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Abstract

We assess the impact of the ECB's unconventional monetary policy (UMP) on the wealth distribution of households in ten euro area countries. For this purpose, we estimate the effects of an ECB balance sheet expansion on financial asset and housing prices by means of vector autoregressions. We then use the estimates to carry out micro simulations based on data from the Household Finance and Consumption Survey (HFCS). We find that the overall effect of UMP on the net wealth distribution of households differs depending on which wealth inequality indicators we use. There is an inequality-increasing effect for the majority of the countries under review when we use wealth inequality indicators that are sensitive to changes at the tails of the wealth distribution. The effect is more equalizing when we base our assessment on the Gini coefficient. It is also important to note that one-third of the households in our sample does not hold financial or housing wealth and is thus not directly affected by UMP measures via the asset price channel.

Keywords: Monetary Policy, Inequality, Wealth, Quantitative Easing

JEL Codes: D14, D31, E44, E52, E58

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1 Introduction

The widespread use of unconventional monetary policy (UMP) has revived the debate about the distributional consequences of monetary policy. Similar to conventional monetary policy¹, the overall distributional impact of UMP is a priori ambiguous. Yet with UMP, the portfolio composition channel affecting households' balance sheets through differences in the composition of the asset portfolios, seems to become more relevant. An UMP-induced fall in long-term rates and the associated boost in asset prices can negatively affect the distribution of financial wealth of households, which generally tends to be more unequally distributed than income. At the same time, the effect on housing prices is mostly positive, as reflected above all by lower mortgage interest rates. As homeownership is usually more broadly distributed, the question arises whether and to which extent this positive effect can compensate for rising inequality resulting from capital gains in financial assets.

In this study, we examine this question for ten euro area countries. We use vector autoregressions (VARs) with monthly data from 2007 to 2016 to estimate, in a first step, elasticities of risky financial assets (proxied via stock prices) and house prices with respect to an increase in the ECB's balance sheet. Second, employing data from the Household Finance and Consumption Survey (HFCS), we use the derived elasticities for micro-simulations to assess the distributional consequences of UMP related to real (housing) and risky financial asset wealth, defined as the sum of mutual funds, bonds, non-self-employment private business, shares and managed accounts. Our main findings are as follows: First, one-third of the households in our sample, most of which are in the lower third of the wealth distribution, hold neither housing nor financial wealth and therefore do not benefit from UMP. This holds particularly true for countries with low homeownership. By contrast (which is beyond the scope of this paper, however), housing expenditure for some of the households seeking to rent may have risen, depending on the respective regulation of the rental market and the speed at which rents adjust to the rising value of residential property. Second, the distributional consequences of UMP on the joint distribution of housing and risky financial wealth are negative for most countries. This is true when inequality is measured in terms of wealth indicators that are sensitive to changes at the tails of the wealth distribution, such as the ratio of the 90th to the 10th percentile or the ratio of the 80th to the 20th percentile, as well as the share of the top 10%, and

¹ For a comprehensive survey, see Colciago et al. (2018).

top 5%, in overall net wealth. However, when we assess the change in the Gini coefficient, in five countries (Germany, Austria, Portugal, the Netherlands and Finland), the more equalizing effect of rising housing prices more than offsets the negative distributional effects of rising values in risky financial assets. In France, the two effects are similar in size, and in Italy, Spain, Greece and Belgium, the overall distributional effects are negative. In the southern periphery countries, this is mainly due to the limited ability of UMP to reverse the downtrend in house prices. Belgium stands out as a country with an above-average share of risky financial assets (that happens to be held by the upper decile), where the negative distributional effects of financial assets more than offset the equalizing effects on housing prices.

Our more general findings are broadly in line with those of the scarce empirical literature examining (aspects of) the portfolio composition channel for euro area countries – some of which also consider other distributional channels at play (Lenza and Slacalek, 2018; Casiraghi et al., 2018). Our approach differs, however, with respect to country coverage and methodology. We report distributional effects based on the Gini coefficient as well as other indicators that better account for changes at the tails, and hence we arrive at a more negative distributional impact.

Adam and Tzamourani (2016) show for all euro area countries that increases in equity prices significantly drive up net wealth inequality, while house price increases generally benefit a broader range of households with large cross-country heterogeneity. The overall effect on the net wealth distribution of individual countries is exclusively determined by the respective wealth composition of households' portfolios, as a uniform exogenous asset price increase of 10% is assumed, not accounting for potential heterogeneity in the response of asset prices across countries. The distributional consequences of monetary policy differ strongly across euro area countries, as demonstrated by Guerello (2018). Using microdata from household surveys conducted in six advanced economies (France, Germany, Italy, Spain, the United Kingdom and the United States), Domanski et al. (2016) argue that equity prices are the main drivers of rising inequality, which is only partly offset by rising housing prices. They therefore provide tentative evidence of the relative importance of monetary policy in affecting wealth inequality. Casiraghi et al. (2018) find for Italy that this negative distributional impact on gross wealth may, however, be mitigated due to through lower liabilities of poorer households. Using a DSGE framework, Hohberger et al. (2019) show that UMP mitigates income and wealth inequality, except in the very short term. More similar to our methodological approach, Lenza

and Slacalek (2018) analyze the effect of quantitative easing (proxied by a drop in the term spread) on income and wealth inequality in the four largest euro area countries by using a multi-country VAR approach. Interestingly, their results imply a more equal distribution of household wealth, but overall effects tend to be rather muted. This result, which is derived from changes in Gini coefficients, is mainly driven by the equalizing effect of increasing house prices.

The remainder of the paper is structured as follows: Section 2 introduces the data and presents a small simulation exercise that illustrates how a uniform 10% increase in equity and housing prices alters the distribution of gross wealth in each of the reviewed countries. It becomes apparent that asset price inflation has different effects in light of the countries' underlying heterogeneous wealth distribution. Section 3 contains a description of the methodology and the main results of the distributional consequences of an expansion in the ECB's balance sheet. Section 4 concludes.

2 Data and stylized facts

In this section, we present some stylized facts about the distribution of real and financial wealth in ten euro area countries, namely Austria, Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal and Spain. We use the first wave of the Household Finance and Consumption Survey (HFCS), which contains detailed information on households' balance sheets. The HFCS is a joint project of the national central banks of the Eurosystem and several national statistical institutes (ECB, 2009, 2013a, 2013b). The HFCS provides detailed household-level data on household balance sheets and related economic and demographic variables, including income, private pensions, employment and measures of consumption. All variables are provided by the respondents of the survey.²

In the first survey wave, most of the data collected had 2010 as the reference period, and were collected in an a priori harmonized way in 17 EU Member States for a sample of more than 62,000 households. We use the data for the above-mentioned

² All questions on income, consumption and wealth that households could not or did not want to answer are imputed using multiple imputations based on chained equations. This allows to account for the uncertainty of the imputation. To account for the survey structure, the estimates take into account population weights, based on design, non-response and post-stratification weights. Finally, the HFCS data also include bootstrap replicate weights for variance estimation.

ten euro area countries. See ECB (2013b) for more details on the methodology of the HFCS. We use the first wave – as opposed to the second wave (where in most countries 2014 was the reference year) –, because we want to capture the effect of UMP measures, which were implemented from 2008 onward.

As the focus is on the distributional impact of UMP, we are particularly interested in housing and risky financial assets. To that end, we use the following classification throughout our study. "Housing" refers to the value of a given household's main residence and other real estate property; "risky financial assets" refer to mutual funds, bonds, non-self-employment private business, shares and managed accounts; "other" refers to other wealth positions, such as deposits, voluntary pension accounts, and vehicles. We include risky financial assets that are most likely to be influenced by UMP. We do not include deposits or savings accounts as we concentrate on the effect of asset price changes. We also exclude private pension funds, mostly because the effects UMP has on private pension funds is not as well researched (with Boubaker et al., 2017, being a notable exception) and it is unclear at this point if private pension funds behave in a similar way as risky financial assets. Throughout this study, we will focus on results where households are grouped in gross wealth deciles. The reason we opt for this representation is that we do not consider possible effects on debt. It should be kept in mind, though, that higher gross wealth deciles are usually associated with higher debt. To allow for comparability with most of the inequality literature, we use net wealth to calculate inequality measures.

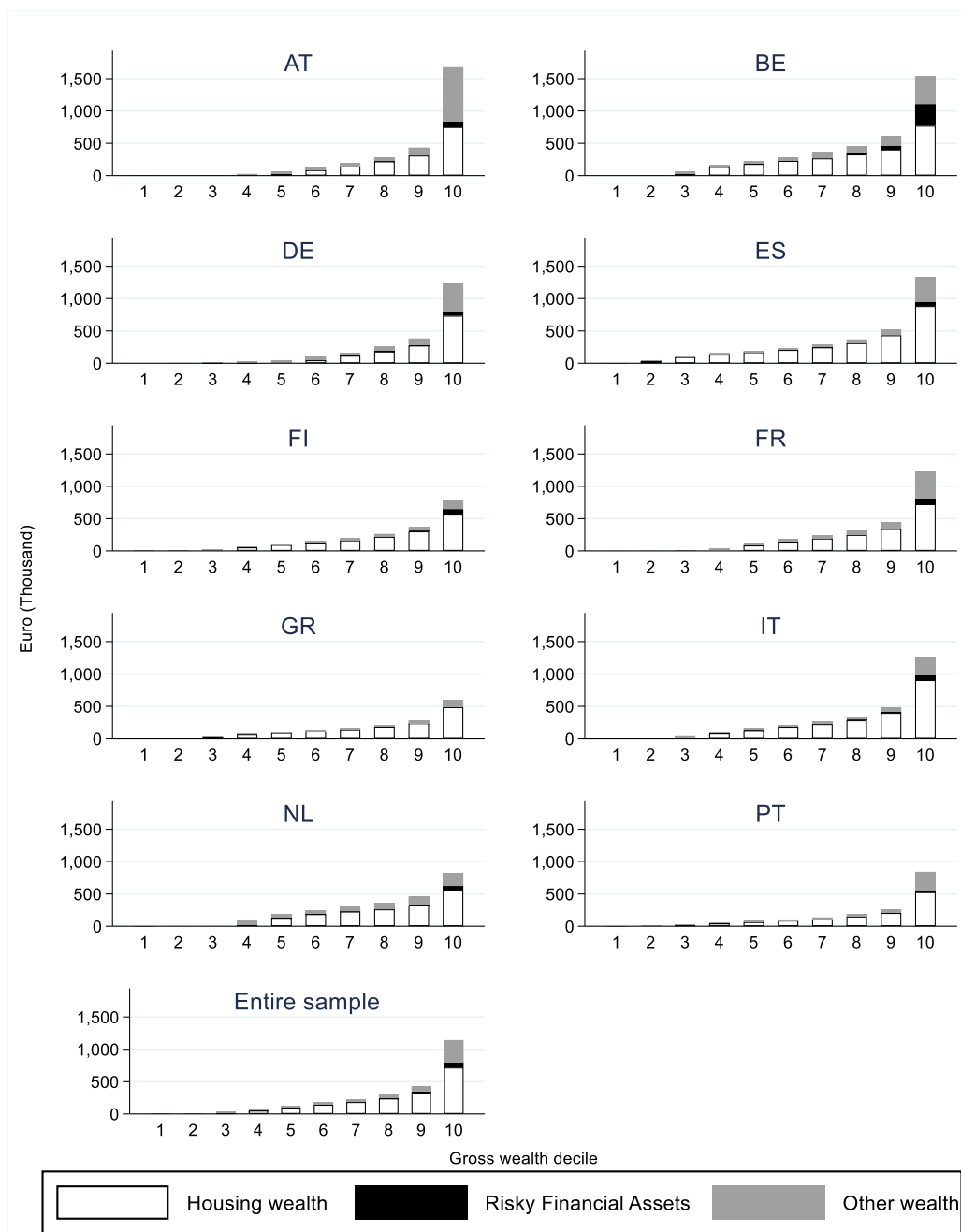
In the following, we first illustrate the data and then show how a uniform 10% increase in house prices and risky financial assets prices affects the household wealth distribution. This simple exercise, which is in the spirit of Adam and Tzamourani (2016), should reveal, for the countries under review, the underlying wealth distribution and patterns of asset participation.

Figure 1 shows mean gross wealth per gross wealth decile per country. In our sample, wealth is composed of housing (51%), risky financial assets (3%), and other wealth (46%).³

³ In more detail, gross wealth is composed of: housing (main residence 43%, other real estate property 8%), mutual funds (1%), bonds (0.5%), non-self-employment private business (0.1%), shares (0.6%) and managed accounts (0.04%) as well as deposits (21%) and other assets (24%; voluntary pension, other financial assets, money owed to households, vehicles, valuables).

There are some features that are common to all countries under consideration: (i) households in the lower half of the distribution hold only negligible amounts of wealth, and are therefore, in absolute terms, not severely affected by asset price changes; (ii) housing wealth is the most important component of wealth in all countries starting, on average, from the 5th decile; (iii) risky financial assets are almost exclusively held by the upper decile of the gross wealth distribution.

Figure 1: Wealth distribution by gross wealth deciles, average wealth per decile.



Note: The figure displays the mean wealth per gross wealth decile in each country in the sample. “Housing wealth” refers to the households’ main residences and other real estate property; “Risky Financial Assets” refer to mutual funds, bonds, business (non-self-employment), shares, managed accounts; “Other wealth” refers to vehicles, valuables, deposits, saving funds, voluntary pension / whole life insurance, other assets. Source: HFCS Wave 1, Authors’ calculations.

Apart from these general findings, there is substantial heterogeneity in the distribution of wealth between countries in terms of composition of wealth and distribution across wealth deciles.⁴ For instance, in Austria and Belgium, risky financial assets are more prevalent at the top of the distribution compared to other countries. It is also notable that in Spain, households in the third and fourth deciles already hold considerable amounts of housing wealth, while in other countries households start holding substantial housing assets starting in the fifth decile.

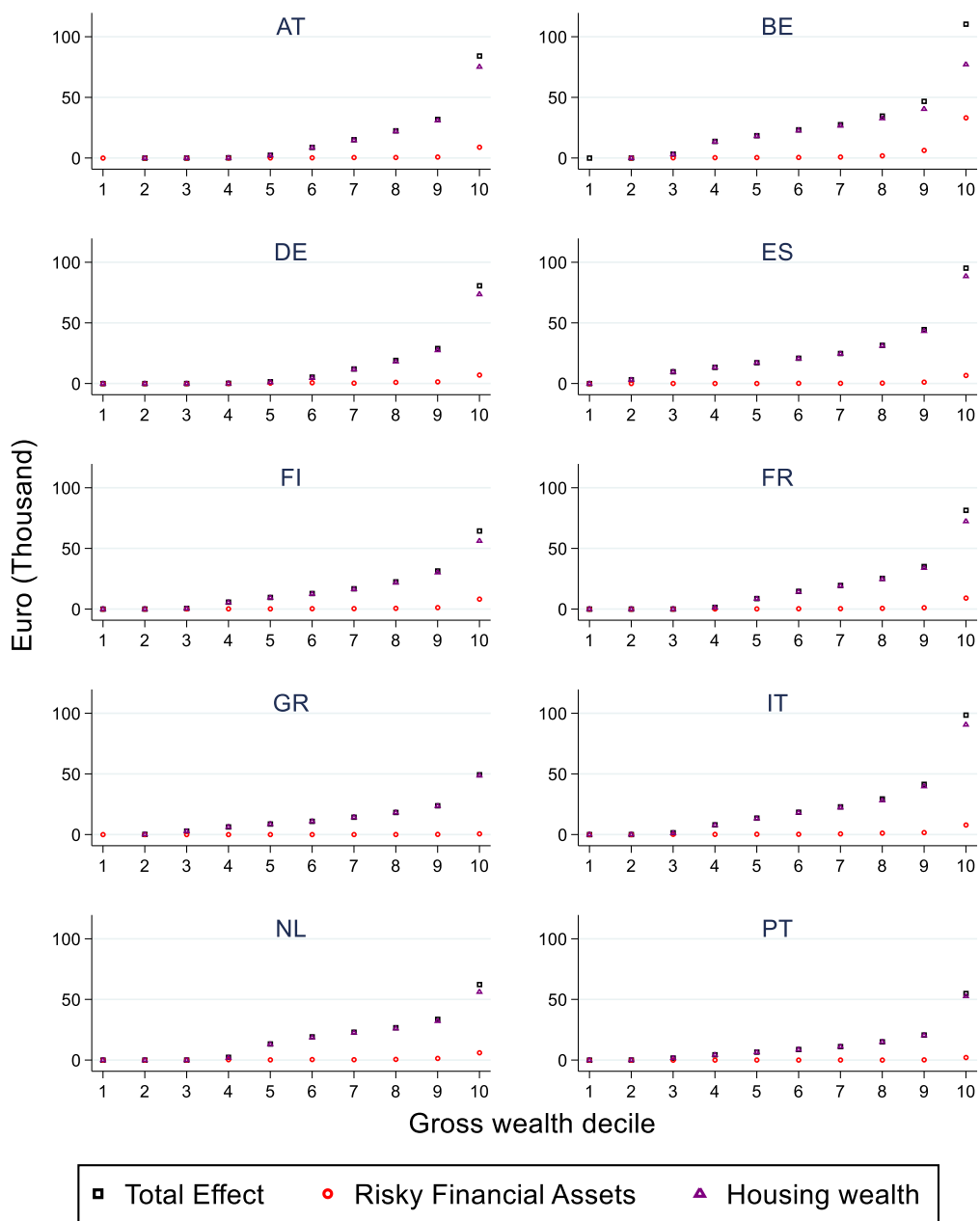
These differences in wealth composition lead to heterogeneous effects of UMP on wealth distribution via the asset price channel. To illustrate this, we do a simple simulation exercise and analyze how a 10% increase in the value of housing and risky financial assets affects wealth distribution across countries.⁵ This exercise is meant to show how differently wealth distributions across Europe react when faced with a uniform price increase, and to allow for a comparison with the heterogeneous price increases applied in section 3. This approach enables us to distinguish between the effects of UMP on inequality based on underlying distributions, on the one hand, and the effects based on the different country-specific impact UMP has on asset prices, on the other.

Figure 2 shows the mean impact of a 10% increase in housing and risky financial asset prices per decile. The gains in gross wealth seen in the upper half of the distribution are to a large extent driven by housing wealth.

⁴ Statements about cross-country heterogeneity in the level of wealth are made difficult given issues such as differences in oversampling of the rich, differing survey modes, small sample sizes (see e.g., ECB, 2013b; Tiefensee and Grabka, 2016).

⁵ A similar approach is applied by Adam and Tzamourani (2016).

Figure 2: Absolute effect of a 10% shock in housing and risky financial asset prices by gross wealth deciles, average effect per decile



Note: The figure displays the mean effect of a positive 10% shock in housing and risky financial wealth assets prices, per gross wealth decile in each country in the sample. The shock is uniform across all wealth classes, households and countries. “Housing wealth” refers to households’ main residences and other real estate property; “Risky Financial Assets” refer to mutual funds, bonds, business (non-self-employment), shares, managed accounts. Source: HFCS Wave 1, Authors’ calculations.

The effect on different inequality indices is displayed in

Table 1. For inequality measures, we follow the literature and use net wealth as target variable. The Gini coefficient and the share of the top 5% and top 10% in net wealth decrease or remain constant for all countries. The reason for this is that these indices are sensitive to movements close to the mean of the distributions. Households close to the mean benefit from a house price increase as they are mostly owner-occupiers. Indicators which are more sensitive to movements at the tails of the distribution, such as the ratio of the 90th percentile wealth to the 10th percentile (P90/P10) and P80/20, increase for most countries because households with almost no wealth do not benefit from the asset price increases. These ratios are, however, relatively sensitive to even small absolute movements in the lower decile. Take the example of P50/P10 for Spain: median wealth increases from about EUR 182,700 to about EUR 201,400, i.e., by about EUR 18,600 or 10%. The 10th percentile net wealth increased from about EUR 5,600 to EUR 6,300 (+EUR 700 or +12%). Accordingly, the ratio of the median relative to the 10th percentile decreased from 32.2 to 31.6. In other words, even a small absolute increase in wealth in lower deciles can cause such ratios to decrease as long as said increase is *relatively* larger than the change in the upper decile. Overall, the impact of a 10% price increase of housing and risky financial asset prices is not sizeable. For the Gini coefficient, for example, the decrease amounts to less than 1 percentage point in all countries except the Netherlands. Occasional negative values stem from negative net wealth in lower deciles.

Table 1: Effects of a 10% housing and risky financial asset price shock on inequality measures

		P90/P10	P80/P20	P90/P50	P50/P10	ShareTop5%	ShareTop10%	Gini
AT	Baseline	554.70	51.07	7.09	78.21	0.48	0.62	76.58
	10% increase	27.36	3.13	0.02	3.62	-0.01	-0.01	-0.39
BE	Baseline	253.43	26.85	3.42	74.13	0.31	0.44	60.83
	10% increase	7.32	0.52	-0.07	3.73	0.00	0.00	-0.43
DE	Baseline	6911.25	74.85	8.61	802.47	0.46	0.59	75.79
	10% increase	-1615.78	2.43	-0.03	-185.36	0.00	0.00	-0.31
ES	Baseline	107.40	7.00	3.33	32.29	0.31	0.43	58.05
	10% increase	-4.62	-0.51	-0.07	-0.70	0.00	-0.01	-0.73
FI	Baseline	-692.19	91.23	4.63	-149.39	0.31	0.45	66.42
	10% increase	13491.68	-10.38	-0.13	2990.03	0.00	-0.01	-1.04
FR	Baseline	323.17	58.16	4.42	73.15	0.37	0.50	67.90
	10% increase	21.70	3.85	-0.08	6.30	-0.01	-0.01	-0.38
GR	Baseline	165.89	14.70	3.25	50.97	0.26	0.39	56.08
	10% increase	13.80	0.48	-0.04	4.93	0.00	0.00	-0.26
IT	Baseline	115.43	20.86	3.33	34.70	0.32	0.45	60.94
	10% increase	9.80	1.37	-0.02	3.18	0.00	0.00	-0.11
NL	Baseline	-112.54	43.08	4.13	-27.25	0.26	0.40	65.42
	10% increase	-718.07	-8.24	-0.13	-180.55	0.00	-0.01	-1.85
PT	Baseline	286.62	21.40	3.95	72.53	0.41	0.53	67.01
	10% increase	-3.05	-1.09	-0.01	-0.50	-0.01	-0.01	-0.62

Note: This table describes the effect of a 10% increase in housing and risky financial asset prices on the following inequality measures: P90/P10 (the ratio of the 90th to the 10th net wealth percentile), P80/P20, P90/P50, P50/P10, ShareTop5% (share of the top 5% of households in the entire net wealth distribution), ShareTop10%, Gini coefficient. The changes are absolute changes relative to the baseline distribution before the shocks occurred. Source: HFCS Wave 1, Authors' calculations.

3 The distributional impact of unconventional monetary policy on asset prices

To analyze the effects of unconventional monetary policy on the distribution of wealth in the euro area, we proceed in two steps. First, we estimate the effect of an increase in the ECB's balance sheet on housing and risky financial asset prices by means of vector autoregressions (VARs). We identify the balance sheet shock via sign restrictions and calculate elasticities based on the peak effects of the impulse responses of house and equity prices. In a second step, we then use these elasticities in a microdata-based simulation to assess the effect of a balance sheet expansion on the distribution of wealth.

3.1 VAR assessment

In this section, we study the effect of unconventional monetary policy on housing and risky assets prices in the euro area in the aftermath of the financial crisis. A broad literature provides evidence of significant effects on housing prices (see, among others, Jarocinski and Smets, 2008; Bernanke and Gertler, 1995; Iacoviello and

Minetti, 2008; Beraja et al. 2018). But only a few studies assess the effect of UMP on housing markets while focusing on the heterogeneous effect on euro area countries. Among the most recent, Lenza and Slacaleck (2018) estimate the effect of a quantitative easing shock (proxied by a drop in the term spread) on house and stock prices and ultimately on wealth inequality in the four largest euro area countries. Nocera and Roma (2017), by contrast, study the effect of a standard contractionary monetary policy shock on house prices in all euro area countries up to 2014. Both Lenza and Slacaleck (2018) and Nocera and Roma (2017) find that monetary policy affects house prices more strongly in Spain than in Germany. However, the estimations in both papers draw on data that include the pre-crisis period, when low interest rates had contributed to the boom in housing sectors, especially in Spain and Ireland (Nocera and Roma, 2017). By contrast, Rahal (2016) examines only the post-crisis period, using a low-dimensional panel VAR model to analyze the effect of UMP on housing market developments in the euro area aggregate, the U.S.A., Canada, Japan, Switzerland, Norway, Sweden and the U.K. He finds that mean group responses of housing prices to UMP (proxied by central bank total assets) are positive and significant, and that country-level responses are very similar across countries⁶, except for the euro area, where responses of housing prices are less pronounced and turn negative after a few periods.

As to the effect of conventional and unconventional monetary policy on stock market prices, the literature uses a more varied set of methodologies. Several authors analyze the effect of UMP on specific financial assets, such as bond yields and equity prices, by using event study approaches (see, among others, Altavilla et al., 2016, Fratzscher et al., 2016 Krishnamurthy and Vissing-Jorgensen, 2011; Ambler and Rumler, 2019). These studies find that ECB asset purchase programs significantly lowered long-term government bond yields especially in distressed countries (Altavilla et al, 2016; De Santis et al., 2016), and that they increased stock market prices. These effects are, however, estimated as impact or short-term effects around the date of the announcements.

Other studies employ vector autoregressions to assess the effect of UMP on a range of macro and financial variables, such as stock market prices (Georgiadis, 2015;

⁶ The largest response in housing prices is observed in the U.S.A. and in the U.K., where mortgage markets are more developed, which points to a relationship between the credit channel and the efficiency of housing finance (Rahal, 2016).

Feldkircher et al., 2019; Boeckx et al., 2017). For instance, Boeckx et al. (2017) estimate the effect of UMP on euro area-wide financial and banking variables from 2007 to 2014.⁷ Their results show that, for the euro area as a whole, UMP decreased the spread between euro area and German sovereign bond yields and increased equity prices.

In our analysis, we estimate the effect of ECB balance sheet expansion on asset prices, employing country-by-country VARs with sign restrictions as in Uhlig (2005). For each of the ten countries in our sample, we estimate a VAR model of the following form:

$$Y_t = a + A_1 Y_{t-1} + \dots + A_p Y_{t-p} + u_t, \quad (4.1)$$

where Y_t is the $n \times 1$ vector of endogenous variables, a is a vector of constants, A_j are the coefficient matrices for lags $j = 1, \dots, p$, and u_t is the vector of one step-ahead prediction error with variance-covariance matrix Σ . We estimate the model over the sample period from January 2007 to December 2016 for all the ten countries but Portugal and Greece. The model for Portugal is estimated as from January 2008, and, for Greece, the time series ends already in October 2016.⁸ Focusing on post-crisis data when assessing UMP measures is consistent with a range of recent studies (e.g., Boeckx et al., 2017). For all countries, we use two lags and 10,000 posterior draws, of which 5,000 are discarded as burn-ins. The quality of our results remains unchanged when we use different specifications of the lag length.

For each country, we include 8 variables: real industrial production, real house prices, consumer price inflation (HICP), housing loans, the spreads between the interest rate on housing loans and the long-term interest rate (proxied by ten-year government bond yields), equity prices, a stock market volatility index (VSTOXX) and the size of the ECB's balance sheet. For more details on the data, see the appendix. We choose to include the spread of rates on housing investments over government bond yields of the same maturity because we try to separate out the housing market-

⁷ Boeckx et al. (2017) rely on a balance sheet shock, as in Gambacorta et al. (2014) and Rahal (2016).

⁸ We also carry out the estimations for the sample starting in 2008, finding very similar results. Robustness checks also included specifications including the EONIA rate or excluding stock market variables. Nevertheless, in line with Gambacorta et al. (2014), we find that the inclusion of a measure of volatility in the VAR is crucial for studying the effectiveness of unconventional monetary policy.

specific risk relative to long-term country-specific sovereign investments. We do this to account for the relative riskiness of housing investments compared to long-term sovereign bonds, implicitly controlling for country-specific sovereign risk. To assess the effect of UMP on stock market prices, it is crucial to include a measure of stock market volatility. In fact, it is necessary to disentangle the effect of increasing risk perception on financial markets and the endogenous reaction of the policy response to increasing market volatility.

We identify the UMP shock as an exogenous innovation to the ECB balance sheet, following, among others, Gambacorta et al. (2014), Rahal (2016) and Boeckx et al. (2017). More specifically, the reduced form errors are decomposed into economically meaningful and mutually independent fundamental innovations, such that $u_t = R\epsilon_t$ and $\Sigma = E[u, u'] = RE[\epsilon\epsilon']R = RR'$.

As we are interested in the effect of an UMP shock, we only identify restrictions on the i^{th} column of the matrix R , r , which represents the contemporaneous impact of the shock on all model variables. The impulse vector r is defined so that the impulse responses to market volatility are non-positive at all horizons in $k = 1, \dots, K$. Imposing a non-positive response of market volatility to an ECB balance sheet expansion is important in order to disentangle the exogenous ECB innovation from its endogenous reaction to financial market volatility. This choice is in line with Gambacorta et al. (2014) and Boeckx et al. (2017).⁹ Moreover, we let stock market variables, such as equity prices and the volatility index, react contemporaneously to UMP shocks. Finally, we leave the sign of the response of the other variables unrestricted, to account for the heterogeneous response across countries. Note also that we do not impose explicit restrictions on the quantities which are of direct interest for our analysis (house and equity prices).

The parameters (A, Σ) are drawn jointly from a Normal-Wishart prior, while the vector r needs to satisfy a penalty function which penalizes positive responses of stock market volatility to an increase in the ECB's balance sheet (see Uhlig, 2005, for more details). This approach selects the best model from the point of view of the economic hypothesis of interest, in this way the uncertainty around the rotation matrix chosen might be underestimated.

⁹ Gambacorta et al. (2014) use the VIX indicator, whereas Boeckx et al. (2017) use the CISS indicator.

One challenge arising from the VAR analysis is that we derive the elasticities based on the impulse responses to an expansionary balance sheet shock, which is a one-off event. It is difficult to model the cumulative effect the monthly purchases or changes in the size of purchases had throughout the asset purchase program. Instead, our results indicate the sensitivity of certain asset classes to changes in the ECB’s balance sheet, and by extension, the impact of the balance sheet expansion on wealth distribution in euro area countries. With this caveat in mind, we scale the VAR impulse responses to a 100% increase in the ECB’s balance sheet. Note that the total increase in the ECB’s balance sheet ascribable to the asset purchase program was much (more than three times) larger.

The results are summarized in table 2, while the full set of impulse responses is shown in the appendix (figures A.1. to A.5). The table shows the peak effect of the balance sheet shock on house prices and stock prices in response to an unexpected 100% rise of the ECB’s balance sheet.

Table 2: Change in housing and risky financial assets prices from 2009 to 2016 (in real terms) and estimated change due to a 100% increase in ECB assets, together with the 68th percent confidence intervals (p.p.)

	Housing Prices				Equity prices			
	Actual change (2009-2016)	VAR-based elasticities to ECB balance sheet policy			Actual change (2009-2016)	VAR-based elasticities to ECB balance sheet policy		
		16 th percentile	Median response	84 th percentile		16 th percentile	Median response	84 th percentile
AT	35.49	10.62	16.85	25.34	30.43	1.88	40.53	94.92
BE	0.64	4.75	7.43	10.65	63.46	6.43	38.69	81.88
DE	22.31	2.31	4.51	7.03	123.73	15.46	37.25	67.28
ES	-29.99	-8.00	-5.41	-3.06	-5.09	-1.37	16.03	36.08
FI	3.03	0.29	4.15	8.31	43.67	-12.89	18.67	55.03
FR	-3.73	-1.04	6.26	14.76	40.30	22.62	49.98	94.37
GR	-41.64	-14.80	-5.00	3.83	-66.41	-98.48	-31.34	41.64
IT	-23.99	-4.10	-2.15	-0.24	-11.24	-4.39	16.12	41.70
NL	-16.06	-4.10	2.20	8.56	69.21	17.78	44.05	78.53

PT	-4.45	-2.11	3.10	8.79	-34.62	-28.53	-1.60	33.15
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Looking at house price elasticities first, we find a positive reaction in most economies. More specifically, we see that, for Austria, a 100% increase of the ECB’s balance sheet increases housing prices by about 17%, which is the highest value for all countries in our analysis. On the other extreme, results for Spain, Italy, Portugal and Greece show (to a different degree) negative reactions of housing prices to an ECB balance sheet shock. At first sight, this result might be counterintuitive. The full set of impulse responses (see figures A.1 to A.5 in the appendix), however, reveals that these negative effects are often accompanied by wide credible sets. A notable exception is Spain. Here, the effects of a positive balance sheet shock on house prices are significantly negative. Dees and Güntner (2014) show that developments in both the housing market and the construction sector contributed considerably to Spain’s economic recession. In the decade before the crisis, house prices had almost tripled. The continuous fall in house prices from 2007 to 2012/13, and the contraction in residential investment led to a severe decline in construction value-added and employment, which had strong spillovers in other sectors (Dees and Güntner, 2014; Cuerpo and Pontuch, 2013). The housing boom and bust cycle in Spain led to continuous oversupply, substantial overvaluation of residential prices, and stagnant demand at least up to 2013.¹⁰

Our findings indicate that UMP was not successful in boosting demand and prices in the housing sector in Spain, Italy, Greece and Portugal. This might be partly due to post-crisis price adjustments in these countries, and partly due to the failure of the refinancing channel, lower home equity and a tightening of refinancing standards, after which a large share of buyers dropped out of the market (see Beraja et al., 2018, for a similar interpretation for the U.S.A.).

The heterogeneous response of house prices to ECB balance sheet shocks across countries explains the relatively low aggregate response of housing prices in the euro

¹⁰ Robustness checks for Spain include unemployment, term spread and output in the construction sector. We also re-estimated the model, splitting the sample in line with the end of the period of housing market adjustments. We find that, up to end-2012, the reaction of housing prices to balance sheet policy remains negative, while it becomes insignificant in the following part of the sample. Results are available upon request.

area, reported by other studies. For instance, Rahal (2016) shows that the response of house prices in the euro area is much smaller compared to that in the U.S.A. or the U.K.¹¹ Moreover, marked differences are found between our estimates and the results obtained from estimations including the pre-crisis period. For instance, Nocera and Roma (2018) and Lenza and Slacalek (2018) find that, during the last few decades, monetary policy shocks have affected house prices more strongly in countries like Spain than in Germany. While the results of these studies help explain the high sensitivity of house prices to low interest rates in Spain and Ireland during the pre-crisis period, they do not say much about the effect of monetary policy at the zero lower bound, and about the effect of balance sheet policies in the post-crisis period.¹²

As to the response of equity prices, our results again show diverging responses in euro area core and peripheral countries. In Austria, Belgium, Germany and the Netherlands, the elasticity of equity prices to an ECB balance sheet shock is estimated to be approximately 0.4% to 0.5%. This is roughly in line with the existing literature (see, for instance, Boeckx et al., 2017; Lenza and Slacalek, 2018, that show an effect of UMP on asset prices which ranges from 0.1% to 4%). In our analysis, this translates into an increase in stock prices of about 40% to 50% following an unexpected 100% balance sheet expansion.¹³

In Greece, Italy, Spain and Portugal, stock market prices appear to have reacted to a lesser, and sometimes insignificant, extent. This reflects higher risk perception in financial markets in these countries, even though ECB policy is targeted to lower spreads in distressed economies. Our results contrast with event studies aimed at assessing the effect on bond yields around the date of monetary policy announcements and asset purchases programs. For instance, Altavilla et al. (2016), De Santis (2016)

¹¹ In Rahal (2016), the median responses of house prices to a balance sheet shock in the euro area are positive up to the lag when sign restrictions are imposed, and turn negative later in the response horizon, for all specifications of the model.

¹² Nocera and Roma (2018) find that a 25-basis-point increase in the policy rate causes a 3% decrease in housing prices in Spain, against only a 0.4% decrease in Germany. At an average 1.6%, the effect in the other euro area countries is estimated to be negative and significant. These results are derived based on quarterly data from 1980 to 2014, imposing a positive response of house prices to monetary policy shocks, in line with economic theory. On the other hand, Lenza and Slacalek (2018) find that a quantitative easing shock, proxied by a 30-basis-point in the term spread, increases housing prices by 2% in Spain and by 0.6% in Germany. Estimations cover the period from 1999 to 2016.

¹³ In Finland, risky asset prices display a somewhat lower but positive reaction, with the median response peaking at 18%.

and Ambler and Rumler (2019) report larger effects on sovereign bond yields in euro area countries that had been more strongly hit by the crisis. Nevertheless, these studies do not assess the effect on corporate bonds or equity prices in isolation for the countries under review. Our results show that the longer-term consequences of ECB balance sheet policies on corporate risky assets are relatively weak in peripheral countries. This could be explained by a shift of capital and investments in the private sector toward euro area countries with a comparatively more stable economic and financial situation. Such a shift was observable even though ECB policies significantly helped boost confidence both in the sovereign bond markets and in particularly vulnerable sectors in countries under sovereign stress.

3.2 The distributional consequences of housing and financial asset price changes

In this section, we use the estimated impact of UMP on house and risky financial asset prices derived from the VAR analysis and analyze the effect on the wealth distribution of households in Europe. We first focus on the effects via house and asset prices separately, before we evaluate the overall distributional effects. This allows us to identify the drivers of shifts in the overall wealth distribution. To reflect the estimation uncertainty from the VAR analysis, all effects are calculated for each of the 5,000 posterior elasticities and median as well as 16th and 84th percentiles of these calculations provided.

3.2.1 Housing wealth

First, we consider the distributional effects of the change in housing prices¹⁴ resulting from UMP. We apply the elasticities provided in table 2 to the HFCS micro-level data to simulate a 100% increase in the size of the ECB's balance sheet. Housing wealth enters the HFCS in the form of the value of the household's main residence as well as of the value of other real estate property. The derived differences in elasticities indicate rather large cross-country heterogeneity, which points to divergence in the transmission of UMP on housing wealth. Country-specific estimates

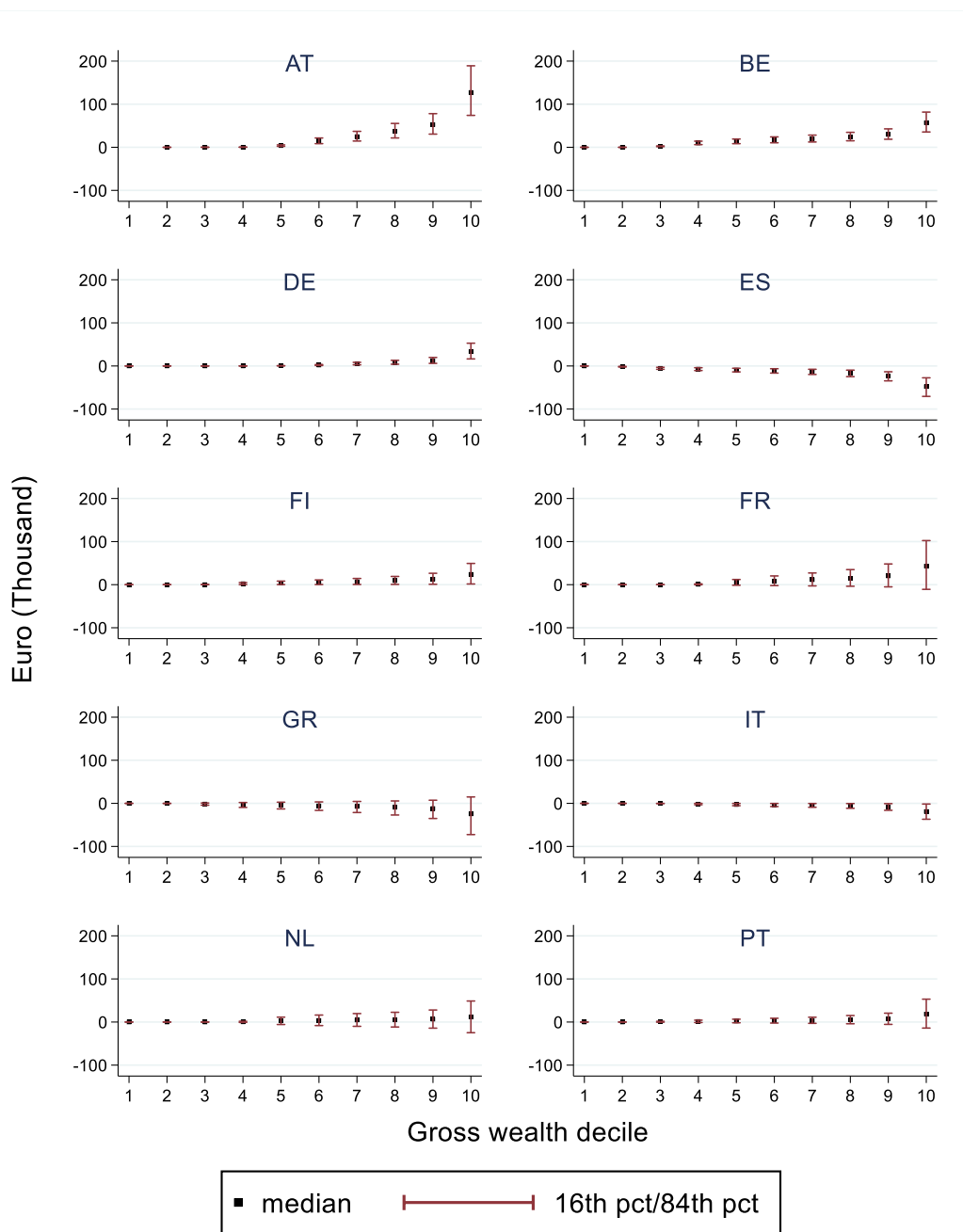
¹⁴ We always refer to housing prices in the sense of real estate property prices, not considering rental prices, etc.

of the reaction of housing prices to UMP are reasonable because, contrary to financial assets, housing wealth is almost exclusively held in the households' country of residence. Most housing wealth is attributable to households' main residences. Hence distributional effects arising from property held by households outside their country of residence are negligible.

Multiplying households' housing wealth by the price increases derived from the VAR rests on the assumption that households do not change the composition of their portfolio. Given that a household's main residence is not liquid, this assumption is reasonable. Even for risky financial assets, there is evidence of considerable sluggishness in household portfolios (see e.g., Calvet et al., 2009).

Figure 3 depicts absolute gains or losses in terms of gross wealth that result from changes in house prices. Households are grouped by gross wealth deciles at the country level. The black square represents the median effect, and the lower (upper) whiskers in red the 16th (84th) percentiles. In absolute terms, households in the upper deciles benefit, on average, most from house price increases in Austria, Belgium and France. Austria stands out as the country whose top decile gains the most by far (on average about EUR 130,000) following increases in the value of main residences or other investment property in Austria. The effects in other countries are smaller, and for Greece, Italy and Spain, the negative price reactions to a balance sheet expansion lead to losses in housing wealth.

Figure 3: Absolute changes in housing wealth by gross wealth deciles, mean effect per decile

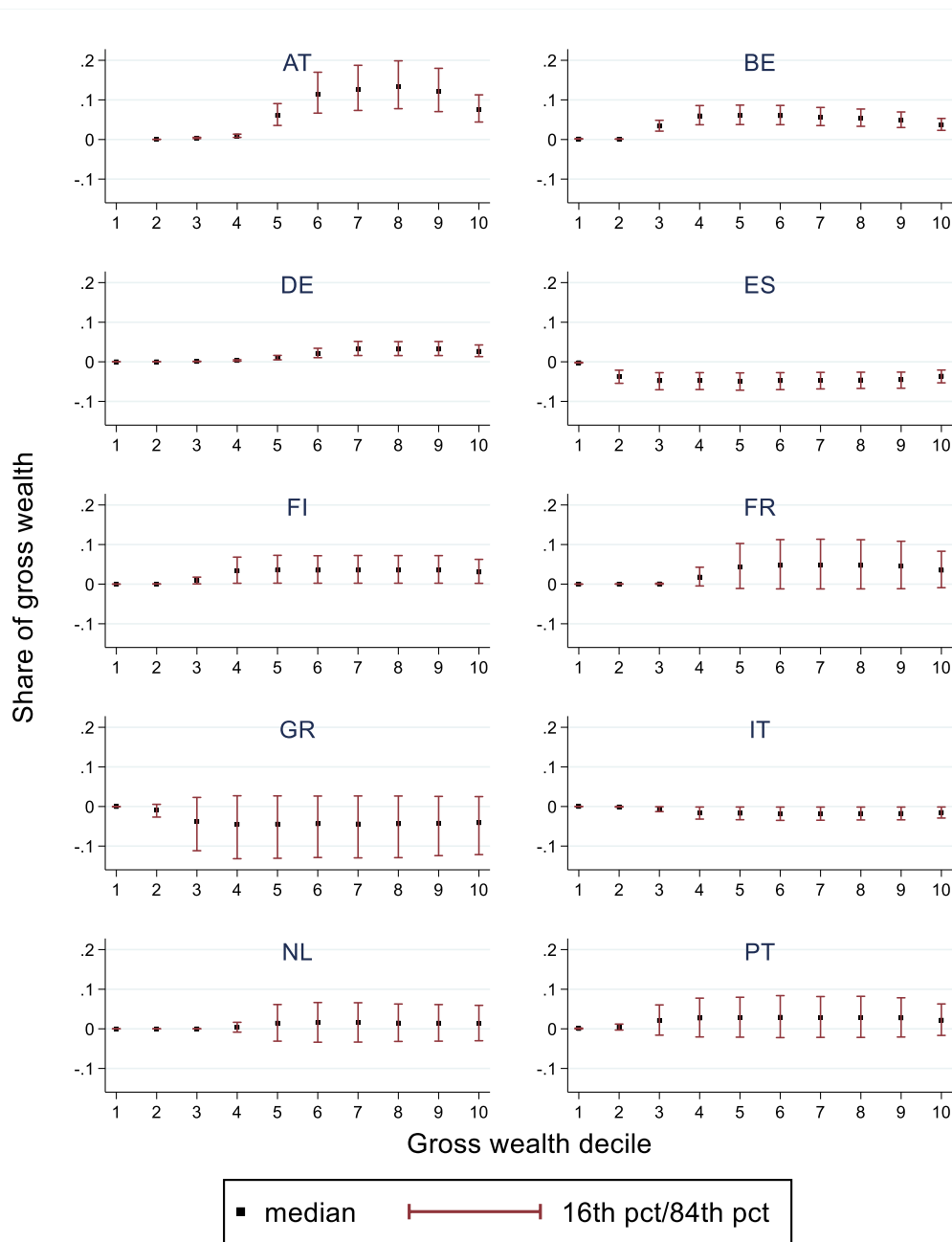


Note: The figure displays the effect of the changes in housing prices from the VAR analysis in section 3.1, per gross wealth decile in each country in the sample. The black squares represent the median estimates; the red spikes depict the 16th/84th percentiles of 5,000 sampling draws from the VAR. “Housing wealth” refers to households’ main residences and other real estate property. Source: HFCS Wave 1, Authors’ calculations.

Next, we analyze the effect on relative wealth, i.e., the changes relative to gross wealth, to get an idea of the impact in relation to households' total wealth. When we look at the gains or losses relative to gross wealth per household (figure 4), we see that the relative impact is more evenly distributed for households with housing wealth (usually starting at the 4th or 5th decile). This reflects the fact that housing wealth is, relative to total wealth, more evenly distributed than risky financial wealth. In Austria, the gains due to UMP-induced increases in housing prices are substantial, exceeding 10%. In Belgium and France, households from the 4th decile onward gain more than 5%.¹⁵

¹⁵ Across distributions and countries, primary/main residence wealth is more important than other residential property. Other residential property is almost exclusively held by households in the upper third of the wealth distribution.

Figure 4: Changes in housing wealth relative to gross wealth by gross wealth deciles, mean effect per decile



Note: The figure displays the effect of the changes in housing prices from the VAR analysis in section 3.1, relative to gross wealth, per gross wealth decile in each country in the sample. The black squares represent the median estimates; the red spikes depict the 16th/84th percentiles of 5,000 sampling draws from the VAR. “Housing wealth” refers to households’ main residences and other real estate property. Source: HFCS Wave 1, Authors’ calculations.

3.2.2 Risky financial assets

Next, we take a look at the effects of UMP on risky financial assets. In contrast to residential property, we do not assume that households hold risky financial assets exclusively issued in their respective countries but assume that the effects of UMP on households' equity are similar across countries. After all, fragmentation in euro area financial markets is low even though it increased in the course of the sovereign debt crisis.

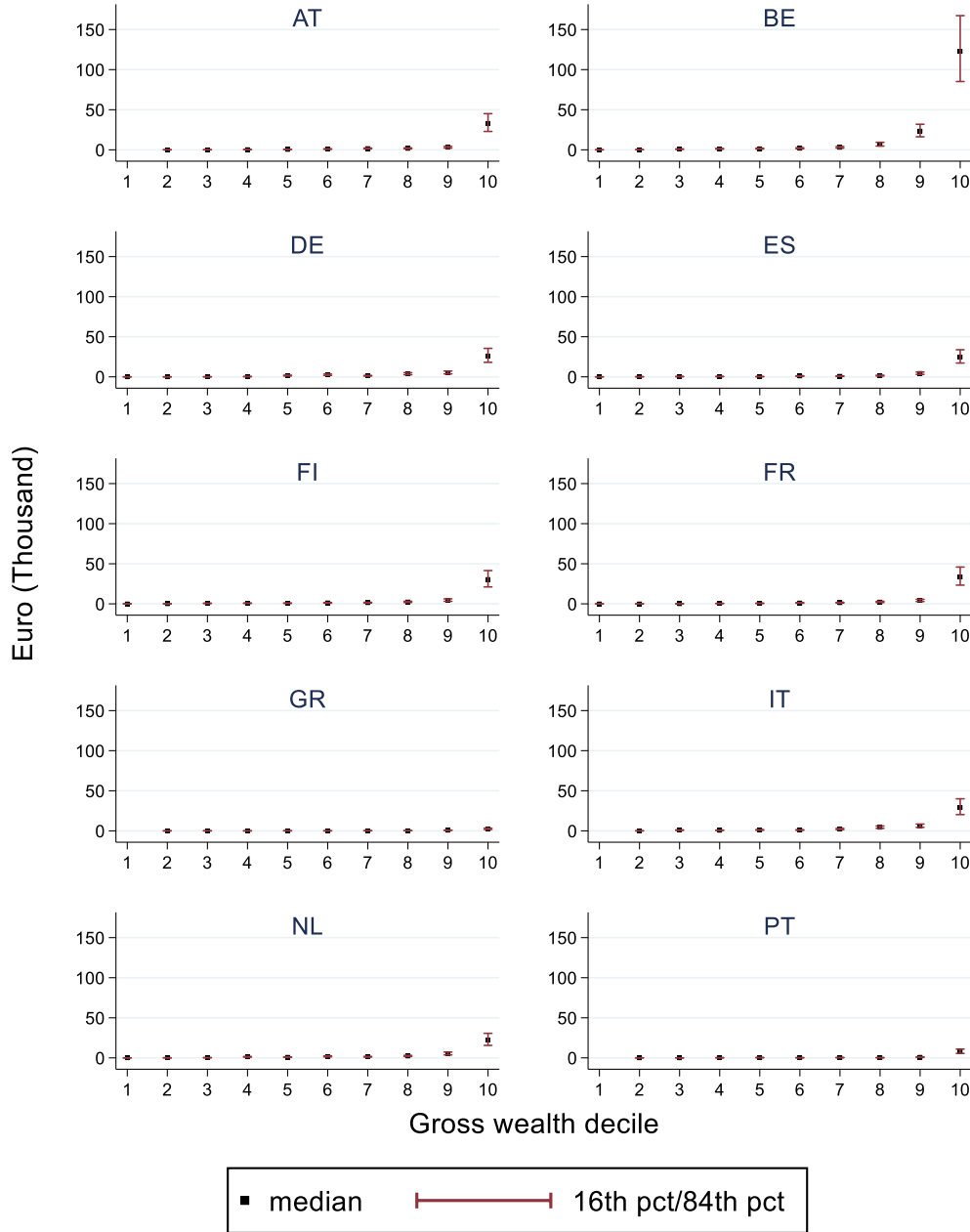
The HFCS does not provide information on where financial assets were issued, so we rely on the approximation that each household holds a risky financial asset portfolio according to the issuing countries' share in financial markets. We use the country-level reactions of equity prices to an UMP shock, weigh them by relative market capitalization¹⁶ and calculate the mean effect of UMP on risky financial asset prices. We then find that a 100% increase in the ECB's balance sheet is associated with an increase in risky financial asset wealth of about 36% according to the median VAR estimate; and 9% / 65% according to the 16th / 84th VAR percentiles. We apply this elasticity to the following risky financial assets according to the HFCS: mutual funds, bonds¹⁷, business (non-self-employment), shares, managed accounts.

As described above, we assume that the impact on risky financial assets does not differ by country, so a difference in gains following a balance sheet shock only reflects the countries' underlying wealth distribution. Figure 5 shows the mean absolute gains by country. Risky financial assets are held almost exclusively by households in the top two deciles and are thus far more unequally distributed than housing wealth. Accordingly, only households in the upper deciles benefit from the price increases of risky financial assets. Average gains per household in the top decile amount to about EUR 2,500 (Portugal) to about EUR 33,700 (France); Belgium stands out as the country with the highest mean gains (of the countries reviewed), which exceed EUR 100,000 per household in the upper decile.

¹⁶ Source: World Bank, Market capitalization of listed domestic companies in current U.S. dollars (Indicator code CM.MKT.LCAP.CD). Data are for 2010 except for Finland (2008).

¹⁷ The HFCS data do not allow to distinguish between different types of bonds such as government, bank or corporate bonds. While government bonds surely will not react in the same way as other bonds, the total bond wealth held by households is small compared to other financial assets, so the effect on our analysis will be minimal.

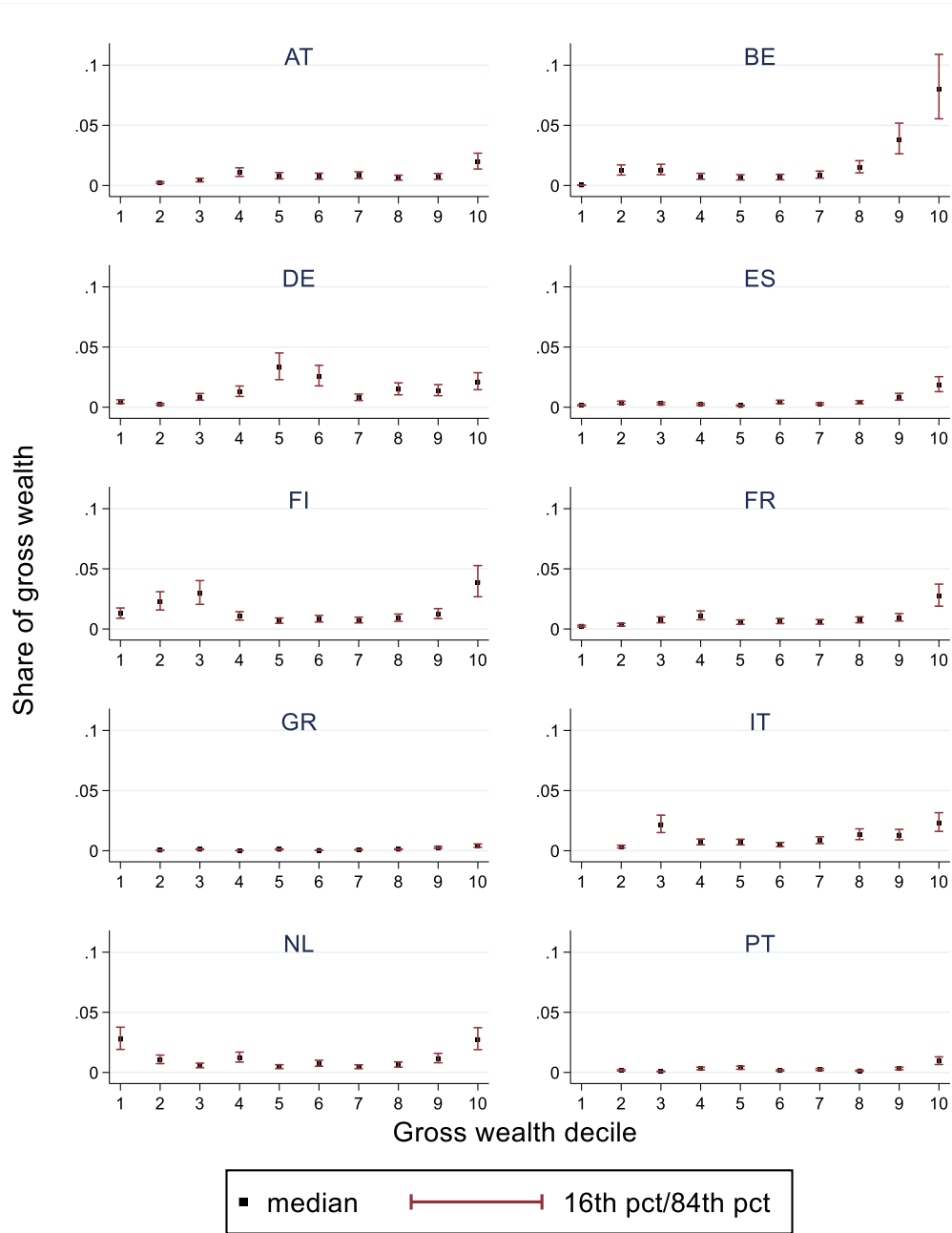
Figure 5: Absolute changes in risky financial assets wealth by gross wealth deciles, mean effect per decile



Note: The figure displays the effect of the changes in risky financial asset prices from the VAR analysis in section 3.1, per gross wealth decile in each country in the sample. The black squares represent the median estimates; the red spikes depict the 16th/84th percentiles of 5,000 sampling draws from the VAR. “Risky Financial Assets” refer to mutual funds, bonds, business (non-self-employment), shares, managed accounts. Source: HFCS Wave 1, Authors’ calculations.

In the next step, we again look at the impact relative to gross wealth (figure 6). Compared to the relative impact of housing wealth price changes, gains in risky financial wealth are considerably smaller (with the exception of Belgium). In contrast to housing wealth, the relative impact of financial assets is unevenly distributed, and the gains are strongest for the top deciles. For a few countries, spikes at lower deciles can be observed. However, gross wealth in the lower deciles is so low that even small gains appear relatively large. For example, the first decile in the Netherlands gains on average about EUR 90 from the financial assets increase: at an average gross wealth of about EUR 2,300, this increase amounts to about 4% of gross wealth. Again, countries at the southern periphery – Spain, Greece, Portugal – benefit the least from the price increase, as the initial holdings of risky financial assets are considerably lower than in the core countries.

Figure 6: Changes in risky financial asset wealth relative to gross wealth by gross wealth deciles, mean effect per decile



Note: The figure displays the effect of the changes in risky financial asset prices from the VAR analysis in section 3.1, relative to gross wealth, per gross wealth decile in each country in the sample. The black squares represent the median estimates; the red spikes depict the 16th/84th percentiles of 5,000 sampling draws from the VAR. “Risky Financial Assets” refer to mutual funds, bonds, business (non-self-employment), shares, managed accounts. Source: HFCS Wave 1, Authors’ calculations.

5.4 Total effect

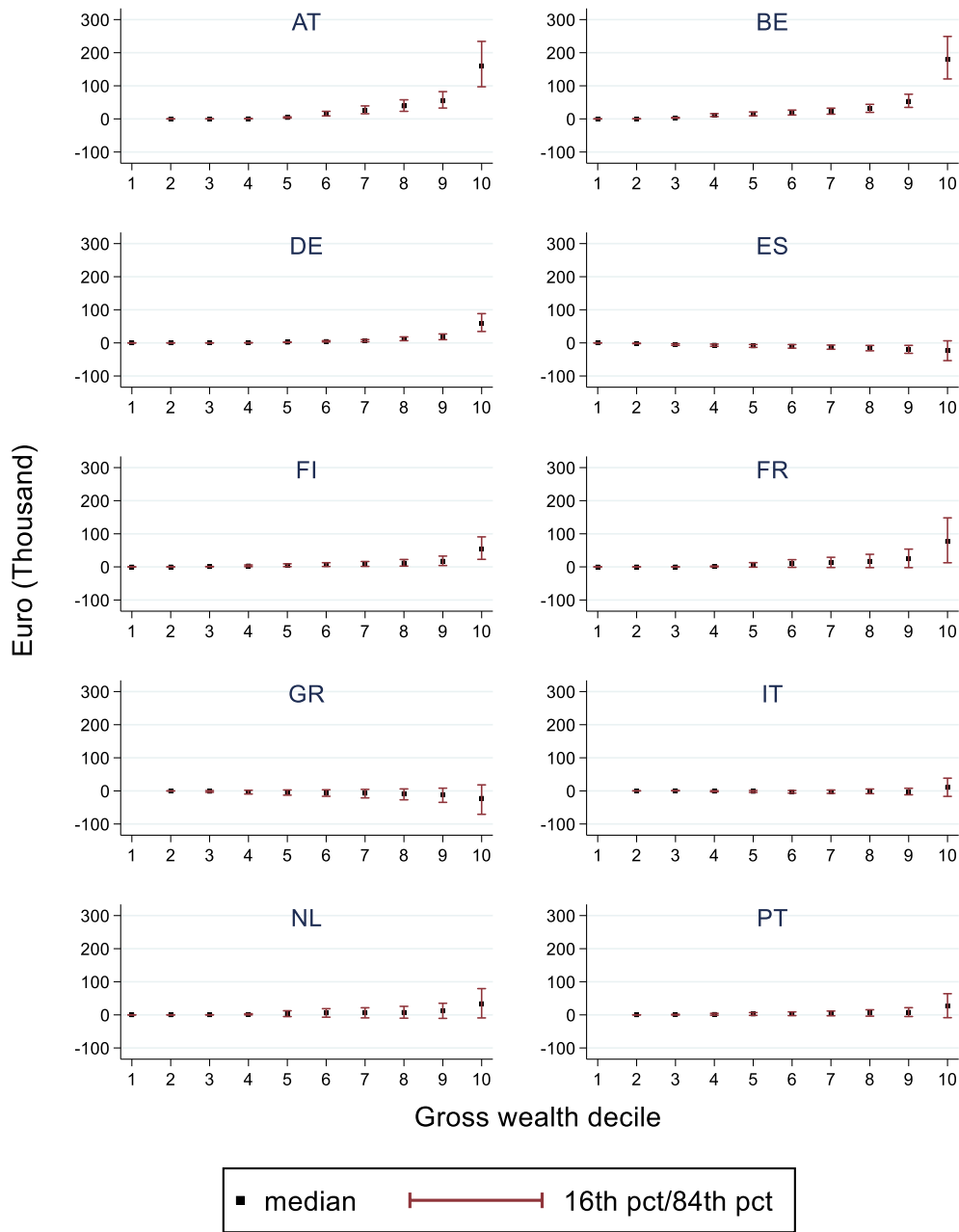
The last two figures (7 and 8) depict the joint effect of a balance sheet shock on housing wealth and on risky financial assets (absolute and relative gains). The lower third of the wealth distribution faces almost no change in its wealth position. In absolute terms, three different clusters emerge: (i) countries with relatively high mean gains, where households in the top decile see their wealth increase by more than EUR 100,000 (Austria and Belgium¹⁸). In Austria, this effect is mainly traceable to the sizeable increase in housing wealth, whereas the gain in risky financial assets is substantial for Belgium. (ii) Countries where the top decile sees moderate gains of below EUR 100,000 (Germany, Finland, France, the Netherlands, Portugal¹⁹). (iii) Countries with declining wealth (Spain, Greece, Italy²⁰). In the third group, the increase in risky financial asset wealth is not large enough to counteract the loss incurred from decreasing housing wealth (except for Italy's 3rd and 10th decile).

¹⁸ The mean gain for households in the top income decile is EUR 160,000 Euro for Austria and EUR 180,000 for Belgium.

¹⁹ The mean gain for households in the top income decile ranges from EUR 26,000 in Portugal to EUR 76,000 in France.

²⁰ In Italy, all deciles experience, on average, a decline in wealth except the third and top deciles.

Figure 7: Absolute changes in housing and risky financial assets wealth by gross wealth deciles, mean effect per decile

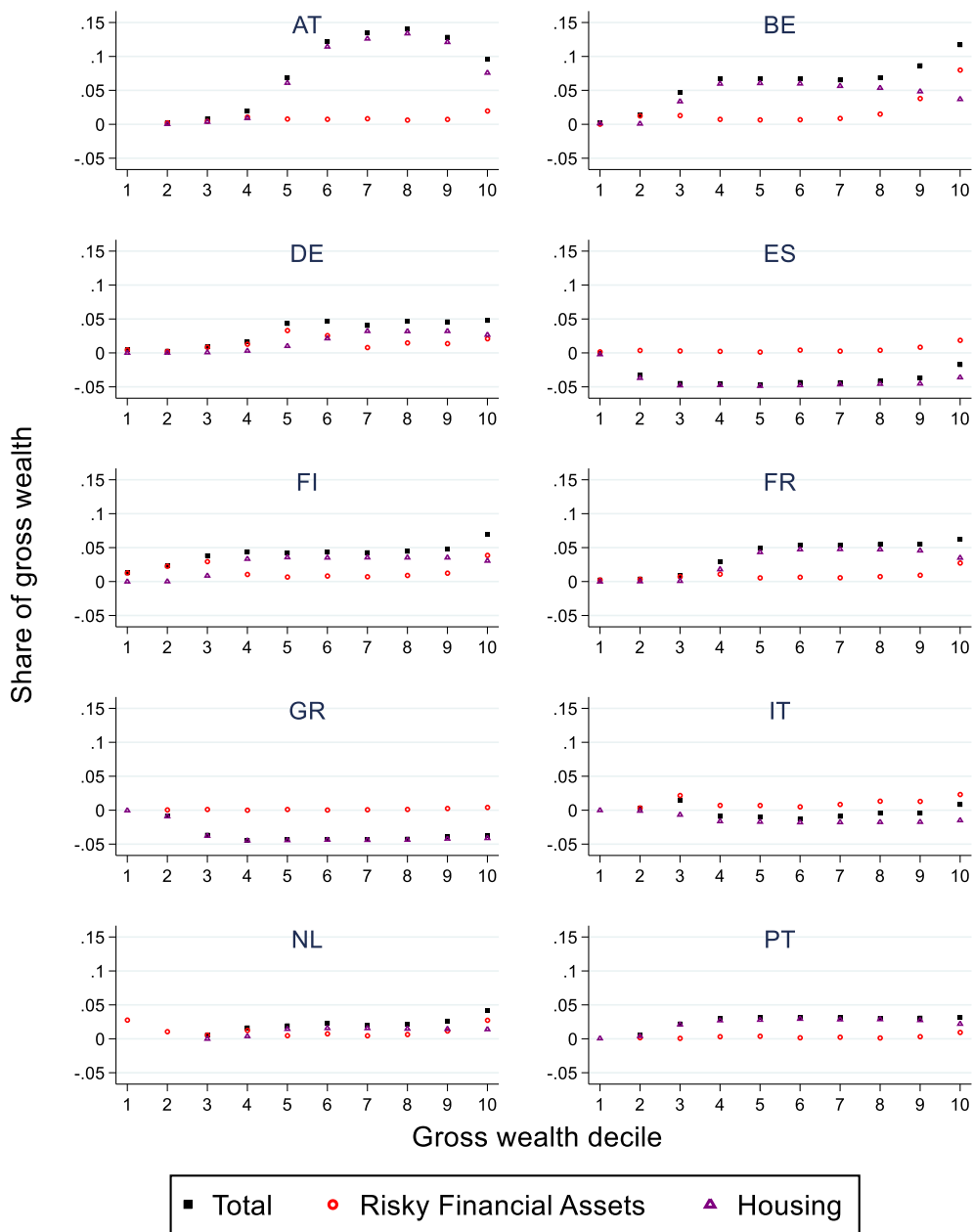


Note: The figure displays the effect of the changes in housing and risky financial asset prices from the VAR analysis in section 3.1, per gross wealth decile in each country in the sample. The black squares represent the median estimates; the red spikes depict the 16th/84th percentiles of 5,000 sampling draws from the VAR. “Risky Financial Assets” refer to mutual funds, bonds, business (non-self-employment), shares, managed accounts. “Housing wealth” refers to the households’ main residence and other real estate property. Source: HFCS Wave 1, Authors’ calculations.

A different picture emerges when we look at the impact relative to gross wealth. Again, relative wealth changes are very small for the lower third of the distribution, but in several countries, more substantial gains relative to gross wealth are already observable from lower deciles onward. Austria and Belgium profit most from the price increases: Austrian above-median household wealth increases by an average 10%–15%, Belgian households in the 5th or higher deciles gain 6% (the top decile even 12%). For Germany, Finland, France, the Netherlands and Portugal, the wealth gains remain under or close to 5%. Finally, Spain and Greece suffer losses of about 5%. In Italy, the losses stemming from housing price decreases are, for deciles 3 and 10, offset by the gains in financial wealth. For other deciles, the wealth decreases are close to –1%.

Concerning the distribution across deciles, relative wealth changes are negligible for the three lower deciles, somewhat equally distributed between the 5th and 8th deciles and higher for the top one or two deciles (with the notable exception of Austria).

Figure 8: Changes in total wealth, risky financial asset wealth and housing wealth, relative to gross wealth by gross wealth deciles, mean effect per decile



Note: The figure displays the effect of the changes in housing and risky financial asset prices from the VAR analysis in section 3.1, relative to gross wealth, per gross wealth decile in each country in the sample. The black squares represent the total median estimates; the red dots depict the median risky financial asset estimates; the purple triangles the median housing estimates. “Risky Financial Assets” refer to mutual funds, bonds, business (non-self-employment), shares, managed accounts. “Housing wealth” refers to households’ main residences and other real estate property. Source: HFCS Wave 1, Authors’ calculations.

To illustrate the distributional effects in more detail, table 3 shows the impact of the changes in housing and risky financial assets on several distributional measures of net wealth²¹. The indices in the table refer to net wealth according to the median impulse response obtained from the VAR analysis. We present both the total effect and the effects for housing and risky financial asset price increases separately. The results present the effects following a 100% ECB balance sheet increase, which is consistent with the previous analysis.

In general, the responses of the Gini coefficient for net wealth to the combined changes in housing and risky financial asset prices are fairly small and are below 1% (except for Spain, where the Gini coefficient increases by 1.3%). Wealth inequality as measured by the Gini coefficient declines in some countries (Austria, Germany, Finland, France, the Netherlands, Portugal), while increasing in Belgium, Spain, Greece and Italy. Notable developments in the three clusters are as follows:

- (i) Countries with high absolute gains in the top deciles: Austria's Gini coefficient declines by about 0.9% due to housing price increases, and the rise in the Gini coefficient due to the increase in risky financial asset prices cannot offset the housing price effect. By contrast, given that Belgian households hold enough risky financial assets, the effect of the positive housing price shock is more than canceled out, so that, overall, the Gini coefficient increases.
- (ii) Countries with moderate total gains: since the influence of housing wealth is stronger than the impact of risky financial assets, the Gini coefficient for Germany, Finland, the Netherlands and Portugal decreases. For France, the two opposing forces on the Gini coefficient cancel each other out, which is why the Gini coefficient remains unchanged.
- (iii) Countries where (almost) all deciles experience a decline in total wealth: both housing price declines and risky financial asset price increases put upward pressure on the Gini coefficient.

The small overall change in the Gini coefficient results from the opposite directions of the two asset price changes: While an increase in the prices of more equally

²¹ Again, while we used gross wealth deciles to depict the impact of UMP on absolute and relative wealth changes across the gross wealth distribution (as the wealth changes can be observed more clearly and debt does not enter our analysis), for the inequality measures we use net wealth to make them/the results comparable to the findings of the prevailing literature that uses this wealth measure.

distributed housing wealth decreases the Gini coefficient, an increase in risky financial asset prices increases the Gini coefficient. For Greece, Spain and Italy, the increase in risky financial asset prices and the decrease in housing prices both result in a rise of the Gini coefficients.

The overall direction of the two effects is in line with the existing literature (e.g., Adam and Tzamourani, 2016). In addition, our approach allows us to quantify the relative size of the two effects and to derive information about the country-level impacts of each shock.

Other inequality measures that are more sensitive to changes at the tails of the wealth distribution (e.g., P90/P10 or P80/P20) increase for most of the countries (therefore indicating an increase in wealth inequality). The reason for this is that households in the lower third of deciles own very little of risky financial asset or housing wealth, and therefore do not benefit from these assets' price changes. Exceptions include Germany, Finland and the Netherlands²² (where some risky financial asset wealth is held by households in lower deciles as evident in figure 6).

Adam and Tzamourani (2016) note that households in the bottom 20% of the net wealth distribution generally benefit relatively little compared with richer households in Austria, Germany and France. This finding is reflected in our results as P80/P20, P90/10, P50/P10 likewise increase following housing price increases.²³ These results are mostly attributable to the low property ownership rates in the lower deciles compared to higher deciles. In Austria and Belgium, the countries with the highest gains, a notable increase of P90/P10 and P80/P20 is associated with the UMP shock, with the increase being up to 10% higher than the baseline ratios.

The ratio of 90th to the 50th percentile is an indicator of the relative income the top of the distribution gained vis-à-vis the middle as a result of the UMP. This ratio

²² In Finland and the Netherlands, the 10th percentile wealth is negative, which results in negative P90/P10 and P50/P10 ratios. The 10th percentile wealth approaches zero due to the UMP asset price shocks, resulting in very large relative changes of the P90/P10 and P50/P10 ratios.

²³ The slightly peculiar figures for Germany are due to the fact that the 10th percentile amounts to below EUR 100, which results in exceptionally large P90/P10 and P50/P10 ratios. This also results in very small changes in the 10th percentile's net wealth (EUR 64) due to housing wealth increases (+EUR 24). Moreover, financial wealth increases (+EUR 17) lead to relatively large drops in these ratios.

increased in most countries. In contrast, it decreased slightly in the Netherlands, France, Finland and Germany.

Table 3: Relative impact of the asset price changes on inequality measures

		P90/P10	P80/P20	P90/P50	P50/P10	ShareTop5%	ShareTop10%	Gini
AT	Baseline	554.70	51.07	7.09	78.21	0.48	0.62	0.77
	Housing price shock	7.69%	10.81%	0.62%	7.02%	-2.55%	-2.34%	-0.87%
	Risky financial asset price shock	-0.56%	0.10%	-0.11%	-0.45%	0.60%	0.34%	0.15%
	Total	7.12%	10.90%	0.51%	6.57%	-1.96%	-1.99%	-0.73%
BE	Baseline	253.43	26.85	3.42	74.13	0.31	0.44	0.61
	Housing price shock	0.37%	2.82%	-2.40%	2.84%	-3.10%	-0.95%	-0.91%
	Risky financial asset price shock	5.27%	0.51%	4.43%	0.81%	4.70%	3.67%	1.85%
	Total	5.64%	3.33%	2.02%	3.65%	1.59%	2.71%	0.93%
DE	Baseline	6911.25	74.85	8.61	802.47	0.46	0.59	0.76
	Housing price shock	-25.19%	1.35%	0.65%	-25.67%	-0.22%	-0.51%	-0.20%
	Risky financial asset price shock	-19.98%	1.07%	-2.05%	-18.30%	-0.03%	0.41%	0.02%
	Total	-45.16%	2.42%	-1.40%	-43.98%	-0.25%	-0.11%	-0.18%
ES	Baseline	107.40	7.00	3.33	32.29	0.31	0.43	0.58
	Housing price shock	3.86%	3.97%	1.36%	2.47%	1.82%	0.67%	0.89%
	Risky financial asset price shock	0.87%	-0.18%	0.89%	-0.02%	1.82%	0.71%	0.49%
	Total	4.74%	3.80%	2.25%	2.45%	3.63%	1.37%	1.38%
FI	Baseline	-692.19	91.23	4.63	-149.39	0.31	0.45	0.66
	Housing price shock	461.79%	-10.67%	-1.83%	472.25%	-0.96%	-0.70%	-0.77%
	Risky financial asset price shock	31.19%	-1.70%	-0.11%	31.33%	2.55%	1.63%	0.54%
	Total	492.98%	-12.37%	-1.94%	503.58%	1.59%	0.93%	-0.23%
FR	Baseline	323.17	58.16	4.42	73.15	0.37	0.50	0.68
	Housing price shock	3.80%	3.96%	-1.11%	4.97%	-1.24%	-0.75%	-0.44%
	Risky financial asset price shock	1.04%	0.30%	0.66%	0.38%	1.60%	1.01%	0.45%
	Total	4.85%	4.26%	-0.44%	5.34%	0.36%	0.26%	0.01%
GR	Baseline	165.89	14.70	3.25	50.97	0.26	0.39	0.56
	Housing price shock	12.33%	0.47%	1.24%	10.95%	-0.30%	0.52%	0.31%
	Risky financial asset price shock	0.05%	0.05%	0.03%	0.02%	-0.20%	0.08%	0.11%
	Total	12.38%	0.52%	1.27%	10.97%	-0.50%	0.60%	0.42%
IT	Baseline	115.43	20.86	3.33	34.70	0.32	0.45	0.61
	Housing price shock	1.71%	-1.86%	0.38%	1.32%	0.24%	0.22%	0.07%
	Risky financial asset price shock	1.81%	1.55%	0.93%	0.86%	0.61%	0.83%	0.41%
	Total	3.51%	-0.31%	1.32%	2.19%	0.85%	1.05%	0.48%
NL	Baseline	-112.54	43.08	4.13	-27.25	0.26	0.40	0.65
	Housing price shock	73.15%	-9.49%	-0.36%	73.78%	-0.74%	-0.60%	-0.73%
	Risky financial asset price shock	1.87%	1.51%	0.10%	1.76%	2.27%	1.39%	0.36%
	Total	75.01%	-7.98%	-0.26%	75.54%	1.53%	0.79%	-0.37%
PT	Baseline	286.62	21.40	3.95	72.53	0.41	0.53	0.67
	Housing price shock	1.29%	-4.49%	17.51%	1.42%	-0.66%	-0.39%	-0.33%
	Risky financial asset price shock	0.49%	0.16%	0.39%	0.11%	0.56%	0.37%	0.16%
	Total	1.78%	-4.33%	17.90%	1.52%	-0.10%	-0.02%	-0.16%

Note: This table describes the effect of the median changes in housing and risky financial asset prices estimated through our VAR above on the following inequality measures: P90/P10 (the ratio of the 90th to the 10th net wealth percentile), P80/P20, P90/P50, P50/P10, ShareTop5% (Share of the top 5% of households in the entire net wealth distribution), ShareTop10%, Gini coefficient. The changes are percentage changes relative to the baseline distribution before the shocks occurred. Source: HFCS Wave 1, Authors' calculations.

It is important to note that some of the distribution indicators do not adequately reflect the fact that households that own neither housing nor risky financial assets are not affected by the balance sheet expansion. 32% of households in our entire sample fall into this category. The country-specific values range from 13% in Spain to 44% in Austria. The participation rate in these two asset classes differs strongly among gross wealth deciles: In the first decile, 99% of households own neither housing

nor risky financial assets, and this percentage goes down to 66% (3rd decile) and 18% (5th decile) and below 1% (8th to 10th decile).

4 Summary and conclusions

In this paper, we have analyzed the effects of unconventional monetary policy (UMP) on the distribution of household wealth for ten euro area countries, namely Austria, Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal and Spain. Our main results are as follows: First, one-third of households, most of which are in the lower third of the wealth distribution, are not affected at all by the balance sheet expansion because these households do not own housing or risky financial assets. Second, there is a divide between “core countries,” where wealth increases for most households, and countries at the southern “periphery.” The latter’s housing price declines seen in our vector autoregressive (VAR) analysis could not be effectively reverted by UMP, and the risky financial asset price increases were not enough to offset the housing wealth losses. Third, housing wealth gains decrease the Gini coefficient, whereas risky financial asset wealth gains increase the Gini coefficient. In most countries, the effect of housing assets on the Gini coefficient exceeds the effect of risky financial assets; in France, the two effects are similar in size, however. And there are two countries where the effect of risky financial asset price increases in the Gini coefficient is stronger, namely Belgium (with a disproportionately large amount of risky financial assets) and Italy (as housing prices reacted only minimally to UMP). Fourth, other inequality measures that are more sensitive to movements in the tails of the distribution compared to the Gini coefficient mostly indicate increasing wealth inequality.

Overall, financial asset price increases almost exclusively benefit households in higher deciles²⁴. That said, it should be noted that our analysis provides a partial assessment of UMP on household wealth, as the impact on other financial wealth components, such as deposits, are not considered. But more importantly, in this study our focus is on the portfolio composition channel. To assess the overall distributional effects, it is necessary to analyze the interaction of this channel with other relevant distributional channels, such as the income heterogeneity channel that works via

²⁴ We are likely to have underestimated this effect because we assumed that every household holding risky financial assets benefits equally relative to its financial wealth. In reality, richer households are likely to earn markedly higher returns on their assets (see e.g., Fagereng et al., 2016).

employment effects (see e.g., Lenza and Slacalek, 2018). As to the potential equalizing effect of housing price increases on the wealth distribution, it should be noted that this effect is only present when Gini coefficients are considered as a measure of inequality. Other inequality indicators suggest that overall inequality increases, more equalizing house price increases notwithstanding. It should also be noted that housing wealth, especially with regard to the main residence, is less liquid than financial assets. For this reason, it may be more difficult to directly benefit from price increases in the housing sector. Policymakers and researchers should also note that periphery countries experienced losses in housing wealth that could not effectively be reverted by UMP (or, taking confidence intervals into account, we saw small increases at best) and do not benefit from risky financial asset price increases very much given low initial levels of such assets.

Future research in the field of UMP and its distributional effects is much needed and might examine issues like: (i) Following the literature, we assumed homogeneous returns on risky financial assets. Taking into account heterogeneity in the ability to profit from price increases, especially through financial asset portfolio composition, would be of great interest for both academics and policymakers; (ii) the housing market reactions to UMP, not only in this paper, are heterogeneous, and more granular research focusing on these markets, jointly with mortgage finance markets, could be very fruitful in explaining diverging patterns across euro area countries; (iii) the connection between property prices and rents could be considered in more detail, as the effects on households' income could be economically significant, especially for low-income renter households that suffer from rising rents following an UMP-induced increase in housing prices.

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Appendix

A.1 Data description for VAR analysis

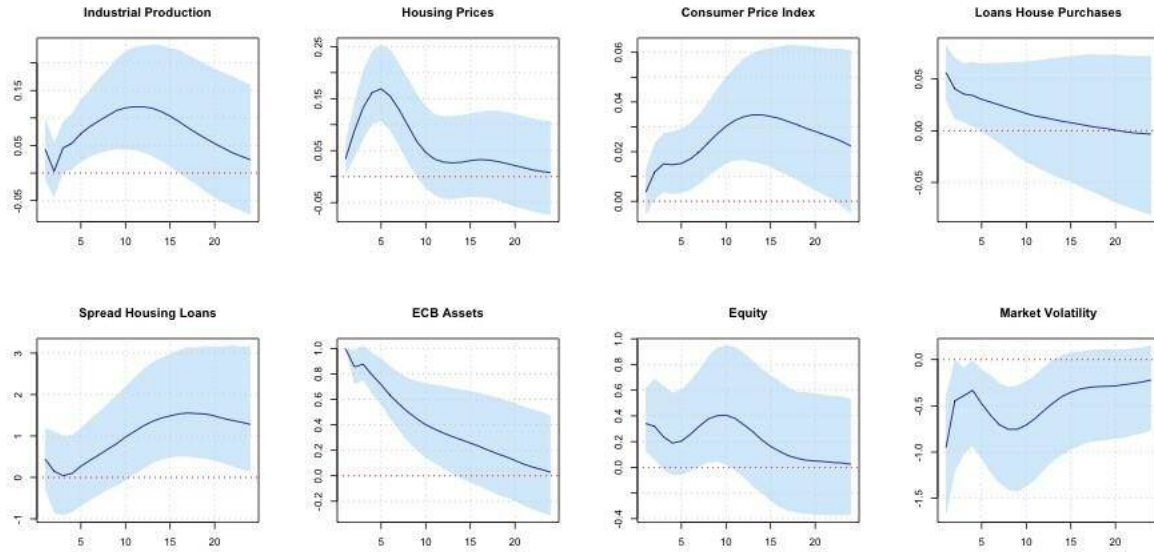
Our dataset includes macroeconomic and financial series from January 2007 to December 2016 for Austria, Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Spain and Portugal. The variables included in the model are the following:

- Industrial production excluding construction. Real terms and seasonally adjusted. Source: Eurostat.
- House prices in real terms. Source: Eurostat and Bank for International Settlements, Property Prices.
- Consumer price inflation. Seasonally adjusted. Source: Eurostat.
- Housing loans. Lending for house purchase excluding revolving loans and overdrafts, convenience and extended credit card debt, Total, Households and non-profit institutions serving households (S.14 and S.15). Seasonally adjusted. Source: ECB Statistical Data Warehouse (MIR).
- Spread between interest rates on loans for house purchase (Lending for house purchase excluding revolving loans and overdrafts, convenience and extended credit card debt, Over 10 years) and the national 10 years government bonds yield. Own calculation. Sources: ECB Statistical Data Warehouse and Macrobonds (Eurostat Maastricht bond yield).
- Equity prices: main national indices. Price indices. Real terms. Source: Macrobonds.
- Stock volatility index for the Euro Area (VSTOXX). Source: Datastream.
- European Central Bank (ECB) Total assets/liabilities in Millions of Euro. Source: ECB Statistical Data Warehouse

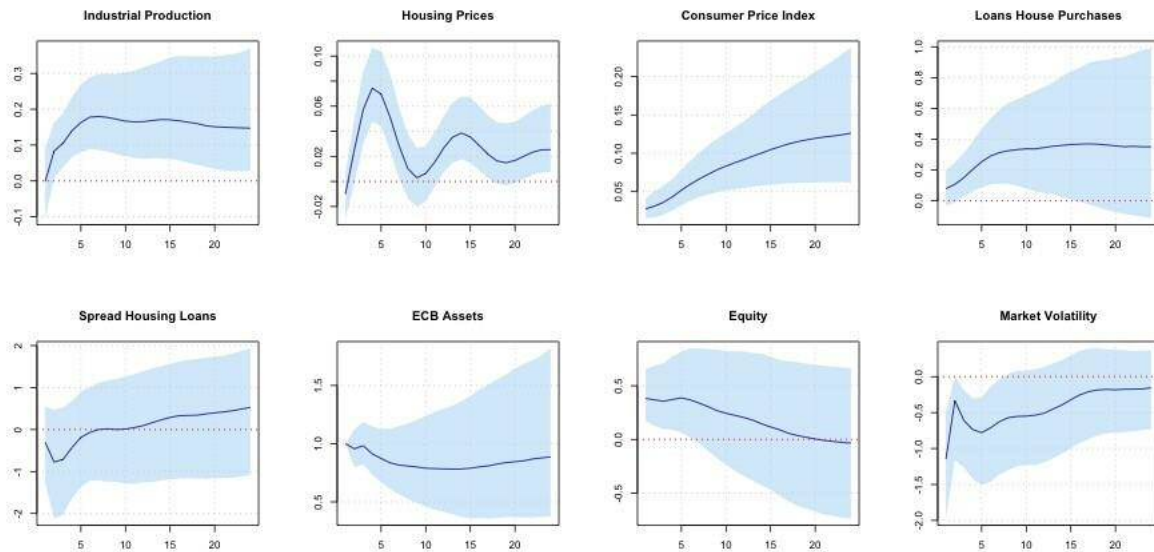
A.2 Additional results

Figure A.1: Responses to an ECB balance sheet expansion

(a) Austria



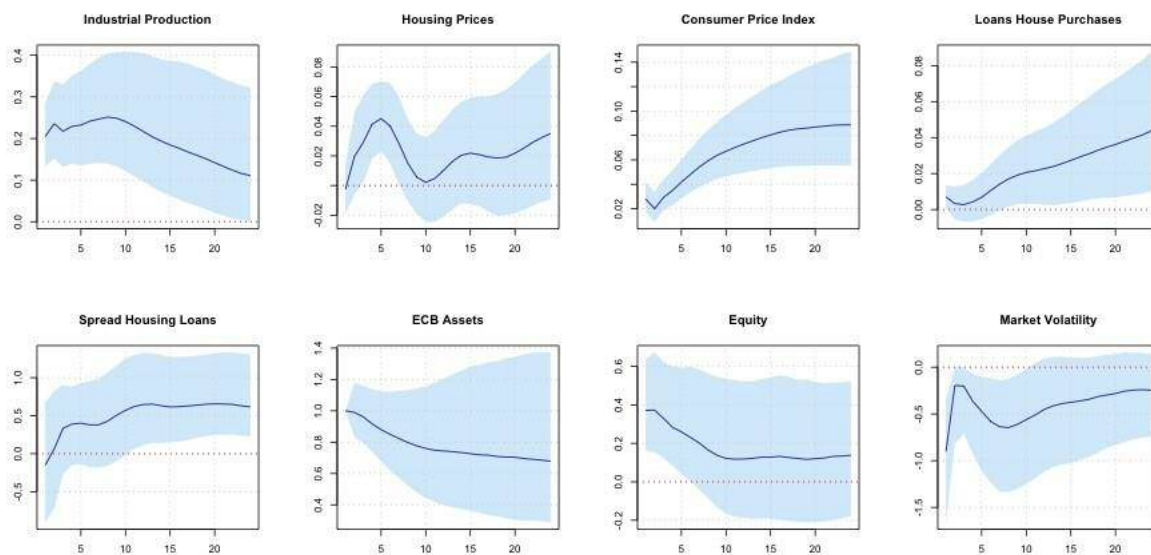
(b) Belgium



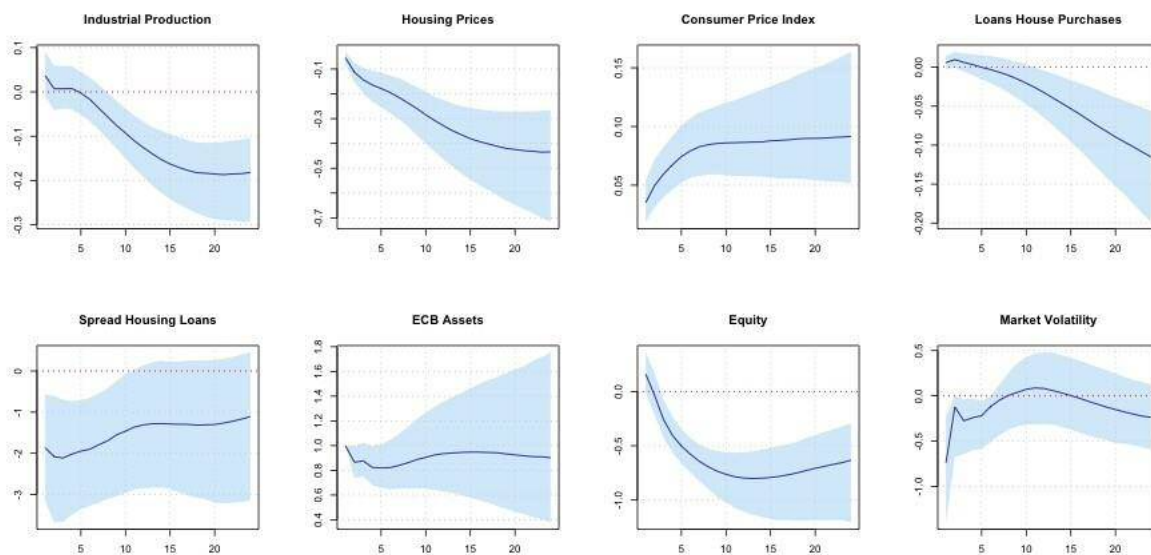
Note: Blue lines correspond to the median impulse responses of equity prices to an ECB balance sheet shock. Shaded blue areas represent the 68% confidence intervals.

Figure A.2: Responses to an ECB balance sheet expansion

(a) Germany



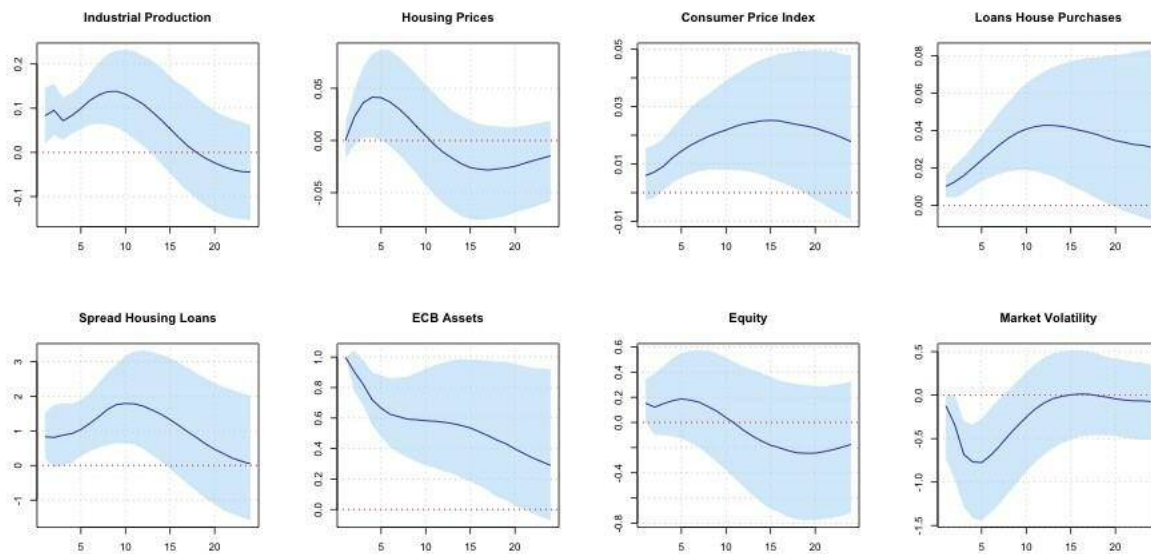
(b) Spain



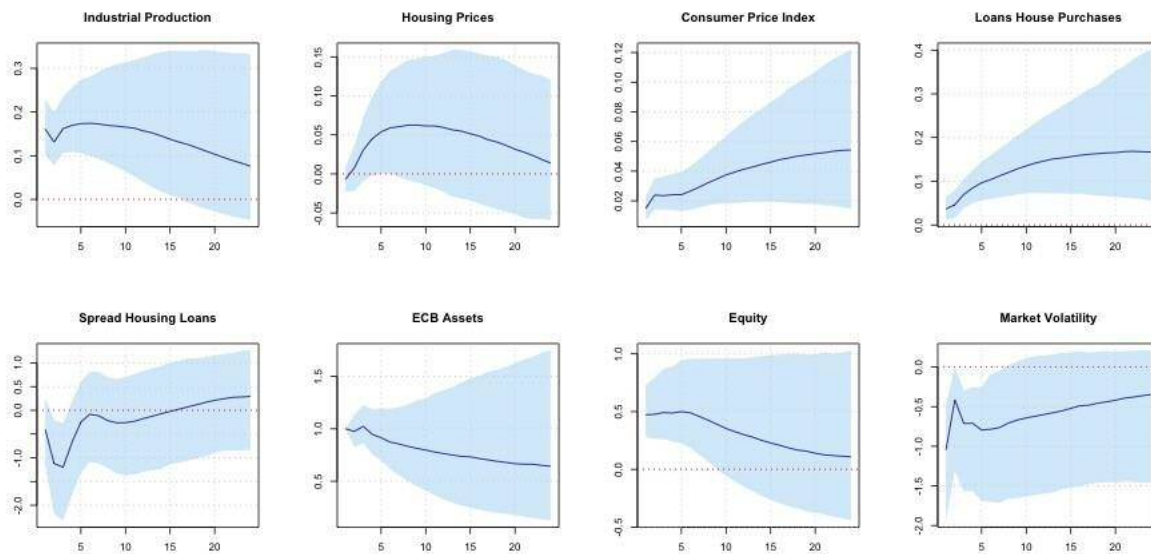
Note: Blue lines correspond to the median impulse responses of equity prices to an ECB balance sheet shock. Shaded blue areas represent the 68% confidence intervals.

Figure A.3: Responses to an ECB balance sheet expansion

(a) Finland



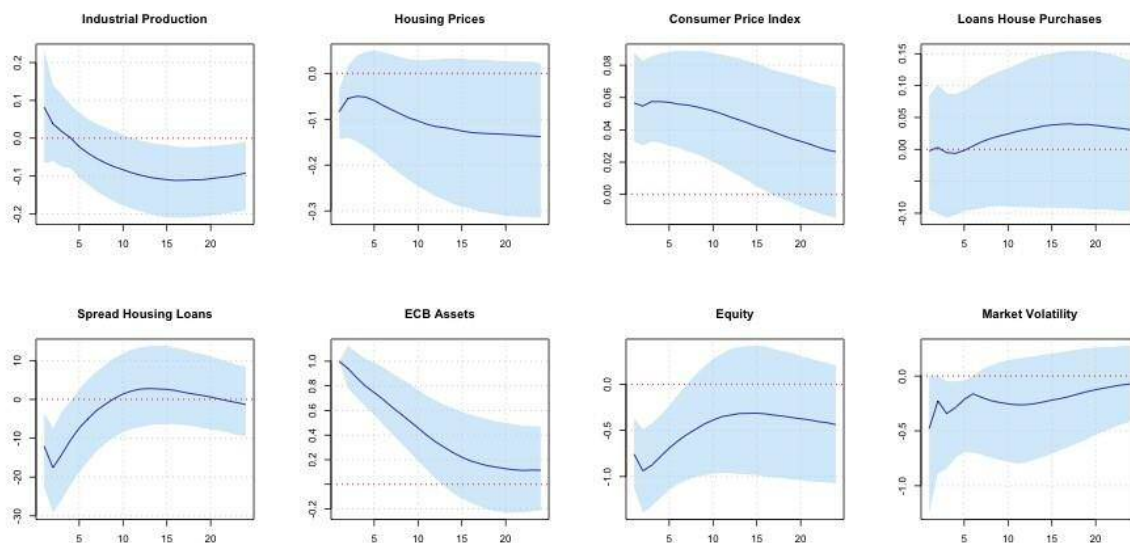
(b) France



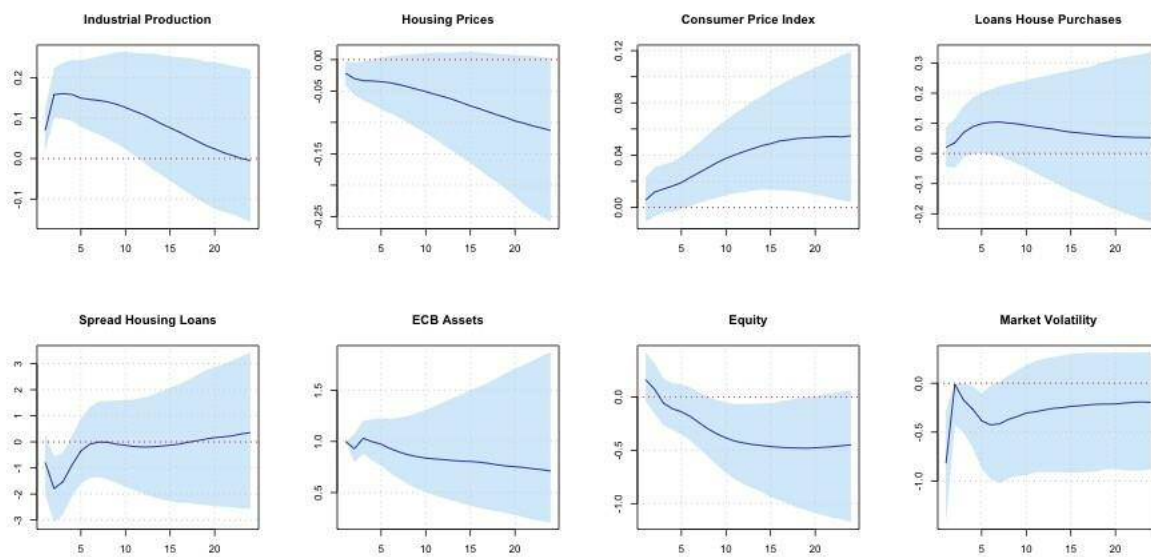
Note: Blue lines correspond to the median impulse responses of housing prices to an ECB balance sheet shock. Shaded blue areas represent the 68% confidence intervals.

Figure A.4: Responses to an ECB balance sheet expansion

(a) Greece



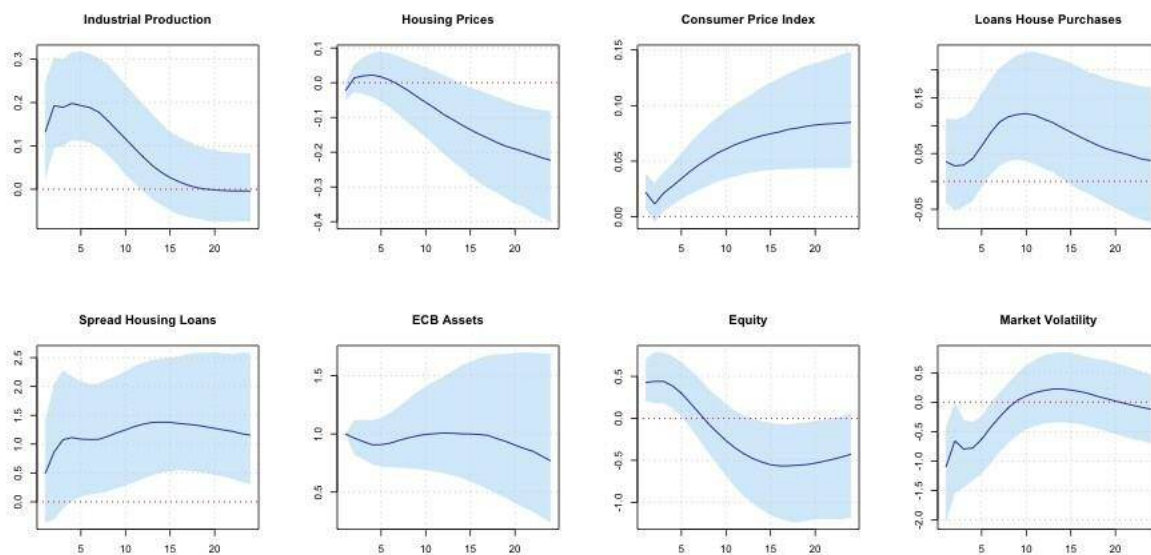
(b) Italy



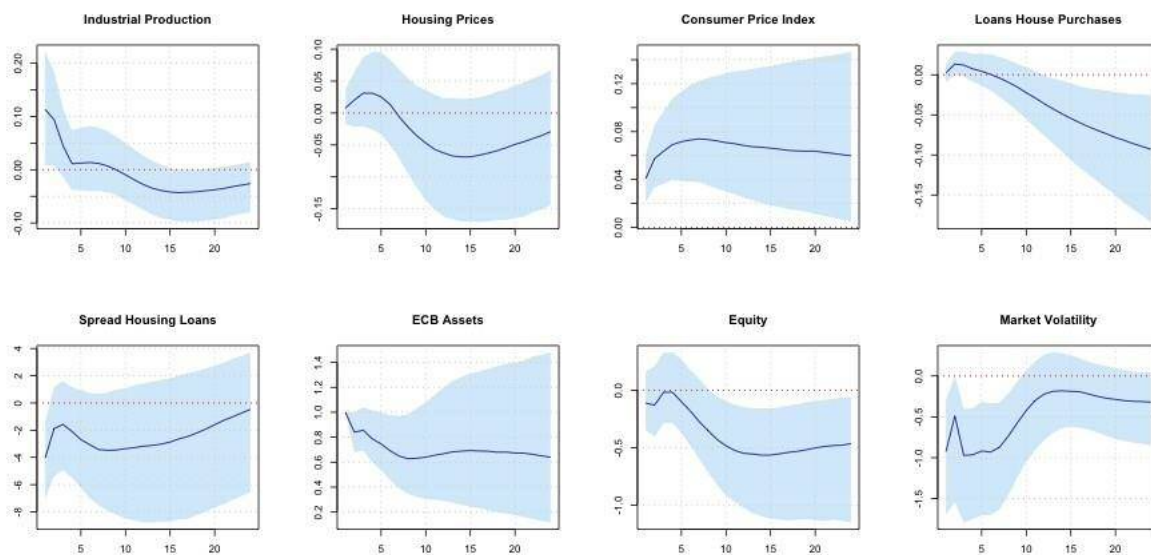
Note: Blue lines correspond to the median impulse responses of housing prices to an ECB balance sheet shock. Shaded blue areas represent the 68% confidence intervals.

Figure A.5: Responses to an ECB balance sheet expansion

(a) Netherlands



(b) Portugal



Note: Blue lines correspond to the median impulse responses of housing prices to an ECB balance sheet shock. Shaded blue areas represent the 68% confidence intervals.