A Housing Portfolio Channel of QE Transmission

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Motivation

- Following the global financial crisis, advanced economy central banks have adopted new tools, the so-called unconventional monetary policies
  - Balance sheet expansion through long-term asset purchase programs (Quantitative Easing-QE)
  - In the case of the ECB, also negative deposit facility interest rate (Negative Interest Rate Policy, NIRP)
- What are the effects? What are the mechanisms?
- Literature focused on the impact on financial markets, asset prices, credit supply, bank and firm behaviors, and macroeconomic aggregates (see for example Tristani, 2021, for a survey)

This paper

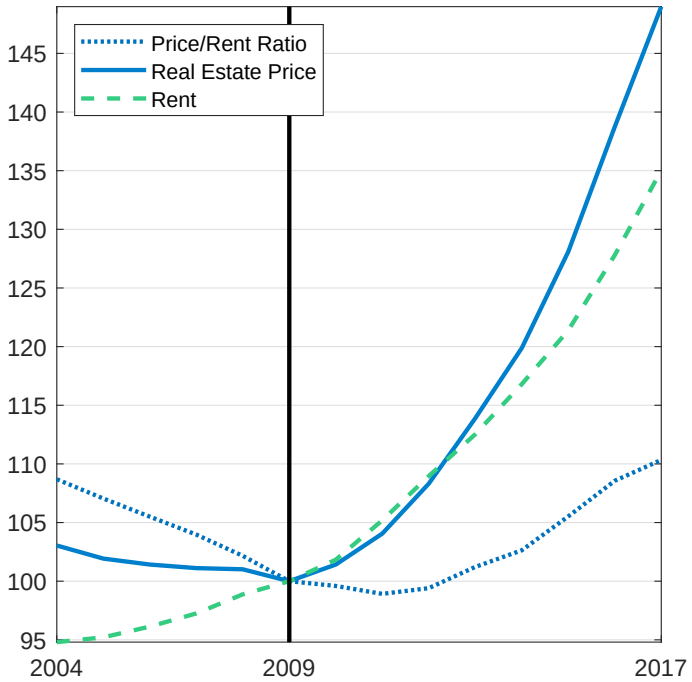
- QE transmission through residential housing markets
  - A housing portfolio channel that differs from credit and collateral channels

    ⋆ **Cash purchases of second homes driven by a buy-to-let motive**

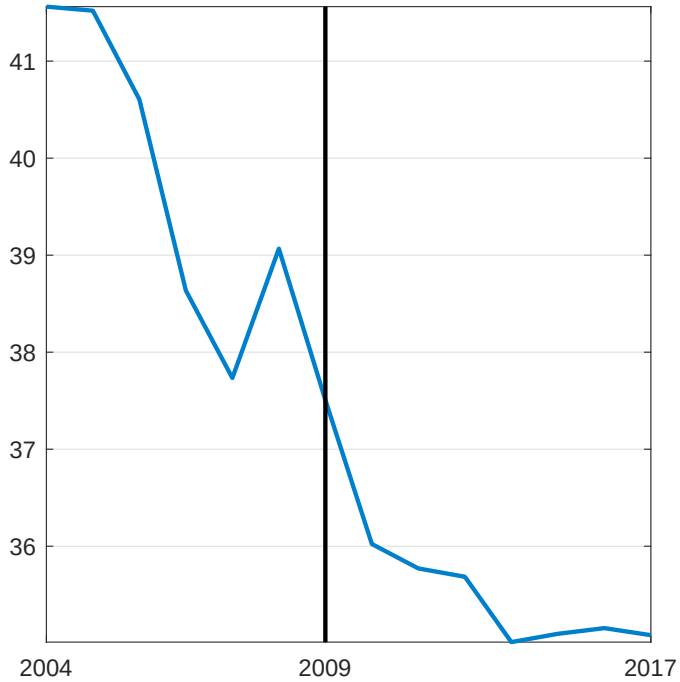
- Identifies this new channel in German household-level and regional data
  - Quantify portfolio rebalancing towards housing for households more or less exposed to QE by exploiting Bundesbank's Panel on Household Finances Survey (PHF) in a diff-in-diff setting
  - Estimate price and quantity impact on the housing market exploiting regional variation in price and rent data, and listings in a Bartick setting

Germany: a housing boom without credit boom

Panel A: Residential house price and rent indexes (2009=100)

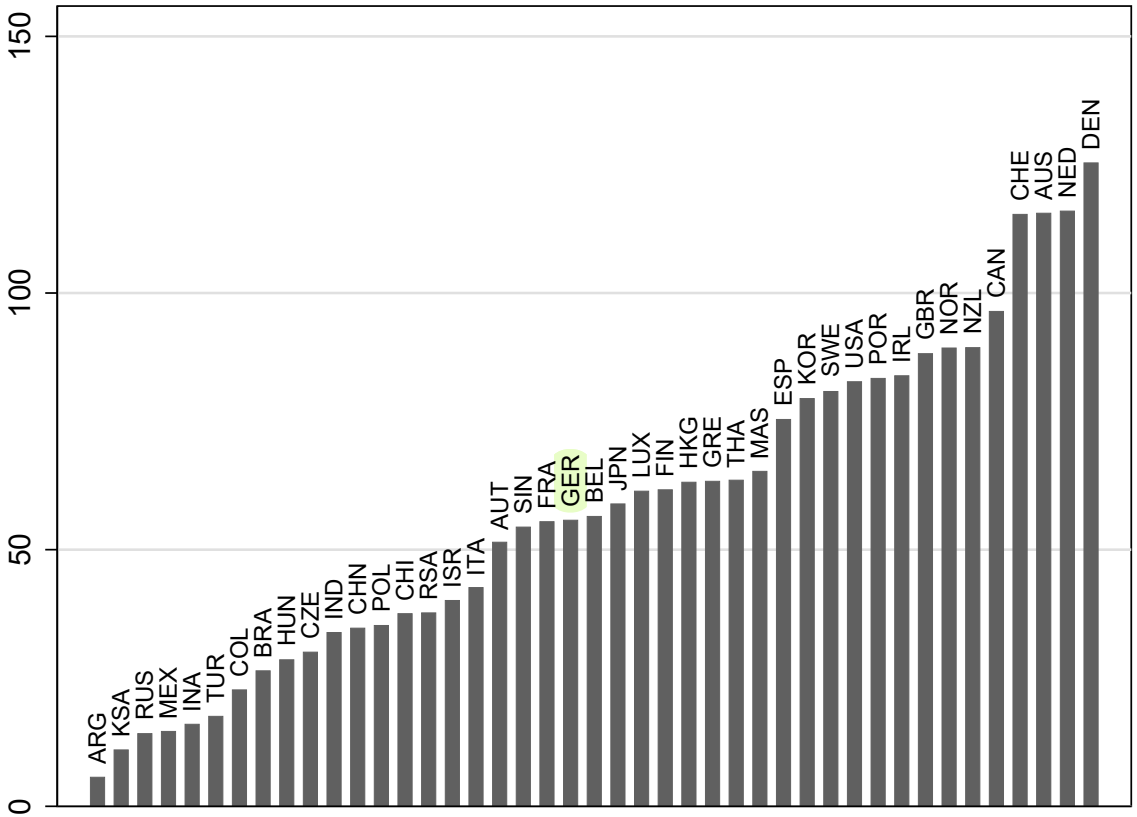


B: Domestic housing credit to households (% GDP)



The German case is not unique

- Few countries have household credit markets as large as the U.S. (IMF WEO, 2008; Cesa-Bianchi, Ferrero, and Rebucci, 2018)



- Housing booms without credit booms are not uncommon (Cerutti, Dell'Ariccia, and Dagher, 2017)

German households

Have a high share of housing wealth in total assets or net worth as in other countries, but

- Increasing ratio of real estate to bonds
- Low and declining leverage
- Low and falling home ownership (increasing buying-to-let?)
- Low stock market participation

	2010	2014	2018
Real Estate/Total Assets	0.55	0.55	0.57
Bonds/Total Assets	0.065	0.064	0.059
Equity/Total Assets	0.083	0.085	0.085
Loans/Total Assets	0.15	0.13	0.12
Homeownership (in %)	53.2	52.5	51.5
Homeownership (with loans, in %)	27.8	26.6	25.6

Preview of results

1. Households with larger ex-ante bond shares rebalance more towards housing, including toward second homes
   - Effect stronger for higher-income households that benefit more from the tax deductions, and more financially literate
   - Effect is not driven by rising mortgage credit
2. QE has a stronger impact on rental yield and rent listings in regions more exposed to our channel
   - The estimated effect is sizable: a one-σ increase in QE is associated with a cumulative housing return decline of 0.4 pp larger in more exposed regions

Related literature

- **Unconventional monetary policy, bank and firm behavior, and macroeconomic outcomes**
  - Kurtzman, Luck and Zimmermann (2017); Rodnyansky and Darmouni (2017); Chakaraborty, Goldstein, MacKinlay (2019); Acharya, Eisert, Eufinger and Hirsch (2019); Todorov (2020); Berg, Haselmann, Kick and Schreiber (2022); Bittner, Rodnyansky, Saidi and Timmer (2022)
  - Eberly, Stock and Wright (2019); Luck and Zimmermann (2020); Fabo Jancoková, Kempf and Pástor (2021)
- **Portfolio rebalancing**
  - Peydro, Polo and Sette (forthcoming)
  - Koijen, Koulischer, Nguyen and Yogo (2021)
  - Korevaar (2022); Gargano and Giacoletti (2022)
- **Literature on house prices, credit and household consumption**
  - Chaney, Sraer and Thesmar (2012); Aladangady (2017); Chodorow-Reich, Novand and Simsek (2021)
- **Literature that views housing as a risky asset in household portfolios**
  - Flavin and Yamashita (2002); Yao and Zhang (2005); Cocco (2005)
- **Post-2009 German housing boom**
  - Le Blanc, Kindermann, Piazzesi, Schneider (2022), Bednarek, te Kaat, Ma and Rebucci (2021);

Outline

- A simple model and its implications
- Data
- Household-level analysis
- Regional analysis
- Conclusions

Model

A simple housing portfolio model

- Two risky assets (houses and long-term bonds) and cash (x):
  - Houses with price P and pays off $\mu_1 + \epsilon_1$
  - Bonds with price Q and pays off $\mu_2 + \epsilon_2$
  - Assumption: $E[\epsilon_1] = E[\epsilon_2] = 0$, $Var(\epsilon_1) = \sigma_1^2$, $Var(\epsilon_2) = \sigma_2^2$ and $Cov(\epsilon_1, \epsilon_2) = \sigma_{12}$
- Three agents: two preferred-habitat investors and one regional household that can arbitrages across all markets (e.g., Vayanos and Vila, 2021)
  - *Local* preferred-habitat investor in city housing market with demand:

$$\tilde{h} = -\alpha_1(P - \beta_1)$$

  - *National* preferred habitat investors in the bond market with demand:

$$\tilde{b} = -\alpha_2(Q - \beta_2)$$

Arbitrager (local household)

The *local* household trades the two risky assets, houses (h) and bonds (b), and has access to a storage technology (x), solving the following mean-variance portfolio problem:

$$\max_{h,b,x} \quad h\mu_1 + b\mu_2 + x - \frac{\gamma}{2}(h^2\sigma_1^2 + b^2\sigma_2^2 + 2hb\sigma_{12}) \tag{1}$$

$$\text{s.t.} \qquad W = hP + bQ + x, \quad \text{with multiplier } \lambda \tag{2}$$

Optimality requires

$$\lambda P = \mu_1 - \gamma h\sigma_1^2 - \gamma b\sigma_{12} \tag{3}$$

$$\lambda Q = \mu_2 - \gamma b\sigma_2^2 - \gamma h\sigma_{12} \tag{4}$$

$$\lambda = 1 \tag{5}$$

And market clearing is

$$b + \tilde{b} = \bar{b} \tag{6}$$

$$h + \tilde{h} = \bar{h} \tag{7}$$

Housing market and portfolio return impact of QE

- If bonds and houses are substitutes, and housing holdings are large enough, housing portfolio share increase and housing portfolio return decline with QE

- **Result 1:** A reduction in the net supply of bonds, $\bar{b}$ (a QE intervention), increases demand for houses and house prices (i.e., $\frac{dh}{d\bar{b}} \leq 0$ and $\frac{dP}{d\bar{b}} \leq 0$) if and only if housing and bond returns are positively correlated ($\sigma_{12} \geq 0$)

  - **Intuition:** in equilibrium, a decline in the covariance risk component of the risk premium allows for an increase in exposure to house price risk and vice-versa:

$$\lambda P = \mu_1 - \gamma h \sigma_1^2 - \gamma b \sigma_{12}$$
$$\lambda Q = \mu_2 - \gamma b \sigma_2^2 - \gamma h \sigma_{12}$$

Housing market and portfolio return impact of QE (Cont.)

- **Result 2:** Consider the total portfolio return, defined as

$$\begin{aligned} E[R] &= \frac{E[W']}{W} = \frac{h\mu_1 + b\mu_2 + x}{W} \\ &= 1 + \frac{h(\mu_1 - P) + b(\mu_2 - Q)}{W}. \end{aligned}$$

  As long as σ_{12} is positive, $\frac{dE[R]}{d\bar{b}} > 0$.

- Moreover, if the equilibrium holding of houses is large enough, the QE impact on the house price (P) dominates the effect on the quantity (h), and the expected housing return $E[R^h]$ also declines, i.e., $\frac{dE[R^h]}{d\bar{b}} > 0$.

Model predictions about a QE intervention ($\bar{b}$ declines)

- With QE, bond supply to the private sector ($\bar{b}$) declines
  - Bond holdings go down, bond prices increase, bond returns fall
  - Households re-balance towards real estate, housing portfolio share increases, prices increase, and expected returns fall
  - Overall household portfolio return decreases
- At the core of the mechanism housing cash purchases for financial investment purposes

Data

Household data

- Based on Bundesbank's Panel of Household Finance survey; 3 waves (2011, 14, 17) covering 4,000-5,000 households each
- Detailed wealth data, including breakdown of housing into main residence and second homes
- We can also track households' borrowing behavior
- Detailed information on household characteristics, such as income, gender, financial literacy etc.

Regional data and QE Indicator

- Annual data from 2010 to 2017 covering all 401 urban and rural regions, matched based on a common region identifier (Kreiskennziffer)
- Residential price and rent indexes, and rental yields from Bulwiengesa: average of new and existing apartments, based on transaction and valuation data
  - We use rental yields as predictor of housing returns and their components
- Listing data aggregated at the regional level from the online platform Immoscout24.de
- In the regional analysis, the QE indicator is total debt securities held by the ECB over nominal euro area GDP

Household Analysis

Specification

- Diff-in-diff specification:

$$\Delta Y_{h,t} = \alpha_t + \alpha_h + \sigma \cdot (\text{Post}_t \times \text{Bonds}_{h,2014}) + \epsilon_{h,t}$$

- Dependent variable is the change in a household's housing portfolio share, adjusted for valuation changes, in the second (2014) and third (2017) waves;
- "$Post_t$" equals one for the third wave, zero for the second wave, "$Bonds_{h,2014}$" is a household's exposure to QE, i.e., the pre-QE share of wealth invested in bonds (directly and indirectly)
- The regressions include time and household fixed effects, or time-income quartile fixed effects
- SEs are heteroskedasticity-robust (clustering at regional level or income quartile level gives very similar results)

Portfolio rebalancing: main results

	Benchmark Estimates		Different dependent variables			Control for deposits	Different bond shares	
	(1) ΔSEC. HOUSING	(2) ΔSEC. HOUSING	(3) ΔSEC. HOUSING (2)	(4) ΔHOUSING	(5) ΔUNITS	(6) ΔSEC. HOUSING	(7) ΔSEC. HOUSING	(8) ΔSEC. HOUSING
Bonds × Post	0.196***	0.178***	0.341***	0.186***	0.002**	0.121**	0.412***	0.462***
	(0.047)	(0.048)	(0.055)	(0.045)	(0.001)	(0.047)	(0.102)	(0.170)
Deposits × Post	-	-	-	-	-	0.128***	-	-
						(0.027)		
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Income-Time FE	No	Yes	No	No	No	No	No	No
Obs	2954	2954	2954	2968	3072	2952	2954	2954
R^2	0.345	0.347	0.390	0.344	0.430	0.354	0.344	0.340

- Households with larger ex-ante bond exposure rebalance more towards second homes
- Result robust to alternative dependent variables (second homes scaled by total portfolio instead of model-consistent, total housing shares, change in number of second homes) and bond shares (without indirect holdings, missing bond values not imputed)
- Households with higher deposits also rebalance more, but bonds still matter
- A household with an initially 10 pp larger (interquartile range) bond share increases its housing share post-QE by an additional 1.8-2.0 pp

Portfolio rebalancing: high-income households

	Full Sample		Urban	Rural	Church Aff.	No-Church Aff.
	(1)	(2)	(3)	(4)	(5)	(6)
	ΔY	ΔY	ΔY	ΔY	ΔY	ΔY
Bonds × Post	0.140**	0.020	0.129	0.139	0.105	0.180**
	(0.062)	(0.060)	(0.090)	(0.092)	(0.076)	(0.090)
Deposits × Post		0.059**				
		(0.029)				
Income × Post	-0.026	-0.138***	-0.016	-0.103*	-0.072*	0.001
	(0.036)	(0.036)	(0.032)	(0.059)	(0.038)	(0.034)
Bonds × Post × Income	0.003*	0.005***	0.003**	0.001	0.004***	0.000
	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)
Deposits × Post × Income		0.003***				
		(0.001)				
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	2954	2952	1056	1898	1766	1188
R^2	0.346	0.365	0.402	0.322	0.364	0.321

- Second homes in Germany are subject to significant tax advantages
- We find stronger rebalancing for higher-income households
- Effects stronger for church members and urban regions where house price appreciations (tax-free after 10 years) are more important than rental income (taxed as income), see Schularick et al. (2022).

Some Institutional Context

- Second homes benefit from a massive tax advantages relative to first homes
- Assume an apartment price tag of 200,000 EUR, with transaction costs (real estate agent, property taxes and notary) of 10% (20,000 EUR) and renovation costs of 15% (30,000 EUR)
- Further assume a marginal tax rate for high-income households of 42% and no mortgage borrowing
- If this purchase is a first home, you can deduct only up to 1,200 EUR per year (of the renovation costs) - **a 504 EUR per year tax advantage**
- If this purchase is a second-home rented out, in the first year, you can deduct 2% of the tag price (4,000 EUR), the full renovation costs (30,000 EUR), and 2% of the additional charges (400 EUR) - a **14,448 EUR tax advantage**
- In subsequent years, it is 2% of the apartment price (4,000 EUR) and 2% of the additional charges (400 EUR) per year - **a yearly 1,848 EUR tax advantage** - plus the annual property tax (rather small, so abstracted from here)

Portfolio rebalancing: exploring other characteristics

	(1) ΔY	(2) ΔY	(3) ΔY	(4) ΔY	(5) ΔY	(6) ΔY
Bonds × Post × Financial Advice	0.324**					
	(0.138)					
Bonds × Post × Financial Literacy		0.122***				
		(0.039)				
Bonds × Post × Renter			-0.252			
			(0.166)			
Bonds × Post × Middle Age				0.281**		
				(0.140)		
Bonds × Post × Older Age				0.117		
				(0.077)		
Bonds × Post × Mortgage to Housing					0.001	
					(0.002)	
Bonds × Post × $\Delta Mortgage$						0.001
						(0.000)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	890	2954	2954	2954	2954	2954
R^2	0.344	0.348	0.346	0.349	0.346	0.356

- Financially more literate households, middle-aged, and those that were financially adviced by their banks rebalance more strongly (points to strong cross-selling activities of banks)
- No evidence of effects being driven by mortgage credit expansions
-

Additional robustness checks

- Results robust to control for a rich set of time-varying household characteristics, such as risk aversion, financial literacy, age etc. ▸ robustness
- Results also robust to interacting these variables with the Post-dummy
- To check for the role of the credit channel, we drop all households with positive mortgage credit volume changes around the QE adoption–all of our results are unchanged

QE Impact on Local Housing Markets

Specification

- Unfortunately, limited information on housing returns and prices in the PHF.
- We exploit regional variation in housing price and quantity indicators for which we have high-quality data
- Bartik research design

$$\Delta X_{r,t} = \alpha_r + \alpha_t + \beta \cdot \left(\text{QE}_{t-1} \times \text{Exposure}_r\right) + \varepsilon_{r,t}$$

  where $X_{r,t}$ is either rental yield, real house price or rent growth, or the number of sale and rental listings.

- Identification hinges on finding suitable exposure measure.

Measuring regional exposure to our channel

- We cannot use regionally aggregated bond shares, as we have 1500 obs and 400 regions
- The model predicts that the impact of QE should be higher in regions in which real estate supply is tighter
- We use the ex-ante (pre-sample value in 2008) share of refugees (market tightness)
- Results robust when we use the share of renters as a measure of market depth

Reduced form results: rental yields and their components

	(1) Rental Yield	(2) House Prices	(3) Rent Prices	(4) Rental Yield	(5) House Prices	(6) Rent Prices
Share of Refugees$_{r,2008}$ × QE$_{t-1}$	-0.0003**	0.0100**	0.0023			
	(0.0001)	(0.0042)	(0.0016)			
Share of Renters$_{r,2011}$ × QE$_{t-1}$				-0.0014***	0.0141**	0.0088***
				(0.0002)	(0.0063)	(0.0026)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	3080	3080	3080	3208	3208	3208
R^2	0.937	0.781	0.813	0.939	0.781	0.812

- We find that QE reduces rental yields (rent-to-price ratios) in regions with more land scarcity or a larger rental market
- A one-sd increase in QE is associated with a rental yield decline in more (95th percentile) relative to less exposed regions (5th percentile) of about 0.4 pp, cumulatively
- This decrease is driven by house prices increasing more than rents

Why focusing on rental yield?

- Housing return predictability regressions fit German data well (e.g., Cochrane, 2011)

	$\sum_{j=1}^{k} \rho^{j-1} r_{t+j}$		$\sum_{j=1}^{k} \rho^{j-1} \Delta d_{t+j}$		dp_{t+k}			
	b_r^k	R^2	$b_{\Delta d}^k$	R^2	b_{dp}^k	R^2	Obs	$b_r^k - b_{\Delta d}^k + \rho^k b_{dp}^k$
k=1	0.033	0.024	-0.026*	0.057	0.980***	0.958	51	1.000
	(0.031)		(0.015)		(0.029)			
k=3	0.135*	0.073	-0.070*	0.067	0.899***	0.797	49	1.000
	(0.070)		(0.038)		(0.066)			
k=5	0.220**	0.111	-0.102*	0.072	0.833***	0.651	47	1.001
	(0.093)		(0.055)		(0.091)			
k=10	0.258**	0.109	-0.203**	0.120	0.816***	0.430	42	1.003
	(0.117)		(0.087)		(0.148)			
k=15	0.376**	0.138	-0.347***	0.197	0.513*	0.101	37	1.002
	(0.159)		(0.118)		(0.258)			

In our short regional panel data set, we find consistent evidence, with evidence that all three components matter over a 1-3 years horizon

	r_{t+1}	Δd_{t+1}	dp_{t+1}	$b_r^k - b_{\Delta d}^k + \rho^k b_{dp}^k$
Panel A: Pooled OLS				
	(1)	(2)	(3)	
dp_t	-0.057***	-0.061***	1.064***	1.025
	(0.003)	(0.003)	(0.003)	
Observations	5614	5614	5614	
R^2	0.055	0.057	0.967	
Panel B: Panel OLS with regional FE				
	(1)	(2)	(3)	
dp_t	-0.101***	-0.073***	1.095***	1.023
	(0.004)	(0.005)	(0.003)	
Observations	5614	5614	5614	
R^2	0.087	0.041	0.939	
Panel C: Panel OLS with regional and year FE				
	(1)	(2)	(3)	
dp_t	0.019*	-0.140***	0.890***	1.013
	(0.011)	(0.013)	(0.008)	
Observations	5614	5614	5614	
R^2	0.309	0.077	0.960	

Reduced form results: sale and rental listings

	(1) Sale Listings	(2) Rental Listings	(3) Sale/Rental Listings	(4) Sale Listings	(5) Rental Listings	(6) Sale/Rental Listings
Share of Refugees$_{r,2008}$ × QE$_{t-1}$	-1.795***	-7.234***	-0.00007**			
	(0.287)	(0.847)	(0.00003)			
Share of Renters$_{r,2011}$ × QE$_{t-1}$				-1.170***	-3.818***	-0.00051***
				(0.312)	(1.190)	(0.00008)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	3080	3080	3080	3208	3208	3208
R^2	0.944	0.967	0.770	0.936	0.954	0.770

- We find that QE reduces rental yields (rent-to-price ratios) in regions with more land scarcity or a larger rental market
- A one-sd increase in QE is associated with a rental yield decline in more relative to less exposed regions of about 0.15 pp
- After QE, households living in regions with stronger rebalancing increase their house price expectations

Robustness Checks

- The results are robust to controlling for the following regional characteristics, interacted with QE:
  - Building permits
  - Population
  - Demographics (share of young people 18-25)
- The results are also robust to restricting sample to QE sub-sample of 2014-2017

Conclusions

- We spell out in a simple model and study a housing portfolio channel of QE transmission that does not work through leverage and credit
- It works through portfolio rebalancing and cash purchases of housing for investment purposes
- We provide supporting empirical evidence exploiting German household-level and regional data
  - Our household data show that households with larger ex-ante bond exposure rebalance more towards second homes
  - This effect becomes stronger for high-income, financially literate households being high-income, and households that got advised by their bank
  - At the region level, we show that more exposed regions see stronger declines in rental yields and sale listings

THANK YOU!

Additional Material

Traditional setup

Consider an alternative setup with housing and bond as follows.

$$\begin{aligned} & \max_{c,h,b} u(c,h) + \beta u(c') \\ \text{s.t.} \quad & c + hP + bQ = w, (\lambda) \\ & c' = (1+r)b \end{aligned}$$

The optimality condition implies that

$$\lambda = u_1(c,h) \tag{8}$$
$$P\lambda = u_2(c,h) \tag{9}$$
$$Q\lambda = \beta(1+r)u'(c') \tag{10}$$

Market clearing: $h = \bar{h}$ and $b = \bar{b}$

Equilibrium conditions

Plugging all equilibrium conditions into the period-1 budget constraint we have:

$$F(c,\bar{b}) \equiv c + \bar{h}\frac{u_2(c,\bar{h})}{u_1(c,\bar{h})} + \bar{b}\frac{\beta(1+r)u'((1+r)\bar{b})}{u_1(c,\bar{h})} - w = 0 \tag{11}$$

By the implicit function theorem we have:

$$\frac{dc}{d\bar{b}} = -\frac{F_2(c,\bar{b})}{F_1(c,\bar{b})} \tag{12}$$

We standard preferences we have $F_1(c,\bar{b}) > 0$

Therefore, if $F_2(c,\bar{b}) > 0$, then $\frac{dc}{d\bar{b}} < 0$, i.e. QE increases consumption

The latter holds if $\sigma < 1$ for CRRA utility

Comparison with our set up

Three key differences

- Decouple IES ($1/\sigma$) that controls intertemporal consumption smoothing, from risk aversion (γ in our model) that matters for asset pricing in a simple manner

- Separate home ownership from housing as asset (REITs investing): German households cannot add rooms to their apartments following QE!
- Testable predictions for household portfolio shares

Back

Robustness (1): Control for other HH char.

	(1) ΔY	(2) ΔY	(3) ΔY	(4) ΔY	(5) ΔY	(6) ΔY
Bonds × Post	0.249***	0.274***	0.198***	0.120***	0.203***	0.198***
	(0.064)	(0.070)	(0.048)	(0.048)	(0.048)	(0.048)
Net Worth$_{t-1}$	-5.928***					
	(1.314)					
Members$_{t-1}$	4.691***					
	(1.714)					
Age$_{t-1}$	-0.386					
	(0.346)					
Financial Literacy$_{t-1}$	-1.481					
	(1.164)					
Risk Aversion$_{t-1}$	0.977					
	(1.421)					
Net Worth$_{2014}$ × Post		0.867*				
		(0.518)				
Members$_{2014}$ × Post			0.430			
			(0.048)			
Age$_{2014}$ × Post				0.056		
				(0.056)		
Financial Literacy$_{2014}$ × Post					1.506	
					(1.164)	
Risk Aversion$_{2014}$ × Post						0.495
						(1.685)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	2788	2850	2954	2954	2954	2952
R^2	0.372	0.351	0.345	0.345	0.346	0.345

Robustness (2): The Role of Credit

	Households with Non-Positive Credit Growth	All Households	
	(1)	(2)	(3)
	ΔY	ΔY	ΔY
Bonds $\times$ Post	0.183***	0.184***	0.183***
	(0.047)	(0.047)	(0.047)
Mortgage to Housing $\times$ Post		-0.047	
		(0.034)	
ΔMortgage Credit $\times$ Post			0.009***
			(0.003)
Household FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Obs	2580	2954	2954
R^2	0.367	0.346	0.354

Back

Robustness (3): Control for other regional char.

	(1) Rental Yield	(2) Rental Yield	(3) Rental Yield	(4) Rental Yield
Share of Refugees$_{r,2008}$ × QE$_{t-1}$	-0.0003**	-0.0004**	-0.0002**	-0.0009
	(0.0001)	(0.0002)	(0.0001)	(0.0006)
Building Permits$_{r,2008}$ × QE$_{t-1}$	0.0008			
	(0.0027)			
Population$_{r,2008}$ × QE$_{t-1}$		0.0000*		
		(0.0000)		
Age 18-25$_{r,2008}$ × QE$_{t-1}$			-0.0132***	
			(0.0030)	
Time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Obs	3080	3072	3080	1925
R^2	0.937	0.937	0.938	0.967

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