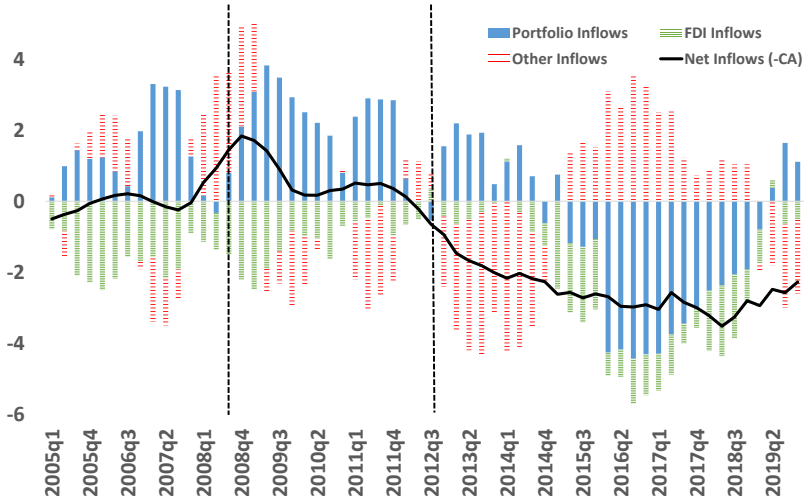
Figure 1 plots the euro area net capital inflows as a share of GDP (or equivalently the current account deficit) and its main components—portfolio flows, FDI, and other investment flows (mostly consist of interbank credit flows). After a significant inflow between the global financial crisis and Draghi's "Whatever-it-takes" speech in July 2012, net flows into the euro area turn persistently negative in the 2010s. Portfolio flows are more volatile and drive the dynamics in Figure 1 as net FDIs (which also record foreign purchases of residential housing) are more stable over this period, while other investments are negatively correlated with the current account balance. In our empirical analysis, we focus on portfolio flows and study both the inflow episode after the 2012 Draghi speech in a difference-in-differences setting and the 2009-2018 period in a continuous treatment (panel fixed effects) setting.

Figure 2 breaks down net flows into gross inflows and outflows. It shows that the changes in net portfolio flow between 2008 and 2013 are driven mostly by higher *gross* inflows, rather than lower gross outflows, which implies that foreign purchases are driving these dynamics more than domestic residents' adjustment of foreign holdings.

Figure 3 looks at net portfolio flows at the country level, distinguishing between the core and the periphery countries in the euro area (i.e., Northern and Southern European countries, respectively). It shows that the inflow episode after Draghi's speech in 2012 is

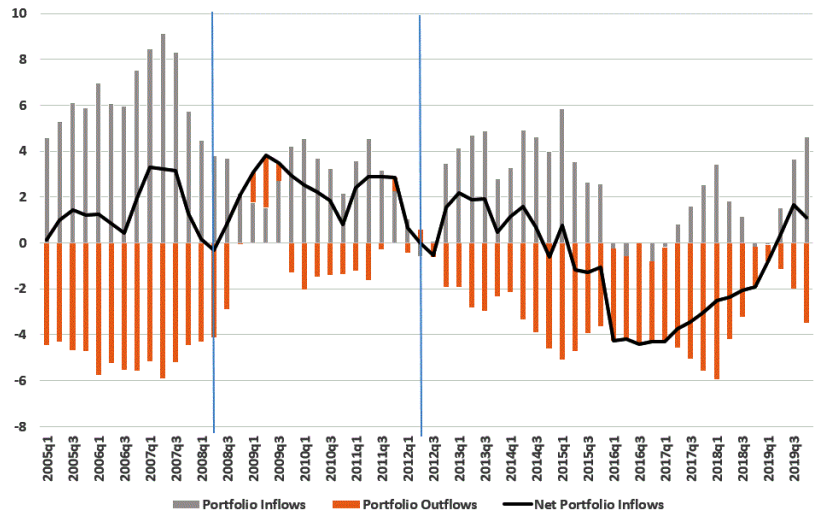
driven by inflows into periphery countries. However, in 2009-2010, there are sizable portfolio inflows also in the core, and at the end of the sample period both core and periphery countries experience portfolio outflows. Our empirical analysis will exploit this rich data variation at both the household and the country level.

Figure 1 Euro Area Financial Account



Note. This figure plots the financial account of the Euro area. The solid line are total net capital inflows, equal to the negative of the current account balance. It also depicts its main components, including net portfolio inflows, net FDI inflows, and other net investment inflows as a share of euro area GDP (+ is an inflow). In this chart, all of these variables are four-quarter moving averages to eliminate the seasonality in the variables. The vertical lines mark the Lehman Brothers' bankruptcy in 2008:Q3 and Draghi's "Whatever-it-takes" speech in 2012:Q3. Sources: ECB, FRED. See the Data Appendix for more details.

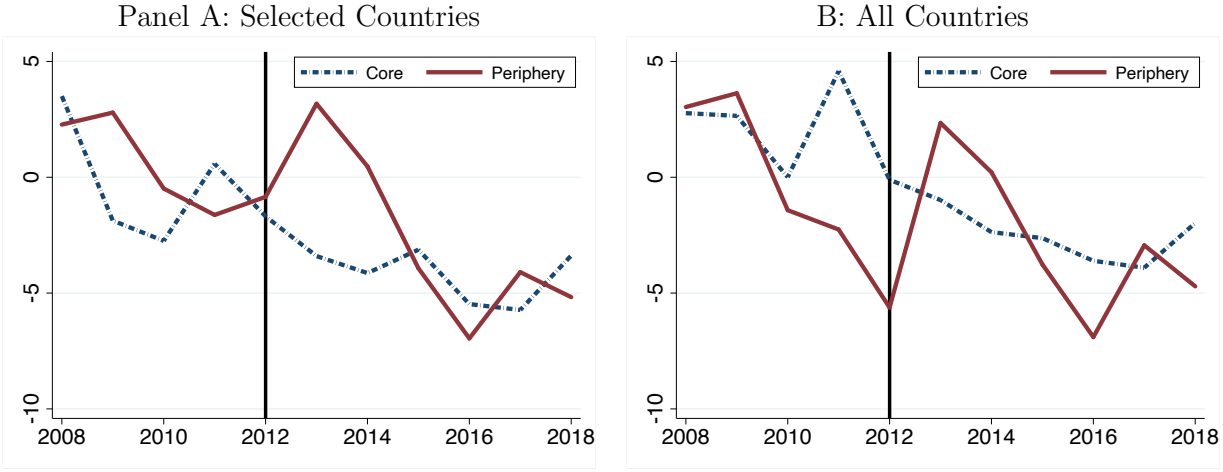
Figure 2 Euro Area Net and Gross Portfolio Flows



Note. This figure plots euro area net portfolio inflows (solid line, + depicts inflows), as well as gross portfolio inflows and outflows as a share of euro area GDP (+ and - are inflows and outflows, respectively). In this chart, all of these variables are four-quarter moving averages to eliminate the seasonality in the variables. The vertical lines mark the Lehman Brothers' bankruptcy in 2008:Q3 and Draghi's "Whatever-it-takes" speech in 2012:Q3. Sources: ECB, FRED. See the Data Appendix for more details.

House prices in the euro area, during our 2009-2018 sample period, are associated with *lagged portfolio* flows but not with net other flows or FDIs. Specifically, Table 2 shows the results of regressions of real house price indexes in the 19 euro area countries on the contemporaneous, first and second-year lagged values of the three main components of total net flows—net portfolio flows, FDI, and other net flows. Columns (1) and (4) show that higher net portfolio flows are associated with higher housing prices. This contrasts with other investments and FDI flows that are not statistically significantly associated with housing prices. This evidence is stronger once we weigh the regressions by the average nominal USD GDP of the respective country (columns 4-6). As Appendix Table A8 indicates, these results are driven by countries where our survey households initially, on average, invest a larger fraction of their wealth in bonds and equity, i.e., by countries where households are more likely to have incentives for portfolio rebalancing towards housing.

Figure 3 Euro Area Portfolio Flows: Core vs Periphery



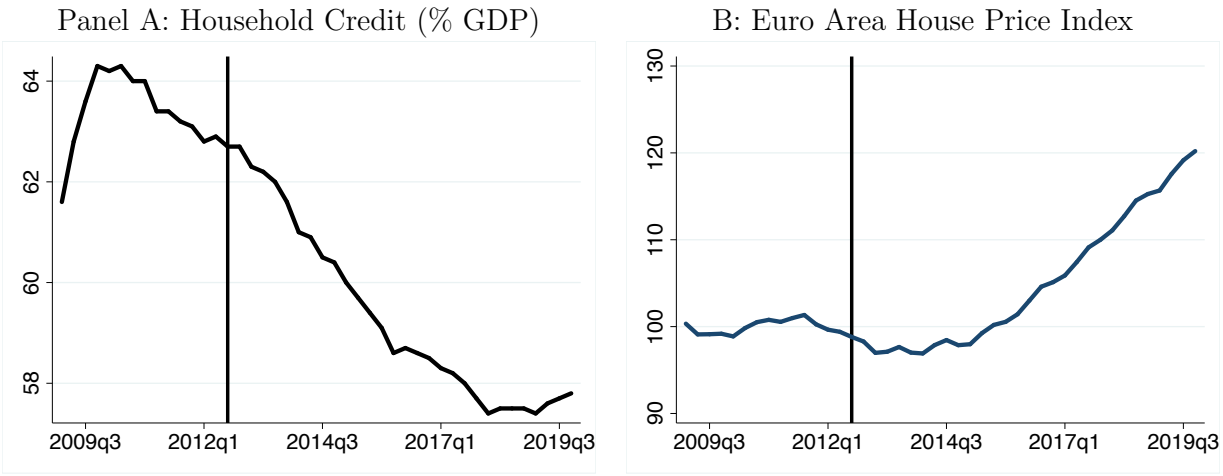
Note. This figure plots net cross-border portfolio inflows (in % of nominal GDP) separately for the periphery and core countries in the Euro area (+ is an inflow). The series are aggregated from the national balance of payment data, using as weights 2007 nominal GDP. Panel A is based on the sample of six countries in the HFCS with panel household data—namely, Belgium, Germany, and Netherlands representing the core, and Cyprus, Italy, and Spain representing the periphery. Panel B is based on a sample that also includes other countries, i.e., Austria, Belgium, Germany, Finland, France in the core, and Cyprus, Greece, Spain, Italy, Portugal in the periphery. In both panels, the vertical lines mark Governor Draghi's "Whatever-it-takes" speech in 2012:Q3. See the Data Appendix for more details.

Table 2 Capital Flow Components and Housing Prices

	Unweighted			GDP Weighted		
	(1)	(2)	(3)	(4)	(5)	(6)
	Real Housing Prices					
Portfolio Flows$_t$	0.017			0.026		
	(0.020)			(0.029)		
Portfolio Flows$_{t-1}$	0.011*			0.021		
	(0.006)			(0.011)		
Portfolio Flows$_{t-2}$	0.017**			0.034**		
	(0.006)			(0.014)		
Other Flows$_t$		0.003			0.016	
		(0.013)			(0.015)	
Other Flows$_{t-1}$		-0.000			0.007	
		(0.006)			(0.011)	
Other Flows$_{t-2}$		-0.011			0.011	
		(0.007)			(0.013)	
FDI Flows$_t$			-0.023			-0.038*
			(0.013)			(0.021)
FDI Flows$_{t-1}$			-0.006			-0.028*
			(0.017)			(0.013)
FDI Flows$_{t-2}$			0.017			0.012
			(0.010)			(0.023)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Joint Coeff.	0.045*	-0.008	-0.012	0.080**	0.034	-0.054*
Obs	188	188	188	188	188	188
No. of Countries	19	19	19	19	19	19
R^2	0.500	0.495	0.498	0.376	0.374	0.375

Note. The table reports regressions of country-level real house price indexes (in levels) for all 19 euro area countries at an annual frequency on the contemporaneous, one-year lag, and two-year lag of net portfolio flows, other net flows, and net FDI flows. All regressions include country and year-fixed effects. Columns (1)-(3) are unweighted regressions, while columns (4)-(6) weigh the data by average nominal USD GDP over 2009-2018 for each country in the sample. Newey-West standard errors with two lags are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Figure 4 A Housing Boom Without Credit Boom



Note. The figure plots the aggregate credit-to-GDP ratio of the household sector in the euro area between 2009:Q1 and 2019:Q4 (Panel A), and the aggregate real house price index in the euro area (2010=100) over the same time period (Panel B). Household credit includes loans from all lenders. The vertical line marks Draghi's "Whatever-it-takes" speech in 2012:Q3. Sources: BIS, FRED.

The strong recovery in euro area house prices in the second part of the sample period, however, is not associated with a strong credit expansion at the aggregate level. Panel A of Figure 4 plots credit-to-GDP ratios for the household sector and shows declining ratios throughout the sample period with stabilization and a modest recovery in 2018-19. In contrast, house prices, at the euro area level, stabilize in 2013 and start a strong recovery thereafter (Panel B of Figure 4). This is strong aggregate evidence of a house price expansion without a credit expansion. Nonetheless, the aggregate euro area picture masks significant heterogeneity. For example, house prices boomed in Germany since 2009:Q2 but kept falling until much later in other countries, such as Italy or Spain.

The association between portfolio flows and housing prices and lack thereof between house prices and credit are consistent with the mechanism that we propose, but of course, they do not imply causation and, as aggregate stylized facts, are only suggestive. So we now start investigating this mechanism with granular household data.

4 Impact on Portfolio Rebalancing

In this section, we present the regression specifications and the attendant estimation results with which we investigate portfolio rebalancing. We study the impact of portfolio flows on house price expectations in Section 5.

4.1 Empirical Specification

In our benchmark specification, we focus on the six countries that have surveys with a panel of households. Based on this sample, we estimate two difference-in-differences specifications that exploit the capital flow recovery in 2012 and 2013 after Draghi's "Whatever-it-takes" speech documented in Section 3. The first specification is:

$$\Delta Y_{h,c}^{w2-w1} = \kappa \cdot \text{Flows}_{c,2012/13} + \lambda \cdot X_{h,c,w1} + \epsilon_{h,c}, \tag{1}$$

where $\Delta Y_{h,c}^{w2-w1}$ is the change in the housing portfolio share from the first wave of the HFCS (conducted in 2010-2011, shortly before the recovery of portfolio flows) to the second one (conducted in 2013-2014). $\text{Flows}_{c,2012/13}$ is the average country-level portfolio inflows as a share of GDP during 2012 and 2013, and $X_{h,c,w1}$ includes a set of household control variables, fixed at the pre-treatment period values in wave 1, including the initial share of wealth invested in housing. The standard errors are heteroskedasticity-robust (HC1).[7]

Equation (1) compares households located in more affected countries to those in less affected ones, using an aggregate continuous variable (i.e., portfolio inflows). In unreported regressions, we replace portfolio flows with a dummy variable that indicates whether a household lives in a country with positive cross-border portfolio inflows on average during 2012-2013. All results are qualitatively unchanged. As a placebo exercise, we also compare the change in housing shares between wave 2 and wave 3. As cross-border portfolio flows did not show any significant cross-country heterogeneity within the euro area during this placebo

[7]The statistical significance is similar for HC2 or HC3 heteroscedasticity-consistent standard errors.

period, as we show in Section 3, we expect the coefficients to be statistically insignificant.

A second specification exploits household-level exposure to portfolio flows. Specifically, it examines whether households more affected by portfolio flows rebalance more strongly towards housing. We estimate the following regression:

$$\Delta Y_{h,c}^{w2-w1} = \alpha_c + \theta \cdot \text{Exp}_{h,c,w1} + \rho \cdot X_{h,c,w1} + \xi \cdot (\text{Exp}_{h,c,w1} \times \text{Flows}_{c,2012/13}) + \epsilon_{h,c}, \qquad (2)$$

where $\text{Exp}_{h,c,w1}$ is the share of equity and bonds in total wealth for the household h located in the country c, fixed at its pre-treatment value in wave 1 ($w1$). Note that $\text{Exp}_{h,c,w1}$ includes bonds and stocks held directly and indirectly via mutual funds. To check whether other characteristics make a household with greater initial bond and equity shares more likely to rebalance towards housing following cross-border portfolio flows, we also present specifications that add triple interactions among cross-border flows, $\text{Exp}_{h,c,w1}$, and following household variables, fixed at the pre-treatment wave 1: a dummy equal to one when a household belongs to the richest 10% in the respective country and wave's net wealth distribution; the share of wealth invested in deposits; and a continuous variable capturing households' risk attitude. Equation (2) also includes country-fixed effects, α_c, to control for macroeconomic factors that affect household portfolios and correlate with cross-border portfolio flows.

Equation (2) is a more demanding specification. Even if omitted macroeconomic variables correlate both with cross-border portfolio flows and housing portfolio shares, it does not threaten identification as long as they do not affect households' ex-ante exposure to such flows (the initial bond and equity shares). However, one concern is that initial bond and equity shares are not randomly distributed among households. In fact, the shares correlate weakly but significantly from a statistical point of view, with standard household characteristics, including demographics, income, wealth, household size, etc. We address this concern by adding interaction terms between those household characteristics and the cross-border portfolio flows. By doing so, we run a horse race between our exposure measure and other

household characteristics. As will be shown, our benchmark estimates hardly change, suggesting that the non-randomness of our household-level exposure variable is not a threat to identification, as argued by Roberts and Whited (2013).

Similarly, we also control for the potential impact of credit access on our estimation results. Specifically, in this horse race, we control for the interaction between portfolio flows and (i) households' initial leverage, (ii) their mortgage credit growth rate between two waves, and (iii) a dummy of whether a household perceives him/herself as credit-constrained. Using a country-level measure of bank loan supply conditions (a measure of financial market liberalization as in Favilukis et al. 2013) based on the ECB's Bank Lending Survey, we also (iv) estimate robustness specifications where we include the interaction between household-level bond and equity shares (exposure) and this aggregate credit variable as a control.

Equation (2) exploits the divergence of portfolio flows between the core and periphery countries after Draghi's "Whatever-it-takes" speech. The country pattern was likely unanticipated and exogenous from the perspective of individual households. For robustness, to control for the possibility that portfolio flows are related to domestic fundamentals, such as changes in households' target portfolios, we also estimate a specification in which portfolio flows are instrumented by countries' own sovereign bond yield during the peak of the crisis in 2011 and 2012.[8] The intuition is that countries with higher sovereign bond yields during the peak of the crisis should be more affected by Draghi's speech, and consequently, their portfolio flows recovered disproportionately more.

4.2 Country Treatment Effects of Portfolio Flows

Table 3 reports a baseline set of estimation results for Equation (1) above. In column (1), the dependent variable is the change in the housing shares (in a portfolio of bonds, stocks, mutual funds, and housing). The coefficient on portfolio flows is positive and statistically significant at the 1% level. The effect is also economically significant: a ten-percentage point increase

[8] Using the spread vis-a-vis the German bund as an instrument yields similar results.

in net portfolio inflows as a share of GDP (less than half a standard deviation in this sample) increases households' housing share by an additional 0.45 percentage points. In column (2), the outcome variable is the share of second homes. Again, the estimate is positive and highly statistically significant, implying that some of the rebalancing is driven by buy-to-let motives. In column (3), the dependent variable is the housing share in a portfolio of bonds, stocks, mutual funds, deposits, and housing. In column (4), we scale the housing wealth by the *total* household wealth. In both cases, the portfolio flow coefficients are positive and statistically significant. Interestingly, once we scale by deposits, the statistical significance of the coefficient estimate declines, suggesting that households are less likely to rebalance out of deposits. In column (5), we use the change in the number of owned housing units as the dependent variable, which, in contrast to previous variables, cannot be affected by valuation effects. The coefficient of interest is still positive and significant at the 1% level.

Taken together, these first five regressions provide clear evidence that portfolio inflows induce households to rebalance their portfolios toward real estate. This evidence is independent of how we compute the housing outcome variable. Therefore, in the remainder of the paper, we use the change in the share of total housing over bond and equity holdings, mutual funds, and housing as the dependent variable, as it most directly captures household rebalancing from risky assets (i.e., bonds and equity) toward real estate. In addition, it is a continuous variable that, in contrast to changes in the number of housing units, can capture the intensity of rebalancing. For instance, when households sell a small house and instead purchase a large (more expensive) one, this would not be captured by the change in housing units. Nevertheless, most results are unchanged when using different outcome variables.

Appendix Section B.1 reports results where we break down total portfolio flows into debt and equity. Both components have a positive and statistically significant effect on household portfolio rebalancing, with a slightly larger point estimate for the equity flows.

One assumption in our setting is that the portfolio flows in the particular episodes were driven by Draghi's "Whatever-it-takes" speech, and hence exogenous to household character-

Table 3 Difference-in-Differences: Standalone Effect of Portfolio Flows

	(1) ΔHOUSING	(2) ΔSECOND HOMES	(3) ΔHOUSING ALT. 1	(4) ΔHOUSING ALT. 2	(5) ΔUNITS	(6) ΔHOUSING	(7) NET PORT. INFLOWS
Portfolio flows	0.045***	0.103***	0.026*	0.079***	0.012***	0.150***	
	(0.01)	(0.03)	(0.01)	(0.02)	(0.00)	(0.03)	
Net wealth	-0.893***	0.686	-0.697***	-1.414***	0.242***	-1.172***	1.329***
	(0.19)	(0.42)	(0.20)	(0.24)	(0.04)	(0.20)	(0.17)
Income	-0.526***	-0.933*	-1.052***	-2.309***	-0.004	-0.254	0.008
	(0.20)	(0.56)	(0.24)	(0.29)	(0.03)	(0.21)	(0.21)
Renter	-7.179***	-3.675**	-5.714***	-8.576***	0.083	-7.649***	4.143***
	(1.40)	(1.56)	(1.38)	(1.43)	(0.06)	(1.41)	(0.77)
Age	-0.017	-0.043	-0.008	0.059***	0.002	0.005	-0.207***
	(0.01)	(0.04)	(0.02)	(0.02)	(0.00)	(0.02)	(0.01)
Household members	0.640***	1.116***	1.120***	1.079***	0.045**	0.487***	0.410***
	(0.13)	(0.43)	(0.15)	(0.18)	(0.02)	(0.14)	(0.15)
Initial housing shares	-0.434***	-0.313***	-0.418***	-0.455***	-0.373***	-0.439***	0.032***
	(0.02)	(0.01)	(0.02)	(0.01)	(0.05)	(0.02)	(0.01)
Sovereign bond yield							3.806***
							(0.10)
Obs	8,371	4,468	8,371	8,371	8,371	8,371	8,371
No. of Countries	6	6	6	6	6	6	6
R^2	0.234	0.163	0.211	0.225	0.099	0.225	0.234
First-Stage F-Stat.	-	-	-	-	-	1350.3	

Note. The regressions are based on the first two waves of the HFCS survey. The dependent variable in columns (1) and (6) is the change in the share of a household's housing wealth over housing, equity, bonds, and mutual funds from the first to the second wave. In column (2), it is only wealth invested in second homes in the numerator. In columns (3) through (5), we employ (i) the change in housing wealth over housing, equity, bonds, mutual funds, and deposits, (ii) the change in housing wealth over a household's total portfolio size and (iii) the change in the number of owned housing units, respectively, as dependent variables. The main regressor is country-level net cross-border portfolio inflows, averaged during 2012-2013. All regressions include the following household controls measured in the pre-treatment period: log of wealth and income, age of the household head, number of household members, a dummy indicating whether a household rents or owns the main residence, and the initial share of housing wealth. The regressions in columns (1)-(5) are estimated via OLS, and columns (6) and (7) are the second and first-stage results of an IV estimation that uses the average country-level sovereign bond yield in 2011 and 2012 as an instrument for portfolio inflows. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

istics and unanticipated for households' behavior. Yet, we cannot fully rule out the possibility that at least some of the flows are unrelated to Draghi's speech, raising some endogeneity issues. To address this concern, we instrument the portfolio flows by countries' government bond yields during the peak of the sovereign debt crisis in 2011 and 2012. The intuition is that countries with higher yields on their government bonds should be more affected by Draghi's speech. Consequently, their portfolio flows should also have recovered disproportionately more. The first-stage regression reported in column (7) confirm this intuition, with higher yields in 2011/12 increasing portfolio inflows in 2012/13.

Although we cannot test the validity of exclusion restriction, note that countries with higher bond yields during the peak of crises experienced larger reductions in uncertainty. It thus made their equity and especially bond markets more attractive following Draghi's speech in 2012-13. This implies that housing shares should have decreased. If anything, the instrument introduces a downward bias for the "true" effect of cross-border portfolio flows. Despite such a possible bias, the second-stage estimate in column (6) shows that our benchmark estimation is robust. The coefficient even increases in size relative to column (1).

4.3 Household Treatment Effect of Portfolio Flows

Table 4 reports a baseline set of estimation results for Equation (2) above. This regression exploits household heterogeneity by interacting portfolio flows with a pre-treatment share of wealth invested in bonds and equity. As portfolio inflows should decrease the risk premium on bonds and equity, they also should affect more households with a larger share invested in these risky assets, inducing them to rebalance towards housing, assuming that the latter is a substitute for bonds and equality in households portfolios (Boddin et al., 2022).

Column (1) of Table 4 shows that, for our benchmark exposure variable that replaces missing observations with zeros, the coefficient is positive, as expected, and statistically significant at the 1% level. Economically, a 10-percentage point increase in portfolio flows increases the housing portfolio share of more (75^{th} percentile) relative to less exposed (25^{th}

Table 4 Difference-in-Differences: Household Exposure

	(1)	(2)	(3)	(4)	(5)	(6)
				Δ Housing Share		
Flows × Exp 1	0.016***			0.011**	0.014***	0.010*
	(0.00)			(0.01)	(0.00)	(0.01)
Flows × Exp 2		0.016***				
		(0.01)				
Flows × Exp 3			0.015***			
			(0.00)			
Flows × Exp 1 × Deposits				0.0008**		
				(0.00)		
Flows × Exp 1 × Rich					0.016*	
					(0.01)	
Flows × Exp 1 × Risk seeking						0.013*
						(0.01)
Household Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	8,371	3,416	8,371	8,136	8,371	8,371
No. of Countries	6	6	6	6	6	6
R^2	0.250	0.275	0.248	0.259	0.254	0.255

Note. These regressions are based on the first two waves of the HFCS survey. The dependent variable is the change in the share of a household's housing wealth over housing, equity, bonds, and mutual funds from the first to the second wave. The main regressor is country-level net cross-border portfolio inflows, averaged during 2012-2013, interacted with the initial household share of wealth invested (directly and indirectly) in bonds and equity. While column (1) replaces missing observations for the latter with zeros, column (2) does not do so, and column (3) imputes missing observations for this variable by replacing missing observations with the median in the respective net wealth decile that a household belongs to. Columns (4)-(6) interact this double interaction additionally with a household's initial wealth invested in deposits, a dummy equal to one if a household belongs initially to the top 10% of the country-wave-specific net wealth distribution, and a household's self-reported risk attitude (a dummy equal to one when a household tolerates at least some risk). All individual variables of the interactions and in the case of triple interactions all lower-order double interactions, when they are not absorbed by the fixed effects, are also included in the regressions but not shown to save space. In addition, all regressions include the following household controls measured in the pre-treatment period that are not reported for reasons of space: log of wealth and income, age of the household head, number of household members, a dummy of whether household rents or owns the main residence, and the initial share of housing wealth. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

percentile) households by 0.38 percentage points. This result survives when we do not replace missing observations for bond and equity shares with zeros (column 2) or when we impute missing observations by replacing them with the average share in the respective net wealth decile that a household belongs to (column 3).

In Appendix Sections B.2 and B.3, we further show that these results are robust to distinguishing between gross portfolio inflows and outflows, they occur in both the core and periphery of the euro area, and they survive when we control for other macroeconomic

variables in their interactions with household-level bond and equity shares.

In columns (4)-(6), we show that the effects of portfolio flow on the portfolio rebalancing of more exposed households are even stronger for households with larger initial deposit shares, as well as for wealthier and more risk-seeking households. Specifically, once we interact portfolio flows not only with household-level bond and equity shares but also with these characteristics, we obtain positive and statistically significant triple interaction coefficients. Note that all of these specifications also include all individual variables and all lower-order double interactions, but the estimates are not shown to save space.

The result of column (4) is important because it shows that more exposed households also use some of their liquid assets (deposits), in addition to bonds and equities, to rebalance to houses. Importantly, and in line with column (3) of Table 3 where we scale houses by portfolio wealth including deposits, the result only manifests for households that have a large bond and equity share. The double interaction coefficient between deposit share and portfolio flow (not reported) is even negative and statistically significant at the 5% level, indicating that households without bond and equity market exposure, but with large deposit holdings, do not actively rebalance towards houses.

Columns (5) and (6) finally indicate that cross-border portfolio inflows can have an even stronger impact on wealthy or risk-seeking households if they have a higher exposure measure. Overall, this is consistent with the notion that cross-border flows in the euro area induce financially more sophisticated households to shift their portfolios towards real estate.

4.4 Portfolio Flows and Household Credit

The aggregate evidence shows that the euro area housing boom is without a credit boom. In contrast, credit volumes as a share of GDP, especially in the household sector, have been decreasing substantially. In this section, we use the household-level data to confirm this evidence by showing first that cross-border portfolio flows do not raise households' total or mortgage borrowing. To this end, we estimate the difference-in-differences Equation

Table 5 Cross-Border Portfolio Flows and the Role of Household Credit

	(1) ΔMORTGAGE	(2) ΔCREDIT	(3) ΔNETHOUSING	(4) ΔHOUSING	(5) ΔHOUSING	(6) ΔHOUSING	(7) ΔHOUSING
Flows × Exp	-0.006	-0.009	0.020***	0.016***	0.016***	0.016***	0.016**
	(0.01)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Flows × ΔMortgage				-0.000**			
				(0.00)			
Flows × Leverage					-0.000		
					(0.00)		
Flows × Constrained						0.033	
						(0.036)	
CS × Exp							0.001
							(0.01)
Household Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	10,017	10,017	8,371	8,371	8,371	8,371	8,371
No. of Countries	6	6	6	6	6	6	6
R^2	0.091	0.137	0.960	0.257	0.251	0.251	0.250

Note. These regressions are based on the first two waves of the HFCS survey. The dependent variable is the change in the logarithm of a household's mortgage or total borrowing from the first to the second wave in columns (1) and (2); net housing wealth (housing wealth less outstanding mortgages) over housing, bonds, equity, and mutual funds in column (3); and our benchmark housing wealth change (housing wealth over housing, bonds, equity, and mutual funds) in columns (4)-(7). The main regressor is country-level net cross-border portfolio inflows, averaged during 2012-2013, interacted with households' initial wealth share invested (directly and indirectly) in bonds and equity. In columns (4)-(6), we add the corresponding interactions between portfolio flows and the change in mortgage borrowing from wave 1 to wave 2, households' initial leverage (outstanding loans over income), or a dummy equal to one if households are credit-constrained. The regressions also include country-fixed effects. In column (7), we add the interaction between country-level change in lending standards during 2012-13 and household-level initial wealth shares invested in bonds and equity. All individual variables included in the interactions, when they are not absorbed by the fixed effects, are also included in the regressions but not shown to conserve space. All regressions include the following household controls measured in the pre-treatment period that are also not shown to save spaces: log of wealth and income, age of the household head, number of household members, a dummy of whether a household rents or owns the main residence, and the initial logarithm of households' credit or mortgage borrowing, the initial net housing share or the initial total housing share, respectively. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

(2), but use the difference in the logarithm of household-level total or mortgage borrowing, respectively, between the first and second wave of the HFCS as the dependent variables.[9] As columns (1)-(2) in Table 5 show, portfolio flows do not induce more exposed households to raise their borrowing. Therefore, households that we have shown to rebalance toward housing do not seem to finance their increasing housing shares by taking out mortgage loans.

In all of our benchmark regressions, we include the wealth variables in gross terms without subtracting outstanding debt volumes, consistent with Chetty et al. (2017). In column

[9]We calculate both outcomes as the difference in the logarithm of (1+credit) to keep zero-valued observations. We further replace observations by growth rates below -100% with -100%.

(3), we define our household-level housing wealth share net of outstanding mortgages and our results survive. That is, more exposed households raise their net housing shares with portfolio inflows. Therefore, (mortgage) credit expansions do not accompany (or even drive) the portfolio rebalancing identified in this paper.

In columns (4)-(6), we run horse races between our exposure measure and (i) a household's change in mortgage borrowing from wave 1 to wave 2, (ii) households' initial leverage (outstanding debt over income), and (iii) a dummy indicating whether a household is credit-constrained (either a credit application being rejected or no application due to a high chance of being rejected). In all these regressions, our benchmark results are robust.

Finally, in column (7), we control for the interaction between the household exposure variable and the change in the country-level bank lending standards (for housing purchases), the measure of financial market liberalization used by Favilukis et al. (2013). While this additional control is not statistically significant, our main interaction of interest remains positive and statistically significant at the 5% level.

4.5 Placebo Analysis

In this sub-section, we conduct two placebo tests. To start with, we look at how cross-border FDI and other investment flows affect the portolio rebalancing of more exposed households. As these two variables do not have a strong direct impact on bond and equity returns, we expect them not having positive effects on households' housing shares. In fact, columns (1)-(2) of Table 6 show that both capital flow variables have a negative effect on portfolio rebalancing of more exposed households. Although the FDI flow interaction coefficient is estimated quite imprecisely, the other flow interaction coefficient is statistically significant and negative at the 1% level. For the latter case, note that other flows predominantly encompass cross-border interbank flows, which can have a sizable effect on banks' credit supply (Baskaya et al., 2017; te Kaat, 2021). This evidence suggests that the portfolio rebalancing channel documented in this paper is independent of the credit channel. In

addition, both negative interaction coefficients imply that other capital flow components do not induce a rebalancing toward real estate.

Table 6 Difference-in-Differences: Placebo Tests

	(1) Δ Housing	(2) ΔHousing	(3) ΔHousing
FDI flows × Exp	-0.019*		
	(0.01)		
Other flows × Exp		-0.026***	
		(0.01)	
Portfolio flows × Exp			-0.002
			(0.00)
Country FE	Yes	Yes	Yes
Household Controls	Yes	Yes	Yes
Obs	8,371	8,371	5,184
No. of Countries	6	6	5
R^2	0.241	0.248	0.206

Note: The regressions in columns (1)-(2) are based on the first two waves of the HFCS survey, column (3) is based on all three waves. The dependent variable in columns (1)-(2) is the change in the share of a household's housing wealth over housing, equity, bonds and mutual funds from the first to the second wave, in column (3) it is calculated over the placebo episode spanning the second and third wave. The main regressor is country-level net net cross-border portfolio inflows, FDI inflows, and other investment inflows, averaged during 2012-2013, and interacted with household-level bond and equity shares measured in wave 1 (Exp). The individual Exp variable is also included in the regression, but the estimates are not shown to conserve space. All regressions include the following household controls measured in the pre-treatment period that are also not reported for reasons of space: log of wealth and income, age of the household head, number of household members, a dummy whether a household rents or owns the main residence, and the initial share of housing wealth. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Second, we calculate the dependent variable as the change in housing shares from the second to the third wave of the HFCS rather than from the first to the second. During the 2014-2018 placebo period, as we saw in Section 3, cross-border portfolio flows were rather flat and did not differ significantly in the core or periphery countries (see, for example, Figure 3, Panel A). In this second test, the main regressor is still the interaction between portfolio flows averaged during 2012-13 and the household-level share of wealth invested in bonds and equity in survey wave 1. According to column (3), more exposed households in countries with larger portfolio inflows in 2012/13 do not rebalance their portfolios towards real estate between the second and third wave of the HFCS. This suggests that the household portfolio changes are the same across countries during this placebo period where significant differences

in cross-border portfolio flows were absent.

4.6 Controlling for the Non-Randomness of Exposure Measure

Our benchmark regressions include a rich set of household controls, fixed at the initial wave 1 level. In this section, we control for their interactions with cross-border portfolio flows. We thus horse race our exposure measure with those household characteristics. This exercise is important because the exposure measure (the bond and equity share) is not distributed randomly. Indeed, there is a small but statistically significant correlation between the exposure measure and other household characteristics. By explicitly controlling for the interaction terms, we make sure our benchmark estimate is not driven by this correlation.

Table 7 shows that the concern about the non-randomness of exposure measure is unwarranted. In all regressions, the interaction term between portfolio flow and the exposure measure is positive and statistically significant at the 1% level. The economic magnitude only decreases slightly once controlling for the tenure status. It makes sense because initial renters are more likely to rebalance. Of all these additional controls, only three are statistically significant. Specifically, portfolio flows have a stronger effect on renters, older households, or lower-net-worth households. The results suggest that the non-randomness of our exposure measure does not threaten our identification (Roberts and Whited 2013).

4.7 External Validity: Estimating Fixed Effects Models

Our benchmark specification is a difference-in-differences model that includes about 8,000-panel households from six countries. In order to show that our results are externally valid, we estimate fixed effects regressions in this section that allow us to include up to 25,000 households from the eleven euro area countries including Belgium, Cyprus, Germany, Estonia, Spain, Finland, France, Italy, Latvia, Netherlands, and Slovakia. The HFCS reports the year when a household is interviewed. Using this information, we construct a household-

Table 7 Difference-in-Differences: Other Household Characteristics

	(1)	(2)	(3)	(4)	(5)
			Δ Housing Share		
Flows × Exp	0.016***	0.016***	0.014***	0.016***	0.016***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Flows × Net worth	-0.031**				
	(0.01)				
Flows × Income		-0.006			
		(0.01)			
Flows × Renter			0.413***		
			(0.08)		
Flows × Age				0.002**	
				(0.00)	
Flows × Household size					-0.012
					(0.01)
Household Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Obs	8,371	8,371	8,371	8,371	8,371
No. of Countries	6	6	6	6	6
R^2	0.252	0.250	0.260	0.251	0.251

Note. These regressions are based on the first two waves of the HFCS survey. The dependent variable is the change in the share of a household's housing wealth over housing, equity, mutual funds, and bonds from the first to the second wave. The main regressor is country-level net cross-border portfolio inflows, averaged during 2012-2013, interacted with the initial household share of wealth (directly and indirectly) invested in bonds and equity (our exposure measure). In each specification, we additionally control for the interactions between portfolio flows and households' initial logarithm of net wealth, their initial log income, a dummy equal to one if the household initially rents the main residence, the initial age of the household head, and the initial household size, respectively. The regressions include the individual variables included in these interactions when they are not absorbed by the fixed effects, but the attendant coefficients are not shown to conserve space. The regressions further include the initial share of housing wealth, whose coefficients are also not shown to save space. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

country-year data set and estimate the following fixed-effect specification:

$$\Delta Y_{h,c,t} = \alpha_c + \alpha_t + \beta \cdot \text{Flows}_{c,t-1} + \gamma \cdot X_{h,c,t-1} + \epsilon_{h,c,t}, \tag{3}$$

where the dependent variable is the change in the housing share for household h, in country c, in year t. The main regressor is country-specific cross-border portfolio flows over GDP ($\text{Flows}_{c,t-1}$), averaged over three years preceding year t. The main hypothesis is that the coefficient β is positive, as higher foreign flows into equity and bond markets induce house-

holds to rebalance more towards housing. Control variables are the same as in Section 4.1 and are lagged by one wave. α_t is a year-fixed effect that controls for macroeconomic factors affecting all euro area households, such as the ECB's monetary policy. α_c are country-fixed effects to control for time-invariant, country-specific heterogeneity.[10] Standard errors are heteroskedasticity-robust (HC1).[11]

Next, we estimate a version of Equation (3) where the main regressor is the interaction between cross-border portfolio inflows and household-level exposure measure:

$$\Delta Y_{h,c,t} = \alpha_{c,t} + \sigma \cdot \text{Exp}_{h,c,t-1} + \nu \cdot X_{h,c,t-1} + \mu \cdot (\text{Exp}_{h,c,t-1} \times \text{Flows}_{c,t-1}) + \epsilon_{h,c,t}, \tag{4}$$

where $\text{Exp}_{h,c,t-1}$ is the household exposure measure to portfolio flows—one-wave lagged shares invested (directly and indirectly) in equity and bonds. As before, the idea is that households with a larger ex-ante share should be more affected by the inflow induced reduction in expected bond and equity returns, and thus rebalance more significantly towards real estate. This specification also permits adding country-year fixed effects. These terms absorb any country-year-specific variables that might affect household behavior, such as the differing positions of individual countries in the business cycle. They also absorb the country-level portfolio flows variable, which, therefore, cannot enter the regression individually.

Table 8 reports the fixed effects regression results. In column (1), we do not add any fixed effects and the coefficient estimate suggests that cross-border portfolio flows have a positive and statistically significant impact on household portfolio rebalancing. In economic terms, the estimated coefficient implies that a one-standard-deviation increase in cross-border flows raises the housing portfolio share by an additional 0.52 percentage points on average, which is quite similar to the main estimate in our difference-in-differences analysis of Section 4.1.

[10] Note that, from an external validity perspective, it does not make sense to add household fixed effects because they would require, as our outcome variable is a first difference, that a household is interviewed in all three survey waves. This would reduce the sample size substantially and only allow us to include five countries in the analysis.

[11] Given the large sample size in most specifications, using HC2 or HC3 heteroskedasticity-robust standard errors does not change the statistical significance of the results. The results are similar when we cluster by country even though we have only 11 of them (not reported).

Columns (2)-(4) control for year, country, as well as year and country fixed effects. When we only use year or country fixed effects, as in columns (2)-(3), the portfolio flow estimate remains positive and significant at least at the 5% level. Once we include both types of fixed effects, however, the estimate turns statistically insignificant, probably as both types of fixed effects together take away too much of the variation in portfolio flows.

Table 8 Fixed Effects Model: Results

	(1)	(2)	(3)	(4)	(5)	(6)
			Δ Housing share			
Flows	0.052***	0.043**	0.054***	0.015	0.020*	-
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	
$Exp_{h,t-1}$					-0.120***	-0.112***
					(0.04)	(0.04)
Flows $\times$ $Exp_{h,t-1}$					0.020***	0.021***
					(0.01)	(0.01)
Year FE	No	No	Yes	Yes	No	No
Country FE	No	Yes	No	Yes	No	No
Country-Year FE	No	No	No	No	No	Yes
Obs	25,366	25,366	25,366	25,366	25,366	25,366
No. of Countries	11	11	11	11	11	11
R^2	0.212	0.215	0.212	0.215	0.222	0.225

Note. These regressions are based on all three waves of the HFCS survey. The dependent variable is the change in the share of a household's housing wealth over housing, equity, bonds, and mutual funds. The main regressor is the country-level portfolio flow averaged over three years preceding the respective survey wave. The household-level controls are lagged by one wave and include net wealth (in logs), income (in logs), the age of the household head, the number of household members, and a dummy variable of whether the household rents or owns the main residence. The coefficients are not reported to conserve space. In columns (5)-(6), we interact portfolio flows with a household's one-wave lagged value of the share of wealth invested (directly and indirectly) in bonds and equity. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Columns (5)-(6) saturate the regressions with household-level exposure to cross-border portfolio flows, as summarized in Equation (4). In column (5), we present a specification without any fixed effects. As becomes apparent, the portfolio flow coefficient itself is positive, but quite small and statistically significant only at the 10% level, implying that a household without any bond and equity exposure hardly rebalances towards real estate. Yet, the highly statistically significant double interaction estimate shows that for more exposed households, portfolio flows trigger a substantial rebalancing towards housing. This main result is corroborated in column (6) where we add country-year fixed effects. Our main coefficient of interest even increases in size relative to the specification without fixed effects.

5 Impact on Household House Price Expectations

In this section, we study the effect of portfolio flows and household portfolio rebalancing on households' house price expectations.

5.1 Empirical Specification

One issue with the survey data is that these expectations are only available for the third wave. This, however, should not be a major problem for our analysis because, once we run the fixed effects specifications outlined in Equations (3) and (4) only for the third wave of the HFCS survey, our results are remarkably robust (results not reported). That is, cross-border portfolio flows also raise the housing portfolio shares of more exposed households between waves 2 and 3. To study the subsequent spillover to house price expectations, we construct a dummy variable to indicate that a household is optimistic about house price dynamics over the next twelve months. We then run a cross-sectional regression as follows:

$$\text{Opt. household}_{h,c,W3} = \alpha_t + \psi \cdot \text{Flows}_{c,t-1} + \xi \cdot X_{h,c,t} + \epsilon_{h,c}, \tag{5}$$

where $\text{Flows}_{c,t-1}$ is the average country portfolio inflow over GDP over three years preceding the third wave, $X_{h,c,t}$ is the set of household controls used in Section 4.1, and α_t are fixed effects for the specific year that a household was interviewed during the third wave. We estimate this regression using a Probit model. The results are similar for a Logit model.

We also study household heterogeneity by adding an interaction term between portfolio flows and household characteristics as follows:

$$\text{Opt. household}_{h,c,W3} = \alpha_c + \alpha_t + \kappa \cdot (\text{Flows}_{c,t-1} \times \text{Z}_{h,c,W3}) + \lambda \cdot \text{Z}_{h,c,W3} + \omega \cdot X_{h,c,t-1} + \epsilon_{h,c}, \tag{6}$$

where $\text{Z}_{h,c,W3}$ includes six dummies for first home buyers, second homes buyers, first homes sellers, second homes sellers, first homes owners who do not change the number of owned real

estate units, and second homes owners who do not change the number of owned real estate units, respectively. All the dummy variables are defined between wave 2 and 3. $X_{h,c,t-1}$ includes several lagged household controls.[12]

The underlying rationale for the specification is to see how different agents in our setting (buyers, sellers, owners) form their future house price expectations and how their expectations differ for households with first or second homes. As second homes are typically held by wealthier households for buy-to-let reasons, those agents are likely to be financially more literate and might have different (possibly more accurate) house price expectations.

Finally, note that this specification allows us to add both year and country-fixed effects. The model is also estimated via Probit and the standard errors are heteroskedasticity-robust.

5.2 Estimation Results

Table 9 shows attendant results. Columns (1)-(2) indicate that higher country-level portfolio flows are associated with increased household-level house price expectations. Economically, a one-standard-deviation increase in portfolio flows increases households' probability of being optimistic about future house price dynamics by 4.2% (column 1)-12.6% (column 2).

For every household that purchases a house, there must be a seller. We thus want to understand how house price expectations differ between buyers and sellers. We also look at households owning real estate, but not changing the number of owned housing units. We distinguish between buyers (sellers, owners) of first from second homes. Second-home buyers are typically wealthier and financially more literate, whose house price expectations might differ a lot from first-home buyers.

Column (3) shows that portfolio inflows are mainly associated with higher house price expectations of second home buyers *and* sellers, as well as both types of homeowners not changing the number of units, relative to households not owning real estate at all, as can be

[12] We lag all household controls by one wave in this specification as this specification requires households to be included in both waves 2 and 3 anyway. Note that, when a household does not report these characteristics in the second, but only in the first wave, we use those values.

Table 9 Cross-Border Capital Flows and House Price Expectations

	(1)	(2)	(3)
Flows	0.003***	0.009***	-
	(0.00)	(0.00)	
Buyer(first)			0.223**
			(0.10)
Buyer(second)			0.124*
			(0.07)
Seller(first)			-0.071
			(0.11)
Seller(second)			0.045
			(0.08)
Owner(first)			0.124*
			(0.07)
Owner(second)			0.045
			(0.07)
Buyer(first) × Flows			0.003
			(0.02)
Buyer(second) × Flows			0.031***
			(0.01)
Seller(first) × Flows			-0.025*
			(0.01)
Seller(second) × Flows			0.037***
			(0.01)
Owner(first) × Flows			0.037***
			(0.01)
Owner(second) × Flows			0.033***
			(0.01)
Year FE	No	Yes	Yes
Country FE	No	No	Yes
Obs	38,066	38,066	13,776
No. of Countries	15	15	8
Pseudo R^2	0.041	0.114	0.113

Note. This table uses the second and third wave of the HFCS and shows cross-sectional regressions of a dummy that equals one for households who have optimistic house price expectations for the next twelve months on country-level cross-border portfolio flows over GDP in three years preceding the third wave. In column (5), we define six dummies—buyers of first vs. second homes, sellers of first vs. second homes, and owners of first vs. second homes, all of them measured between waves 2 and 3—and interact them with portfolio flows. The regressions also include the following household controls (that enter with their contemporaneous values in columns (1)-(2) and their second-wave values in column (3)), whose coefficients are not shown to save space: log of wealth and income, age of the household head, number of household members, and a dummy of whether a household rents or owns the main residence. Some regressions also include country and/or year-fixed effects. Heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

seen from the positive and statistically significant double interaction coefficients. In contrast, first-home sellers have significantly lower house price expectations than the reference group following portfolio inflows. While first home buyers are generally more optimistic, this house price expectation is unrelated to portfolio flows, as the significant coefficient on $Buyer(first)$ and the insignificant double interaction coefficient show.

Overall, the analysis suggests that households exposed to second homes—either owners, buyers, or sellers—have increased house price expectations as a result of portfolio flows. This can be explained by the financial sophistication of households with second homes who have more accurate and positive house price expectations. After all, the sample period experienced a housing boom in most European countries. While the result for sellers of second homes might seem surprising, note that these households are still likely to own real estate and they might just have re-optimized their (real estate) portfolios. The negative effect on the expectations of first home sellers is also intuitive: as portfolio flows mainly induce wealthy households to purchase real estate for buy-to-let motives, the poorer households are crowded out of the real estate market. These "forced" sales of first homes seem to correlate with lower house price expectations of more affected households.

6 Conclusions

This paper studies the impact of cross-border portfolio investment flows on the rebalancing of household portfolios and house price expectations, with a focus on European countries during the 2009-2018 period. Leveraging variation in cross-country and household-level data, we find that portfolio flows induce households to rebalance their investment portfolios toward housing. Moreover, we find that this rebalancing of the household portfolio is correlated with changes in house price expectations.

Specifically, we find that households with larger initial bond and equity holdings tend to reallocate more of their investments away from these assets towards real estate. In economic

terms, a one-standard-deviation increase in portfolio flows results in a 0.76 percentage point larger increase in the housing portfolio share for households at the 75^{th} percentile of the exposure distribution when compared to those at the 25^{th} percentile. Additionally, our analysis reveals that wealthier and more risk-seeking households display a greater propensity to engage in portfolio rebalancing toward real estate. Our empirical findings also show that access to credit prior to the treatment period or credit growth during it does not significantly affect our estimation results. Finally, we also establish a connection between portfolio inflows and heightened household-level house price expectations of both buyers and sellers.

While previous research has focused primarily on the transmission of cross-border capital flows to housing prices through the credit market, our results underscore the importance of the household portfolio rebalancing channel and have important policy implications. Policy-makers have increasingly employed macroprudential tools, such as loan-to-value and debt-to-income ratio caps, to mitigate excessive leverage and potential boom-bust cycles in housing markets, and to safeguard the stability of the financial system. Our research suggests that these measures may not be enough to curb housing boom-bust cycles if these are driven by wealthier households opting to redirect their investments toward real estate.

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Appendix

'Portfolio Flows, Household Rebalancing, and House Prices'

by D. te Kaat, C. Ma and A. Rebucci

September 4, 2023

A Data Appendix

Table A1 Variable Definitions and Sources

Variable	Definition	Unit	Source
ΔHousing	A household's change in the housing wealth over housing, bonds, equity, and mutual funds	%	HFCS
ΔSecond Homes	A household's change in the wealth in second homes over second homes, bonds, equity, and mutual funds	%	HFCS
ΔHousing Alt.1	A household's change in the housing wealth over housing, bonds, equity, mutual funds, and deposits	%	HFCS
ΔHousing Alt.2	A household's change in the housing wealth over the total portfolio	%	HFCS
ΔUnits	The change in the number of apartments that a household owns	-	HFCS
Optimistic Household	=1 when a household, with a probability larger than 50%, expects house prices to increase	0/1	HFCS
Net wealth	The logarithm of a household's assets less liabilities	ln(euro)	HFCS
Rich	=1 if a household is in the upper 10% of the country-wave specific net wealth distribution	0/1	HFCS
Income	The logarithm of a household's total gross income	ln(euro)	HFCS
Renter	=1 if a household is a renter in the main residence	0/1	HFCS
Household members	The number of household members	-	HFCS
Age	Age of the household head	-	HFCS
Risk seeking	=1 if a household self-reports to tolerate at least some risk	0/1	HFCS
Bonds and equity shares (Exp)	A household's share of bond and equity (directly and indirectly held via mutual funds) over the total portfolio value	%	HFCS
Deposit shares	A household's share of deposits over the total portfolio value	%	HFCS
ΔCredit	The log-difference in households' outstanding credit volumes	%	HFCS
ΔMortgage	The log-difference in households' outstanding mortgage credit volumes	%	HFCS
Constrained	=1 when a credit application was rejected or when a household did not apply due to a high chance of being rejected	0/1	HFCS
Portfolio flows	Net portfolio investment inflows over nominal GDP	%	International Financial Statistics
Gross portfolio inflows	Gross portfolio investment inflows over nominal GDP	%	International Financial Statistics
Gross portfolio outflows	Gross portfolio investment outflows over nominal GDP	%	International Financial Statistics
Debt flows	Net debt investment inflows over nominal GDP	%	International Financial Statistics
Equity flows	Net equity investment inflows over nominal GDP	%	International Financial Statistics
FDI flows	Net foreign direct investment inflows over nominal GDP	%	International Financial Statistics
Other flows	Net other investment inflows over nominal GDP	%	International Financial Statistics
Growth	Real GDP growth during 2012-13	%	WEO
Gov. debt	Gross government debt over nominal GDP during 2012-13	%	WEO
CS	Net share of banks tightening their credit standards to households for housing purchases	-	ECB, Dutch Central Bank
HP index	National nominal house price index (2015=100), deflated by the CPI	-	Eurostat, Bank of Greece

Table A2 The Number of Households per Country and Wave (Full Sample)

Wave	AT	BE	CY	DE	EE	ES	FI	FR	GR	IE	IT	LT	LU	LV	MT	NL	PT	SI	SK
1	2,250	2,257	1,127	3,336	-	5,954	10,257	14,598	2,780	-	7,763	-	918	-	827	1,167	4,204	330	1,992
2	2,796	2,169	1,127	4,097	2,135	5,872	10,288	11,827	2,789	4,712	7,903	-	1,543	1,077	928	1,104	5,886	2,427	2,041
3	2,906	2,229	1,105	4,644	2,576	6,156	9,513	13,012	2,863	4,599	7,203	1,624	1,582	1,174	952	2,335	5,715	1,941	2,080

Table A3 The Number of Households per Country (Panel Countries)

BE	CY	DE	ES	IT	NL
853	691	1,364	2,718	2,155	521

Table A4 The Aggregate Household Balance Sheet over Time

	Port. inflow countries			Port. outflow countries		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Real Estate/Total Ass.	61.08	63.15	62.18	59.83	61.19	58.88
Other Real Ass./Total Ass.	17.40	18.87	19.17	17.92	16.92	17.06
Deposits/Total Ass.	14.98	13.27	13.18	18.78	18.70	20.50
Bonds/Total Ass.	8.34	4.57	4.75	10.96	8.97	7.87
Equity/Total Ass.	6.83	5.81	5.97	6.66	5.46	5.43
Mutual Funds/Total Ass.	7.97	7.63	7.89	8.04	6.56	6.61
Other Fin. Ass./Total Ass.	14.03	13.89	15.14	11.49	11.15	12.48

Note. This table reports the mean composition of household balance sheets based on data from the HFCS (in %). Note that the number of observations is different for each variable, implying that the numbers do not add up to 100. Real estate assets are households' housing wealth; other real assets include business wealth, vehicles, and valuables; deposits are all household deposits; bonds include all direct short-term and long-term debt securities held by households; equity includes all publicly traded shares held by households; mutual funds are the total household wealth invested in mutual funds; other financial assets include managed accounts, money owed to households, insurances, options, futures, metals, etc.; and total assets is the sum of all financial and non-financial assets. The numbers are corrected for valuation effects, as described in detail in Appendix A.1. The first three columns focus on households in Belgium, Cyprus, Spain, France, Greece, Ireland, Luxembourg, Lithuania, Slovakia, and Slovenia only (countries with positive one-year lagged average portfolio inflows during the sample period), and the latter three on households from all other countries.

A.1 Valuation Adjustment

In this section, we provide details on how we correct households' self-reported bond, equity, and housing wealth for valuation changes. The main source of the house price data is Eurostat's House Price Statistics. Since this database does not cover Greece, for Greek households, we use the annual average dwellings price index from the Bank of Greece.[A1]

[A1] Using end-of-the-year housing prices does not affect the results.

For wealth invested in equity, we use country-level share price data at the annual frequency from the OECD. In three cases where a country's stock prices are not part of this data set (Cyprus, Lithuania, and Malta), we use the euro area average.

Bond wealth is valuation-corrected by using the country-specific, end-of-the-year Bank of America bond price index with a maturity of 7-10 years.[A2] Since Latvia, Lithuania, Luxembourg, Slovakia, and Slovenia are not covered by Bank of America's bond indices, we use the iboxx bond index for these five countries. Note as well that two countries (Latvia and Slovenia) only reported their bond prices after 2013, so we express households' bond wealth in these two cases in 2014 prices.

We use these national asset price series to express the self-reported housing, equity, and bond wealth in initial prices as follows. For the fixed effects estimation, as most households are no panel households and therefore not necessarily interviewed during the first wave, we use the national price series to express the three asset categories in *average, country-level* prices prevalent during the first wave. For instance, as in the first wave of the HFCS 50% of households in country A were interviewed in 2010 and 50% in 2011, we express all asset values for households living in country A in average prices of 2010 and 2011.[A3] For the difference-in-differences regressions, since all households were interviewed in wave 1 and we know the exact year when this interview took place, we use the mentioned national bond, equity, and house price indexes to express these three wealth categories in prices of the year during which a household was interviewed in the pre-treatment period (for most households 2010, only for a few 2011).

Finally, as mutual funds mostly consist of bonds and equity as well, we also correct their values for valuation effects, assuming a 50% investment share in bonds and a 50% investment share in equity.

[A2] For Cyprus and Lithuania, the Bank of America only reports a bond index without any maturity indication.

[A3] Four countries (Estland, Ireland, Latvia, Lithuania) did not participate in the first wave of the HFCS. We hence expressed their wealth variables in prices of 2010.

B Additional Results

B.1 Breaking Down Portfolio Flows into Debt and Equity Flows

Here we report results from the estimation of our regression in Section 4 for cross-border portfolio debt and equity flows, separately. We standardize both flow variables by subtracting the mean and dividing by the standard deviation in order to make them comparable.

Table A5 Difference-in-Differences: Debt vs. Equity Inflows

	(1) ΔHOUSING	(2) ΔHOUSING
Debt Flows	0.595***	-
	(0.17)	
Equity Flows	-	0.795***
		(0.17)
Household Controls	Yes	Yes
Obs	8,371	8,371
No. of Countries	6	6
R^2	0.234	0.235

Note. The regressions are based on the first two waves of the HFCS survey. The dependent variable is the change in the share of a household's housing wealth over housing, deposits, equity, and bonds from the first to the second wave. The main regressor is country-level net cross-border debt inflows and equity inflows, averaged during 2012-2013 and standardized by subtracting the mean and dividing by the standard deviation. All regressions include the following household controls measured in the pre-treatment period that are not reported to save space: log of wealth and income, age of the household head, number of household members, a dummy of whether a household rents or owns the main residence, and the initial share of housing wealth. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A5 reports the results and shows that both debt and equity flows have a positive and statistically highly significant impact on households' housing shares. Note, however, that the point estimate is larger for cross-border equity flows. One potential explanation is that euro area households, on average, invest a larger fraction of their wealth in equity and are thus more affected by equity inflows.

B.2 Gross Portfolio Inflows vs. Outflows and Core vs. Periphery

Next, in this section, we first distinguish between gross portfolio inflows and outflows. This is important because Figure 2 indicates that the net portfolio flow dynamics during the episode

exploited in our difference-in-differences analysis is mainly driven by changes in gross inflows. In other words, these dynamics are driven by foreign investors increasing their exposure in the euro area, rather than domestic residents adjusting their foreign investment position. Here, we want to see to what extent the difference between foreign vs. domestic investors adjusting their stock and bond portfolios matters.

Columns (1)-(2) of Table A6 show that both interaction coefficients are statistically significant and have the expected sign. That is both higher gross inflows and lower gross outflows induce more exposed domestic households to rebalance towards real estate. This result justifies our focus on a net flow measure in the benchmark regressions, calculated as the difference between inflows and outflows, a calculation that therefore does not seem to result in information losses. Interestingly, however, the inflow interaction coefficient is larger in absolute terms than the outflow coefficient, suggesting that gross inflows might matter more than gross outflows in affecting households' portfolio rebalancing.

Noting that during the episode on which we focused on in the difference-in-difference regression analysis inflows mostly occurred in countries of the euro area periphery, we now estimate our benchmark regression, which uses the *net* portfolio flow-exposure interaction as the main regressor, separately for core and periphery countries. Columns (3) and (4) show that the attendant coefficients are statistically significant in both country groups, but larger and estimated more precisely in countries of the core. One explanation for this finding is that our household-level exposure variable is also larger in countries of the core.

B.3 Other Robustness Checks

In this section, we report the results of several additional robustness checks. In columns (1)-(2) of Table A7, we control for two important macroeconomic variables that, at least during this specific time period shortly after the European sovereign debt crisis, correlate with cross-border portfolio flows and might have an effect on household portfolios—real GDP growth and government debt as a percentage of GDP, both fixed at their 2012/13 average values.

Table A6 Difference-in-Differences: Gross Flows and Core vs. Periphery

	All countries		Core	Periphery
	(1)	(2)	(3)	(4)
	ΔHOUSING	ΔHOUSING	ΔHOUSING	ΔHOUSING
Gross portfolio inflows × Exp	0.029**			
	(0.01)			
Gross portfolio outflows× Exp		-0.016***		
		(0.01)		
Net portfolio flows × Exp			0.030***	0.009*
			(0.01)	(0.01)
Household Controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Obs	8,371	8,371	2,808	5,563
No. of Countries	6	6	3	3
R^2	0.241	0.249	0.223	0.307

Note. The regressions are based on the first two waves of the HFCS survey. The dependent variable is the change in the share of a household's housing wealth over housing, equity, bonds, and mutual funds from the first to the second wave. The main regressor is country-level net portfolio flows (columns 3 and 4), gross cross-border portfolio investment inflows (column 1), and outflows (column 2), respectively, averaged during 2012-2013 and interacted with the initial household share of wealth invested (directly and indirectly) in bonds and equity. All regressions include country-fixed effects and the following household controls measured in the pre-treatment period that are not reported to save space: log of wealth and income, age of the household head, number of household members, a dummy for whether household rents or owns the main residence, and the initial share of housing wealth. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The results show that their inclusion reduces the size of our main coefficient of interest only marginally relative to the benchmark estimates in Section 4. From the additional controls, only the government debt interaction turns out to be statistically significant. In particular, households having a higher bond and equity share rebalance more significantly towards housing in countries with a lot of government debt.

The countries included in the HFCS interviewed households during different years. This implies that the dependent variable—the change in housing shares between the first and second wave—can have different lengths across countries and even within countries, across households. However, the larger the gap between the two waves, the more likely are households to rebalance. In order to make sure that this possibility does not affect our benchmark results, in column (3), we control for the household-specific number of years between the first and second wave. As expected, this control is positive, but it is not statistically significant. Importantly, our benchmark results turn out to be largely unaffected.

Table A7 Difference-in-Differences: Robustness Checks

	(1) ΔHOUSING	(2) ΔHOUSING	(3) ΔHOUSING
Flows × Exp	0.014***	0.014***	0.016***
	(0.00)	(0.01)	(0.00)
Gov. Debt × Exp	0.006***		
	(0.002)		
Growth × Exp		-0.035	
		(0.02)	
Distance between waves			0.116
			(0.93)
Household Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Obs	8,371	8,371	8,371
No. of Countries	6	6	6
R^2	0.256	0.252	0.250

Note. The regressions are based on the first two waves of the HFCS survey. The dependent variable is the change in the share of a household's housing wealth over housing, equity, bonds, and mutual funds from the first to the second wave. The main regressor is country-level net cross-border portfolio investment inflows, averaged during 2012-2013, interacted with the initial household share of wealth invested (directly and indirectly) in bonds and equity. All regressions include country-fixed effects and the following household controls measured in the pre-treatment period that are not reported to save space: log of wealth and income, age of the household head, number of household members, a dummy of whether household rents or owns the main residence, and the initial share of housing wealth. Columns (1) and (2) add the interactions between household-level initial bond and equity shares and the country-level share of government debt over GDP and country-level real GDP growth, both averaged during 2012-2013, to the regressions. All individual variables included in the interactions, when they are not absorbed by the fixed effects, also enter the regressions, but their coefficients are not shown to conserve space. Column (3) controls for the number of years between the first and second wave of the HFCS. The heteroskedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

B.4 Additional Tables

Table A8 Capital Flows and House Prices: Role of Portfolio Rebalancing

	(1) Real HP	(2) Real HP	(3) Real HP
Portfolio Flows	-0.097**		
	(0.040)		
Portfolio Flows × Exp	0.018**		
	(0.008)		
Other Flows		0.189*	
		(0.098)	
Other Flows × Exp		-0.023*	
		(0.011)	
FDI Flows			0.125
			(0.132)
FDI Flows × Exp			-0.016
			(0.012)
Exp	-0.416	-0.772	-0.872
	(0.245)	(0.545)	(0.549)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Obs	148	148	148
No. of Countries	15	15	15
R^2	0.521	0.512	0.513

Note. This table shows regressions of country-level real house price indexes for all 19 euro area countries at annual frequency on the contemporaneous, one-year lag and two-year lag of net cross-border portfolio inflows, FDI flows, and other investment flows, respectively, and their interactions with the initial country-level average of households' portfolio shares of (directly and indirectly held) equity and bonds during the first wave of the HFCS (Exp). For reasons of space, the table only shows the joint coefficient estimates and standard errors. All regressions include country and year-fixed effects. Newey-West standard errors with two lags are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.