Institutional investors and house prices *

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Abstract

Institutional investors, such as investment funds, play an increasingly important role in euro area residential real estate (RRE) markets. This raises the possibility that their actions might drive aggregate market outcomes and may change how and which macrofinancial shocks transmit to house prices. In a BVAR setting, we show that a demand shock from institutional investors has a positive and persistent effect on aggregate euro area house price growth and mortgage lending volumes. Institutional investors also increase their purchase activity following a loosening of monetary policy. Exploiting regional heterogeneity, we use a dynamic panel data model to show that institutional investors weaken the link between house price growth and local economic fundamentals but strengthen the sensitivity to monetary policy and to financial market shocks.

JEL classification: E52; G11; G23
Key words: Monetary policy; non-bank financial intermediation; macropudential policy; real estate

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1 Introduction

Housing is one of the most important asset classes in developed economies, playing a central role in driving the credit cycle, the transmission of monetary policy and wider economic activity (Jordà et al., 2015; Mishkin, 2007; Mian et al., 2013; Kaplan et al., 2020). Our understanding of house price dynamics, particularly in the euro area, typically focuses on households and the banks which lend to them. However, the presence of institutional investors in this market has steadily increased over the past decade and our understanding of whether and how they influence market dynamics remains limited. Where the presence of these investors becomes significant enough to influence aggregate market dynamics, it raises a range of important questions regarding the capacity of these players to amplify house price cycles or to create links between vulnerabilities in the non-bank financial system and housing markets.

This paper uses a data set covering large real estate transactions to examine the role of institutional investors in euro area housing markets. First, we document the evolution of investor purchases of euro area housing over time, finding a steady increase in activity since 2013. We then use a Bayesian vector autoregressive (BVAR) model to show that a demand shock from institutional investors has a positive and persistent effect on residential house prices and mortgage lending volumes at the euro area aggregate level. Investor demand also increases in response to a loosening of monetary policy. Finally, we examine how the participation of investors in a market changes the response of house prices to macrofinancial shocks. We find that investors' presence tends to increase house price growth and weaken its link with local economic fundamentals. Institutional investors also appear to increase the sensitivity of the housing market to both monetary policy and financial market shocks.

A major barrier to our understanding of these dynamics to date has been availability of data. Our use of a transactions-level data set allows us to examine for the first time the participation of institutional investors in euro area housing markets. Our data set shows a steady increase in total purchases of residential assets by institutional investors from approximately 2013 onwards, with this increase largely been driven by the investment fund sector. However, not all euro area housing markets appear to be equally exposed, with institutional investor presence particularly pronounced in Germany, the Netherlands, Finland and in a number of capital cities such as Paris, Dublin, Madrid and Helsinki.

From a macroeconomic perspective, the relevance of these players in the housing market will rest on their capacity to affect aggregate market dynamics. We use a BVAR framework to show that increased demand for residential properties by institutional investors is indeed associated with a persistent rise in euro area house prices. It is the first time that this has been shown for the euro area but also that it has been shown for any jurisdiction using a BVAR framework. Crucially, the BVAR framework allows us to capture feedback loops

between key variables - such as house prices and investor demand - which have significant implications for market dynamics.

The BVAR framework also allows us to study for the first time the interaction between these non-bank players and the banking system: we show that rising purchases of real estate by institutional investors are associated with a rise in mortgage lending. Finally, we provide the first empirical evidence that these buyers are responsive to monetary policy, with an accommodative policy shock associated with an increase in purchases. This confirms views expressed by prominent policy figures during the low-for-long monetary policy period (see, for example Schnabel (2021)). Taken together, these findings indicate that institutional investors have become systemically relevant players in euro area housing markets and that they may play an amplifying role in euro area house price cycles.

If institutional investors are able to affect aggregate market prices, then markets where they are particularly prevalent may be exposed to a very different range of shocks compared to markets where buyers are almost entirely households. The heterogeneity in investor participation across the euro area allows us to study this empirically and to show, to the best of our knowledge, the first empirical evidence on how the participation of institutional investors in real estate markets changes the response of house prices to macrofinancial shocks. We examine this empirically using a dynamic panel data model, based on regional data for eight euro area countries and take a comprehensive approach to our question, examining transmission of real economy, monetary policy, global and financial market shocks.

First, we investigate whether the presence of institutional investors in housing markets weakens the link between house prices and local economic fundamentals. We find that in markets with more institutional investors, house price growth was typically higher over the period examined and showed almost no relationship with variations in local wages. In contrast, markets without institutional investors have lower house price growth and a clear positive relationship between local wages and house prices. From a financial stability perspective, this may insulate housing markets from the effect of local economic shocks. However, where prices are detached from fundamentals this may also give rise to overvaluation and increase the vulnerability of housing markets to sharp corrections, particularly in response to any turnaround in investor demand.

Next, we examine whether the presence of institutional investors affects the link between monetary policy and house prices. We provide evidence that a high presence of institutional investors in a given market increases the sensitivity of house price growth to variations in euro area monetary policy. This is a particularly important finding given that the euro area as a whole is subject to a single monetary policy but we have shown that the composition of buyers varies quite substantially across regions, thus creating heterogeneity in the transmission of monetary policy via the housing market.

Lastly, we examine whether institutional investors create a link between financial market or global shocks and local housing markets. For example, households may be less exposed to financial market shocks than institutional investors like investment funds. Similarly, the presence of overseas institutional investors in housing markets could create a link between local house prices and global factors such as US monetary policy. Institutional investors do appear to increase the short-term sensitivity of housing markets to financial market volatility. In contrast we do not find any evidence that overseas investors increase the sensitivity of housing markets to US monetary policy.

Overall, these findings suggest that institutional investors play a systemically relevant role in euro area housing market dynamics and that understanding this role is an important component of assessing how different housing markets may respond to real economy, monetary policy and financial market shocks. Moreover, the predominance of investment funds among these investors gives rise to the possibility that vulnerabilities among real estate funds could have implications for wider euro area real estate markets. In this regard, Daly et al. (2023) highlights the structural liquidity risks within euro area real estate funds. Our findings suggest that widespread firesales by these funds could have implications for euro area house prices and further emphasise the importance of widening the macroprudential toolkit to allow authorities to mitigate financial stability risks from this sector.

In the next Section we will discuss our work in the context of the wider literature. In Section 3 we provide an overview of our RCA data and descriptive analysis of institutional activity in euro area RRE markets. In Section 4 we carry out our BVAR analysis. In Section 5 we construct our regional data set and use this to first confirm key BVAR findings and then to examine how investors affect house price response to shocks. In Section 6 we consider implications for policy and in Section 7 we conclude.

2 Related Literature

Our paper adds to a number of strands of existing literature. Regarding the existing empirical literature on the effects of institutional investor activity on house price dynamics, we are the first to study the euro area, to use a structural VAR framework and to examine how the participation of institutional investors in real estate markets changes how house prices respond to macrofinancial shocks.

The existing literature on this topic focuses entirely on US markets, and in many cases on specific US counties and metropolitan areas (Gay, 2015; Allen et al., 2017; Mills et al., 2019; Smith and Liu, 2020; D'Lima and Schultz, 2022). Our findings largely confirm those of the US-focused literature. In particular our key finding that fluctuations in investor demand do appear to play a role in driving market prices is also found throughout the U.S.

literature. U.S. housing markets with a higher share of short-term investors, including institutional investors, have also grown substantially in the last decades (Ganduri et al., 2023; Mills et al., 2019). The growth of institutional real estate investments in the U.S. has been identified as an amplifying factor in the boom-bust cycle preceding the global financial crisis (Alter and Dernaoui, 2020; Gao et al., 2020). This has also been identified as a contributing factor to the increasing house prices and decreasing affordability and homeownership rates following the Great Recession (Gay, 2015; Allen et al., 2017; Mills et al., 2019; Lambie-Hanson et al., 2019; Halket et al., 2020; Garriga et al., 2021, 2022).[1] By confirming that these investors can also drive aggregate market dynamics in the euro area - and indeed across a range of euro area countries with very different institutional set ups - we show that the findings of the existing literature are relevant beyond the U.S. and provide an important new perspective on how European real estate markets operate.

Our use of a BVAR framework as opposed to a purely microeconometric approach is also an important addition to this literature. A structural VAR framework allows us to model the relationships between a number of endogenous variables and their responses to structural shocks. In particular, this allows us to model feedback loops between endogenous variables which are highly relevant to the market dynamics being studied. For example, the BVAR allows us to account for feedback loops between price growth and investor demand. Reverse causality in this relationship - whereby future price growth drives investor demand as opposed to vice versa - has been identified in the existing literature: D'Lima and Schultz (2022) use repeat sales of homes to show that institutional investors were skilled in identifying undervalued homes in areas with high house price growth potential.[2] The structural VAR framework is also well suited to examining how investor demand affects other endogenous variables - such as bank lending - and to understand the response of investor demand to monetary policy shocks.

The granularity of our data and the heterogeneity of investor participation in real estate markets across the euro area, allows us to study for the first time how the participation in real estate markets by these investors affects the transmission of macrofinancial shocks to house prices. We take a comprehensive approach to this exercise, studying how institutional investors may change the vulnerability of real estate markets to real economy, monetary policy, financial market and global shocks. This is an important exercise given the growing role of institutional investors in real estate markets internationally and the implications of house price fluctuations for financial stability (Jordà et al., 2015; Iacoviello and Neri, 2010; Reinhart and Rogoff, 2008) and key macroeconomic variables like household consumption

[1] A possible reason is that institutional investors have a stronger bargaining power and tend to purchase at a large discount compared to single-purchase buyers (Allen et al., 2017; Smith and Liu, 2020). Institutional investors' purchases can have also a spillover effect on nearby home values by reducing the supply of properties available for sale (Ganduri et al., 2023).

[2] We also address this potential for reverse causality in our panel data set-up and provide further evidence that the link between current investor demand and future house price growth is not simply a case of reverse causality.

(Mian et al., 2013; Aladangady, 2017; Berger et al., 2018). Our findings also have clear implications for the literature on drivers of overvaluation in housing markets (Muellbauer, 2012; Álvarez-Román and Garcia-Posada, 2021) and drivers of synchronisation in global housing markets - for example via the response of investors to or financial markets (Hirata et al., 2013; Hoesli, 2020; Duca, 2020).

By studying the response of institutional real estate investors to monetary policy we contribute to both the literature on the transmission of monetary policy via housing markets and the literature on the transmission of monetary policy via non-banks. While the response of house prices to changes in monetary policy has been extensively studied, this literature overwhelmingly focuses on transmission via households and bank lending (see for example (Jarocinski and Smets, 2008a; Battistini et al., 2022; Aastveit et al., 2023; Garriga et al., 2017; Cloyne et al., 2020).[3] The budding literature on monetary policy transmission via non-banks in contrast focuses largely on transmission via financial markets (Hau and Lai, 2016; Banegas et al., 2016; Holm-Hadulla and Thürwächter, 2020; Giuzio et al., 2021). By showing that institutional investor purchases of real estate increase following an accommodative shock, our BVAR analysis shows that non-banks also play a role in transmitting monetary policy via housing markets. Our panel analysis indicates that investors may in fact amplify the impact of monetary policy via their stronger response relative to households.

By showing that rising institutional investor activity is associated with rising mortgage lending, we also complement the existing literature on the interactions between banks and non-banks in financing real economic activity. Interestingly, while much of the existing literature examines how the expansion of non-bank activity can lead to a contraction of bank activity, we show that the actions of these two groups can also amplify one another. For example, Gete and Reher (2018) shows that the growth of institutional investors in US housing markets has been amplified by the tightening in lending standards in the aftermath of the Global Financial Crisis. Recent theoretical work has also found a link between the banking and macroprudential regulations and the presence of institutional investors in housing markets (Muñoz and Smets, 2022). Indeed the wider literature on bank and non-bank financing of economic activity typically frames non-bank activity as a "spare tyre" which increases following a reduction in bank lending (De Fiore and Uhlig, 2011; Adrian et al., 2012; Becker and Ivashina, 2014; Altavilla et al., 2019; Holm-Hadulla and Thürwächter, 2020). In contrast, we show that rising purchases of RRE by institutional investors is also associated with an expansion in banks' mortgage lending, suggesting that amplifying feedback loops may also exist between these two parts of the financial system.

Finally, we add to the existing literature on the growing role of non-banks in the global

[3] Garriga et al. (2021) use the Fed Quantitative Easing as an instrument to proxy the geographical presence of institutional housing investors after the GFC, but the main focus of their analysis is the impact of investors on US housing affordability.

financial system. This literature, particularly for the euro area, has focused largely on non-banks' financing of firms (Altavilla et al., 2019; Holm-Hadulla and Thürwächter, 2020). In terms of economic growth, non-bank financial intermediation has positive effects but may also introduce new sources of volatility across the economic cycles (European Central Bank, 2021). This literature has also highlighted that structural vulnerabilities, in particular in the investment fund sector, can amplify financial distress and negatively affect financial stability (Chen et al., 2010; Feroli et al., 2014; Goldstein et al., 2017; Morris et al., 2017; Giuzio et al., 2021; Ma et al., 2022; Ryan, 2022). Given the importance of housing as an asset class, understanding the role of non-bank players in real estate markets is another crucial element in understanding the implications of this structural change for the real economy and for financial stability.

3 Novel data on investor transactions in euro area residential real estate markets

3.1 Real estate transactions data

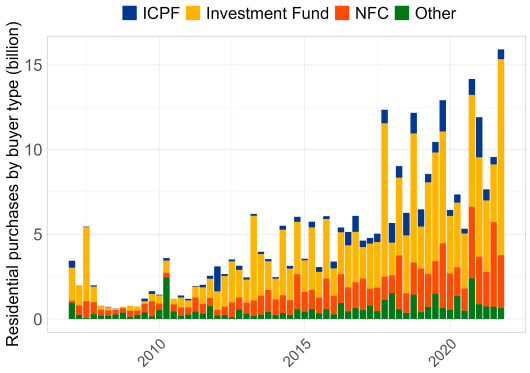
Our main explanatory variables are computed using Real Capital Analytics (RCA) data, provided by Morgan Stanley Capital International. RCA publishes several data sets on real estate transactions, collected from different public sources, data partners and brokers. RCA specifically targets commercial real estate transactions, which also include large housing deals for investment purposes. RCA provides transaction-level data for deals closed from 2007 onwards. More specifically, the data set includes detailed information on purchases of residential assets by non-households such as non-financial companies, financial entities or governments. This includes information regarding the location of the building, the transaction date and price, as well as the names and locations of both buyers and sellers.

While the data set is very granular in nature, it can only offer a partial picture of all relevant transactions in European RRE markets, as it solely focuses on institutional investors and therefore does not cover purchases by households. This also implies that the observed transactions of institutional investors cannot be expressed as a share of total RRE transactions. Furthermore, the data set is biased towards large transactions, covering mostly deals valued at 10 million EUR or more and - as it is compiled from different original sources across countries - data quality may vary across euro area countries. Finally, the RCA data set may not provide a complete picture, even of large transactions occurring in the euro area and so total figures should be interpreted with caution. However, fluctuations in total figures over time do likely reflect fluctuations in total market activity.

Despite its shortcomings, RCA data allow us to analyse for the first time the impact of institutional investors on RRE markets in the euro area. As such, it can give valuable

Figure 1: Purchases of residential real estate assets by buyers such as investment funds and firms have grown steadily over the past decade.

(a) Residential transactions by buyer type



insights into the role these investors play in house price growth, affordability and procyclical market dynamics. The following section offers selected descriptive statistics based on this data set to illustrate the dynamics of institutional investment over time.

3.2 Summary statistics: Institutional investors in euro area residential real estate markets

The role of institutional investors in euro area RRE markets has remained broadly unstudied until now, so we begin our work by examining our transactions data set to see what type of institutional buyers are present in euro area markets, changes in activity over time and geographic heterogeneity.

First, we identify purchases of residential assets in our data set (e.g. as opposed to offices) and also identify those which are recorded as being bought for investment purposes.[4] Figure 1a shows the total value of transactions in our RCA data set by quarter between 2007 and 2022. Here we see a clear growth in purchases over time, with the total value of purchases approximately tripling in a typical quarter between 2012 and 2020. This provides clear motivation for the rest of our analysis as this rapid expansion in market activity increases the capacity for institutional investors to play a systemically relevant role in euro area housing markets - for example, by driving aggregate market prices. We will examine this in the next sections.

For each quarter, we first break down activity by the type of buyer (Figure 1a) and find that the majority of these purchases of residential assets are made by investment funds.

[4]The vast majority of purchases are recorded as being for investment purposes. The remainder includes transactions for renovation purposes. As we are interested in investment activity, we remove non-investment purchases from our sample for the remainder of the analysis.

Indeed the rapid increase in buying activity by investment funds reflects the expansion in the broader euro area investment fund sector over this time period and its increasing importance in financing euro area economic activity. Non-financial corporations (NFCs) such as large institutional landlords make up the second biggest sector and while insurance companies and pension funds (ICPFs) are also present in the market they typically account for a small share of transactions. Institutional buyers are also quite geographically diverse. A large share come from three of the euro area's biggest economies - France, Germany and the Netherlands - and non-euro area buyers are also active in the market, with the US and the UK well represented within this group (Figure 2a).

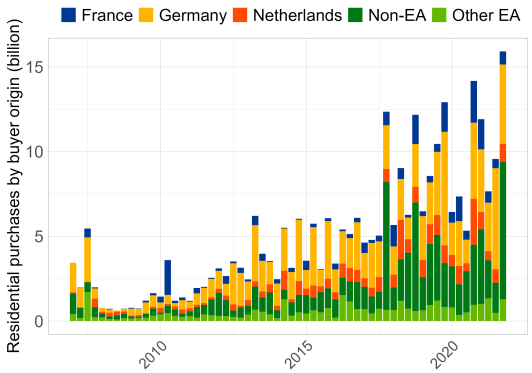
We can also take a look at the sample broken down by the location of the building bought. Figure 2b shows that activity is concentrated in Germany and the Netherlands, with Finland, Austria and France making up most of the remaining transactions. However, if we want to understand the impact this activity may be having on housing markets we need to account for the varying size of euro area countries. To get a rough initial idea of the importance of institutional investors across the euro area we take the total number of purchases occurring between 2007 and 2021 and divide by the country's end 2021 population, as shown in Figure 3a. We repeat the exercises dividing the total value of purchases by GDP in Figure 3b. This simple analysis indicates clear cross-country heterogeneity in the importance of institutional investors across RRE markets in the euro area. In particular, the Netherlands appears to be the country where institutional investors may play the most pronounced role, with significant market participation also shown for Austria, Germany, Finland and Ireland.

The granularity of our data allows us to extend our analysis to the regional level where we also see investor demand varying substantially within countries. Figure 4 shows total purchases in 2018 by NUTS2 region, normalised by GDP, with darker-shaded regions representing a higher concentration of institutional investor activity. We focus on countries where we will ultimately be able to also examine house price dynamics in Section 5. The map shows that country-level aggregates mask significant regional heterogeneity. For example, while the role of institutional investors in French markets appears limited, we can see a significant presence in Paris and very little in most other parts of the country. Similarly, Finnish investor activity is highly concentrated in the region close to Helsinki and Irish activity in the area around Dublin. In contrast, institutional investors appear to play an active, although varying role across Germany and the Netherlands.

This geographic heterogeneity motivates the second part of our analysis. If institutional investors do play a systemically relevant role in euro area housing markets but are particularly concentrated in certain countries and regions - then we may expect housing markets to behave differently in these markets. In particular, a significant presence of institutional investors may increase the exposure of RRE markets to shocks affecting institutional investors - such as financial market shocks or global shocks - and may also weaken their link

Figure 2: Buyers typically come from a number of large euro area economies but a substantial share come from outside of the euro area, while purchases appear concentrated in a small number of countries.

(a) Residential purchases by origin of buyer



(b) Residential purchases by country of asset

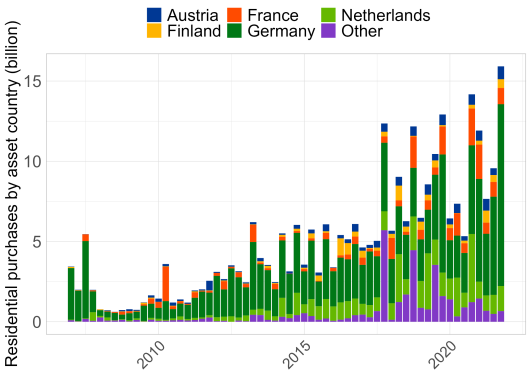
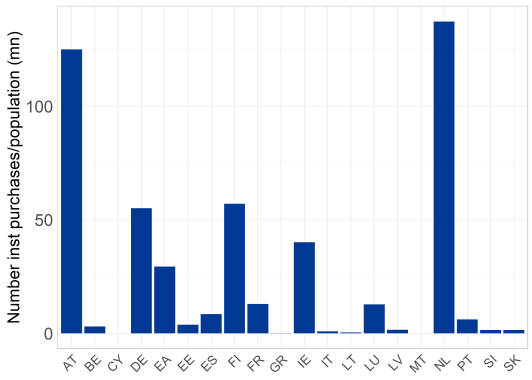
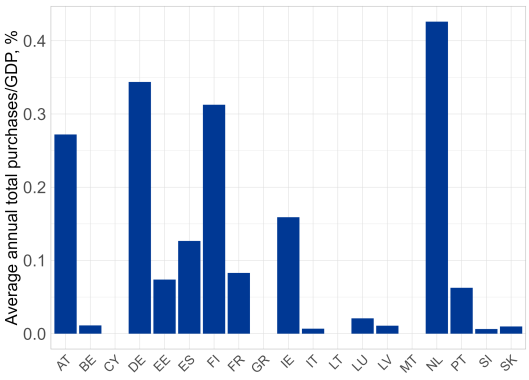


Figure 3: Normalising by country size reveals a number of further countries where investors play a prominent role.

(a) Total number of purchases (2007-2021) normalised by population

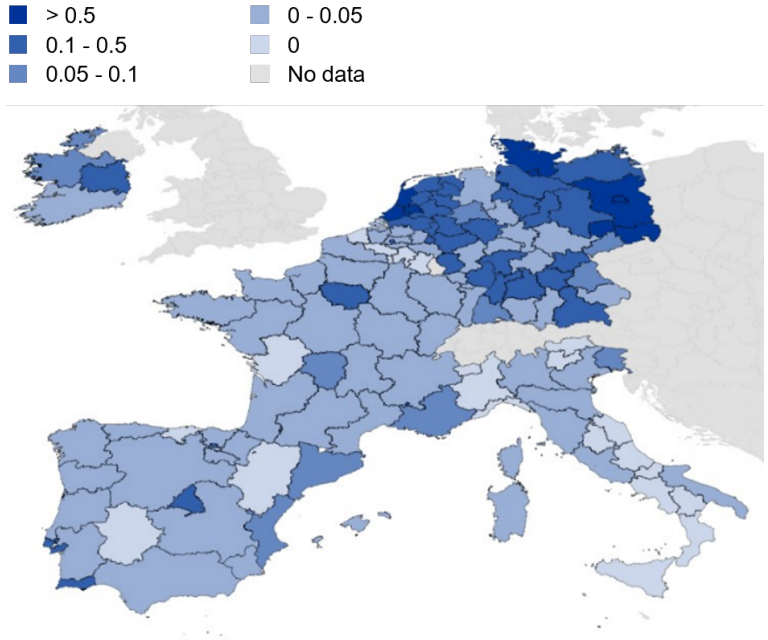


(b) Total value of purchases (2007-2021) normalised by GDP



with the local economy. Moreover, given the euro area is subject to a single monetary policy, the sensitivity of institutional investors to monetary policy changes is also important - with geographic variation in their market participation potentially creating heterogeneity in monetary policy transmission. We examine these issues in Section 5.

Figure 4: Substantial regional heterogeneity can also be seen at the regional level (colors reflect 2018 purchases normalised by regional GDP).



4 Institutional investors and aggregate market dynamics

We start our analysis by studying whether and to what extent the increased presence of institutional investors might play a role in influencing aggregate euro area RRE market dynamics. Moreover, we examine whether aggregate demand by these investors responds to monetary policy.

4.1 The model

The modelling approach builds on De Nora et al. (2022), which is extended in order to include information on institutional investor purchases. In particular, we consider the following reduced-form VAR(p) model:

$$y_t = \alpha + \sum_{i=1}^{p} B_i y_{t-i} + u_t \tag{1}$$

where y_t is a (N $\times$ 1) vector containing N endogenous variables, α is a (N $\times$ 1) vector of constants, B_i for $i = 1, ..., p$ are (N $\times$ N) slope coefficients matrices, p represents the number of lags, and u_t is the (N $\times$ 1) reduced-form residual with $u_t \sim \mathcal{N}(0, \Sigma)$, where Σ

is the (N × N) variance–covariance matrix of the error terms, which is not assumed to be diagonal.

As in De Nora et al. (2022), the vector of endogenous variables includes real RRE prices, lending volumes for house purchase, interest rates on the outstanding stock of mortgages, real residential investments (proxied by fixed capital formation in the construction sector) and real disposable income. To capture the effect of both conventional and non-conventional monetary policy measures that go beyond steering the policy rates, we opt for using the shadow rate (Krippner, 2013). Moreover, we include a measure of institutional investor demand for residential properties, given by the gross RRE purchases of institutional investors, using RCA aggregated at euro area level. We use quarterly series for the euro area aggregate covering the period 2007Q1 to 2021Q4. Measures of RRE prices, lending for house purchase, residential investments and institutional investor gross purchases enter the model in log-levels, while the shadow rate and lending rate on housing loans enter in levels. The series on residential investments, RRE prices, mortgage volumes and real disposable income are sourced from ECB Statistical Data Warehouse, the shadow rate is sourced from Krippner,[5] while the series on institutional investor demand is computed using RCA data (see Section 3.1). The lag length in the baseline model p is set to 2. We adopt a Bayesian approach to estimation and use a Gibbs sampling algorithm to approximate the posterior distribution of the model parameters. As discussed in Uhlig (2005), this approach offers a convenient method to estimate error bands for impulse responses. We use a flat prior and, therefore, the results reported below are data driven.

4.1.1 Identification of structural shocks

The structural shocks are identified relying on a combination of zero and sign restrictions following the algorithm proposed in Arias et al. (2018). The identifying restrictions related to the household and banking sector and to monetary policy follow those set in De Nora et al. (2022) which, in turn, follows the relevant empirical literature (Jarocinski and Smets, 2008b; Calza et al., 2013; Nocera and Roma, 2017; Furlanetto et al., 2017). While we will provide a brief explanation of the structural shocks involving the household and the banking sector, we leave to the above mentioned references a more in-depth discussion and we will focus instead on the institutional investors shock. All the restrictions are imposed only contemporaneously.

Households, banks and monetary policy. A housing supply shock affects housing investments and prices in opposite directions, while a housing demand shock involves a co-movement of residential investments and prices, as standard in the literature. The latter is also accompanied by movement in the same direction of mortgage volumes and rates. A housing demand shock can be attributed to changes in household preferences, fiscal

[5] https://www.ljkmfa.com/

regimes, social habits, or remote work practices (see De Nora et al. (2022)). Household preference shocks are distinguished from potential changes in demand due to household financial conditions. Income shocks are identified as an increase in prices and in disposable income. The shadow rate in the housing supply, household preferences, and income shocks does not react contemporaneously, consistently with the Taylor rule. Household preference shocks are then distinguished from exogenous changes in mortgage lending availability on the supply side via the reaction of the mortgage rate. Mortgage supply shocks refer to exogenous innovations in mortgage supply that affect the banking sector's ability to lend, influenced by factors like regulatory requirements, risk aversion, funding costs, and market competition. The mortgage supply shock and monetary policy are differentiated from a monetary policy shock by the reaction of the policy rate. Finally, for all the above-mentioned shocks we do not impose prior views on the way institutional investors react contemporaneously, which is left unrestricted.

Institutional investors. We extend our set of identifying restrictions to study the impact of the increased presence of institutional investors in the residential real estate (RRE) market. Our *RRE institutional investors shock* aims to capture exogenous innovations that increase institutional investors' propensity to participate in the RRE market. An intuitive interpretation of a shock that moves up investors' appetite to invest in RRE assets is a change in the financial attractiveness of RRE properties relative to other asset classes. In some aspects, the shock looks similar to a change in preferences in the household sector. We identify our RRE institutional investor shocks as follows. We assume that an increase in the demand for residential units by institutional investors is accompanied by an increase in residential house prices, similarly to what we would observe with an increase in demand from the household sector. Consistently with the household preferences and housing supply shocks, we assume that housing investments respond contemporaneously and in the same direction (mimicking the household preference shocks). We distinguish an institutional investor demand shock from a household sector demand shock by imposing that both the volumes and the prices of mortgage loans do not move contemporaneously, reflecting the assumption that institutional investors do not finance their projects through bank lending, as opposed to what assumed for the household sector.[6]
The full set of identifying restrictions is summarised in Table 1.

Table 1: Restrictions used for each variable (in rows) to identify shocks (in columns) in our VAR. Asterisks indicate that the response of the variable is left unrestricted.

	Housing Supply	Housing Preference	Income	Mortgage Supply	Monetary Policy	Institutional Investors
Residential Investments	-	+	*	0	0	+
RRE Prices	+	+	*	+	+	+
Mortgage loans	*	+	*	+	+	0
Lending rate	*	+	*	-	-	0
Shadow rate	0	0	0	0	-	0
Disposable income	0	0	+	0	0	0
Institutional investor purchases	*	*	*	*	*	+

[6]Even if institutional investors do use bank financing this will not be included in our mortgage loan variable as it covers only loans to households.

4.2 Impulse responses for the euro area aggregates

This section examines the transmission channels through which the presence of institutional investors affects the RRE market in the euro area as a whole, and to what extent its presence can amplify markets' cyclical swings. We do so by studying the estimated impulse response functions from the model described above. The impulse response functions refer to one standard deviation shock and are computed over 20-quarter horizon. Results are based on 11,000 iterations of the Gibbs sampler after discarding the first 10,000 iterations.

Institutional investor shock. Looking at our RRE institutional investor shock (Figure 5), we find that a positive demand shock from institutional investors has a positive and statistically significant impact on residential property prices which persists over about 8 to 10 quarters after the shock occurs. Specifically, a one standard deviation increase in investors' demand is associated with an increase in house prices of about 0.4 per cent. The channel through which institutional investor demand can affect prices is mainly via the direct impact on demand-supply equilibrium, given that often investors purchase properties in large scale. When institutional investors acquire multiple properties, either for rental or for re-selling purposes, it can lead to increased demand in the housing market. This heightened demand can drive up the general level of prices due to competition among potential buyers or investors looking to purchase properties in that area. Moreover, institutional investors frequently buy residential units with the intention of renting them out in order to generate long-term yields on their investments (Mühlhofer (2019); Cvijanović et al. (2022)). Hence, large-scale purchases can reduce the available housing supply for individual home buyers, potentially driving up prices due to scarcity of units to be purchased. The impact of this channel will be particularly pronounced in those markets where household preferences are strongly skewed towards home ownership as opposed to renting. In fact, where the two options are not seen as substitutes, higher scarcity in units for sale will drive up prices, ceteris paribus. In those markets where households do not strongly prefer home ownership over renting and the two options are seen as substitutes, an increase in investor demand and subsequent upward pressure on house prices might still come from people choosing to buy homes instead of renting when rental rates rise. In fact, in areas with a substantial institutional investor presence, their rental pricing strategies, aimed at maximising their investments returns, can influence the overall rental market rates, indirectly affecting property values. In this regard, some institutional investors might invest in upgrading or renovating properties to attract higher-paying tenants. These improvements can contribute to an increase in property values within the surrounding area, affecting the overall market prices and rents.

It is important to highlight that, to the best of our knowledge, this represents the first empirical evidence on the significance of institutional investors role in the aggregate dynamics of the euro area RRE market. It shows that the presence of institutional investors,

despite being highly concentrated in certain regions, plays a large enough role to influence the overall price levels and, as such, institutional investors should be regarded as systemically relevant players. This represents a key result and warrants careful consideration of institutional investors when studying aggregate RRE market dynamics, especially from a financial stability perspective. One reason is that institutional investors, especially investment funds, tend to be subject to a number of pro-cyclical behaviours and structural vulnerabilities that can amplify market cycles and have adverse effects on those markets. For example, positive flow-performance relation dynamics can lead to higher investment volumes and hence higher housing purchases in times of strong performance and increasing prices while a poor performance might prompt investors to redeem their investments, resulting in abrupt outflows. Given the illiquidity of real estate as an asset class, there is a particularly high risk that such outflows may lead to funds engaging in firesales, further depressing market prices and potentially giving rise to negative feedback loops. As mentioned above, Daly et al. (2023) highlights that approximately 80 per cent of euro area real estate fund assets are held in open-ended structures, creating substantial exposure to this type of run risk.

The latter is confirmed by another insight that is worth highlighting in 5. An increase in demand from institutional investors for residential units tends to push up house prices, but, as one would expect, this does not affect households income. The latter is true on impact by assumption, but it holds true also in subsequent periods where responses are left unrestricted. An increase in prices not accompanied by an increase in households income would result in a decrease in housing affordability for the households sector. This corroborates the concern that the presence of institutional investors might lead to a increase in prices faster than what in line with economic fundamentals (proxied by households' disposable income) and, most importantly, it suggest that the impact is empirically significant also at aggregate level, confirming a systemic role of institutional investors in affecting not only house prices dynamics but also housing affordability. Given the uneven distribution of investors across region, we will explore this aspect also at regional level of granularity, as presented in the nest Section.

A common empirical challenge faced in the literature when studying the impact of institutional investors on price dynamics is the "reverse causality" problem. Institutional investors enter the housing market in search for yields, hence it is likely that their presence will be larger in those markets where they foreseen higher price growth and hence better earnings. Pinpointing whether the increased demand from institutional investors is the primary driver of price increases or if rising prices attract more investor interest becomes challenging. In this context, adopting a structural approach is particularly convenient. In fact, structural VAR models are well-suited to deal with reverse causality issues by imposing identifying restrictions that can isolate structural shocks and disentangle the causality among endogenous variables included in the model. We will also further examine this issue

in the next Section.

We now look at the response of mortgage volumes to the institutional investors demand shock. The positive and statically significant reaction, slightly delayed with respect to prices, suggests that the price increase induced by the demand-push shock feeds through higher credit volumes. This can occur for example via an increase in financing needs by individual buyers due to increasing prices, or also via increased collateral values, thus strengthening the balance sheets of both households and banks. By influencing the amount of cash available to lenders to originate new loans, their participation in these markets may have an indirect impact on the volume of mortgages issued. Abstracting from the prevailing channel, this evidence points to a clear link between banks and non-banks activities via the RRE market.

Monetary policy shock. Turning to the monetary policy shock (Figure 6), we find that an easing monetary policy shock transmits to the RRE market mainly through a lower bank lending rate and leads to a positive yet delayed response in house prices, in line with standard findings in the economic literature. However, we do also find that an accommodative monetary policy shock has a positive and statistically significant impact on institutional investors' residential purchases. This result gives empirical grounds to Schnabel (2021), suggesting that increased participation in housing markets by investors from 2013 onward may have been driven by low for long monetary policy. This makes intuitive sense as monetary policy easing can increase institutional investors' demand for residential properties due to several factors. Lower financing costs make it easier for investors to finance property acquisitions or development projects, increasing their appetite for capital-intense investments. Real estate assets are more attractive in a lower-interest-rate environment than traditional fixed-income investments, offering high returns in terms of capital growth or rental income. Additionally, easing monetary policy can protect against potential future inflationary pressures by increasing property values and rental incomes within certain inflation ranges. Lower bank lending rates and economic activity following monetary stimulus can also encourage demand for housing, leading to increased property values and capital appreciation. Overall, easing monetary policy fosters an environment favorable to real estate investment, making RRE an attractive investment option for institutional investors. This raises the possibility that the uneven distribution of institutional investors across the euro area may give rise to a heterogeneous response of housing markets to the euro area's common monetary policy. We will also examine this in the next Section.

Figure 5: Median responses and 68 per cent credibility intervals to a 1 standard deviation increase in institutional investors' gross purchases of residential assets. Estimation sample: 2007Q1-2021Q4.

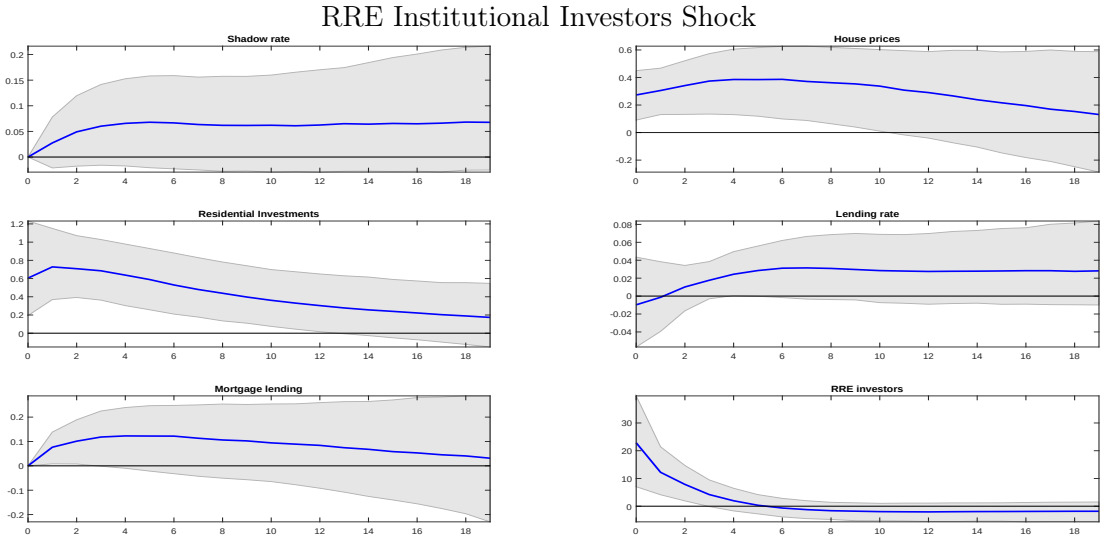
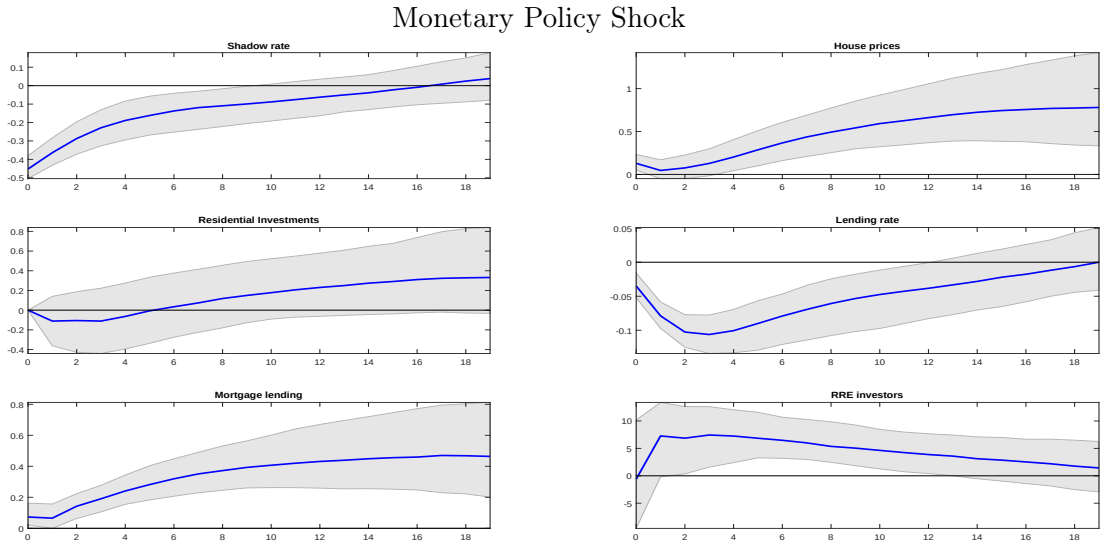


Figure 6: Median responses and 68 per cent credibility intervals to a 1 standard deviation decrease in the euro area shadow rate. Estimation sample: 2007Q1-2021Q4.



5 Institutional investors and regional market dynamics

Having examined aggregate dynamics, we take advantage of the granularity of our data set and examine the role of institutional investors at the regional level. First, we re-assess the link between institutional investor demand and prices to confirm our previous results, this time using a dynamic panel data model. We then examine whether the presence of institutional investors has implications for the way real estate markets behave. If institutional investors are able to affect aggregate market outcomes - as we have shown above - then markets where they are particularly prevalent may be exposed to a very different range of shocks compared to markets where buyers are almost entirely households. The heterogeneity in institutional investor presence across the euro area allows us to study this empirically and we take a comprehensive approach to our question, examining transmission of real economy, monetary policy, global and financial market shocks.

5.1 Regional house price growth

Our transaction-level data can quite easily be aggregated to the regional level, but access to other variables is more challenging. In particular, traditional house price indices are not widely available at the regional level for the euro area. To produce our dependent variable - house price growth - we rely on RRE collateral valuations data from the European Data Warehouse (EDW) and apply an approach first laid out in Battistini et al. (2022). EDW is a loan-level data set compiled using data provided to the ECB when residential mortgage-backed securities (RMBS) are used as ECB lending facility collateral.[7] As part of this data set, property valuation figures associated with individual mortgages are provided and we use this to produce regional indices of residential property values at the regional (NUTS2) level. We smooth our house price data by computing a 12-month moving average.

Several potential issues may arise from the use of EDW data, which is based on securitised loans. First and foremost - due to cross-country differences in the use of securitised mortgages as collateral in ECB operations - sufficient data is only available to produce indices for a subsample of euro area countries: Belgium, Germany, Spain, France, Ireland, Italy, the Netherlands and Portugal. It should be noted that, even for these countries, the data set will only include those mortgages which were securitised and then used as collateral with the ECB, and so will only reflect a subsample of mortgage lending within a given country or region. The extent of market coverage varies substantially across countries. To double-check the accuracy of this method we aggregate the data at country level and find

[7] EDW has been introduced by the European Central Bank in 2011 as part of its Asset-Backed Securities (ABS) loan-level data (LLD) initiative and it started collecting data in 2014. The LLD initiative establishes specific information requirements for ABSs and for non-marketable debt instruments backed by eligible credit claims accepted as collateral in Eurosystem credit operations. In particular, we use loan-level data of loans belonging to a RMBS.

a satisfactory level of correlation between our indices and traditional RRE price indices. Given the concerns, it is reassuring that the regional house price developments inferred from EDW on aggregate closely follow the national house price developments. To further mitigate any concerns, we employ a range of control variables and fixed effects in our panel regression framework.[8]

Givne the availability of control variables, we cover all NUTS2 regions of eight large euro area economies: Belgium, Germany, Spain, France, Ireland, Italy, the Netherlands and Portugal. Due to data availability constraints, the final merged data set for the regional analysis ranges in a time window between 2008 and 2019.

5.2 Investor demand and price dynamics

We first use our regional panel data to confirm the link between investor demand and house prices shown in our BVAR model in Section 4. Our baseline setting presents as follows:

$$house\_price\_growth_{i,t+4} = \alpha + \beta \cdot investor\_purchases_{i,t} + X_{i,t} + \epsilon_{i,t} \tag{2}$$

Institutional investor purchases are calculated at regional (i) level by summing up total purchases by institutional investors in quarter t, normalising by regional real GDP, and finally calculating its deviation from the historical mean.[9] We regress this metric on one-year-ahead house price growth for the same region. We add X_{it} time-region controls, namely current house price growth, GDP per capita, GDP growth, and population growth, all in terms of 12-month moving averages. Given our panel data has a sufficiently large t value, we estimate the model using ordinary least squares and traditional fixed effects. We cluster errors at the region level throughout.

Results shown in Table 2 confirm the findings of our BVAR model: there is a positive and statistically significant relationship between institutional investor demand and future house price growth. This type of finding is subject to a number of missing variable issues, including the potential bias that both house price growth and investor demand are jointly driven by other factors. We address these concerns in a variety of ways. First, in all specifications we include as many relevant control variables as are available in regional data. Controlling for GDP per capita and current GDP growth, in particular, should account for investors choosing richer or more economically successful parts of the euro area, which may also have higher house price growth. In our final specification (column 4)

[8] In theory selection bias may affect loans which enter into an RMBS, as lenders may securitise riskier loans in order to remove risk from their balance sheet. However, as we focus on fluctuations in collateral values as opposed to loan characteristics like the loan-to-value, this issue may have a limited impact on our analysis.

[9] Extreme values are truncated in order to avoid upward bias given by unusually large transactions.

Table 2: Panel regressions show a positive and statistically significant relationship between current investor demand and 4-quarter-ahead house price growth.

	(1)	(2)	(3)	(4)
				Region and Year FE
VARIABLES	No FE	Country FE	Region FE	Shadow rate
GDP per capita	0.000273***	6.51e-05	0.000595**	-0.000337
	(7.48e-05)	(5.33e-05)	(0.000257)	(0.000247)
House price growth	0.204***	0.0722**	0.0322	-0.0292
	(0.0350)	(0.0357)	(0.0356)	(0.0365)
GDP growth	0.109**	0.0425	0.0235	0.190***
	(0.0513)	(0.0556)	(0.0731)	(0.0577)
Population growth	-0.0329	0.855***	0.894**	0.839***
	(0.226)	(0.264)	(0.359)	(0.306)
Investor purchases	1.091***	1.366**	0.934*	0.905**
	(0.415)	(0.559)	(0.504)	(0.402)
EA shadow rate				-0.412***
				(0.0881)
Constant	-1.401***	-0.358	-3.802**	3.667**
	(0.508)	(0.363)	(1.854)	(1.760)
Observations	6,476	6,476	6,476	6,476
R-squared	0.066	0.156	0.022	0.134
Country FE	NO	YES	NO	NO
Region FE	NO	NO	YES	YES
Year FE	NO	NO	YES	YES
Number of NUTS2			132	132

Dependent variable: 4-quarter-ahead house price growth.
Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

we also account for the shadow rate as it is likely that low interest rates are driving both house prices and investor demand. The coefficient for investor demand remains positive and statistically significant throughout.

We also accept that our range of available control variables is limited and many institutional, policy and regulatory factors may be difficult to empirically control for, even if data were available. To account for all characteristics of a given country, region and time period we repeat our analysis adding fixed effects at the country and region level (columns 2 and 3). Finally, we add both region and time fixed effects (column 4) and we continue to find a statistically significant relationship throughout.

As already mentioned in previous Sections, another possible bias in our coefficient of interest could arise from the "reverse causality" problem discussed in the previous Section. Institutional investors may be better able than households to identify markets where prices are going to increase in the future and may invest in a market on this basis. Controlling for current house price growth should, in theory, account for any currently available information about the housing market, including expectations of future growth. However, real estate markets are not as liquid as other financial markets and may take some time to price currently available information. In this regard our extra control variables should account for the most important factors that institutional investors would use to identify markets where they expect future house price growth, namely population growth, economic growth, economic prosperity per capita and monetary policy.

As an additional check, we run a number of regressions in which investor demand is the dependent variable and future house price growth is instead an explanatory variable (Table 3). First, we run a simple regression with future house price growth as our only explanatory variable (column 1). As expected, we do find that one year before a rise in house prices we typically see a rise in investor demand. However, once we include all of our control variables, including the shadow rate, we no longer find a statistically significant relationship (column 2). This means that variation in current investor demand, once we account for our control variables, is associated with future variation in house price growth but variations in future house price growth is not associated with variations in current investor demand (in a statistically significant way). This finding is robust to our standard set of fixed effects. We take this as evidence that our results are not driven by reverse causality.

5.3 Investor presence and house price response to shocks

We may expect markets with a large institutional investor presence to behave differently from those where buyers are limited to the household sector. To gauge the importance of institutional investors in a given market - as opposed to simply focusing on quarterly demand shocks - we now use the 3 year rolling average of the sum of total purchases by

Table 3: We re-run analysis with future house price growth as an explanatory variable and current investor purchases as a dependent variable to check for reverse causality problems.

VARIABLES	(1) No controls	(2) Controls	(3) Country FE	(4) Region FE	(5) Region and Year FE
GDP per capita		1.32e-06	1.70e-06	2.76e-05*	2.81e-05
		(1.34e-06)	(1.58e-06)	(1.52e-05)	(1.88e-05)
House price growth		0.000852**	0.000894*	0.000519	0.000770
		(0.000376)	(0.000452)	(0.000500)	(0.000491)
GDP growth		0.00154	0.00191*	0.000942	-0.000620
		(0.00102)	(0.00106)	(0.000718)	(0.00108)
Population growth		0.0216***	0.0225***	0.0221***	0.0234***
		(0.00428)	(0.00521)	(0.00679)	(0.00811)
House price growth (1y ahead)	0.00149***	0.000197	0.000274	0.000389	0.000774
	(0.000464)	(0.000280)	(0.000360)	(0.000353)	(0.000511)
EA shadow rate		-0.0118***	-0.0117***	-0.00641**	0.000745
		(0.00202)	(0.00202)	(0.00283)	(0.00162)
Constant	-0.00548***	-0.0385***	-0.0565***	-0.231**	-0.258*
	(0.00112)	(0.0107)	(0.0145)	(0.112)	(0.138)
Observations	7,113	6,476	6,476	6,476	6,476
R-squared	0.003	0.051	0.052	0.060	0.065
Country FE	NO	NO	YES	NO	NO
Region FE	NO	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES
Number of NUTS2				132	132

Dependent variable: Investor demand. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

institutional investors normalised by GDP in region i as of period t. We will refer to this variable as *investor participation*.

5.3.1 Sensitivity to local real economy shocks

Regarding local economic fundamentals, we focus on the link between household earnings - i.e. the amount of money households might have to buy a house - and local house prices. We use two different variables from Eurostat to measure this, namely annual growth in compensation of employees and household income. While these variables are available at the regional level, they are only provided on an annual basis and so for this part of our analysis we run regressions at the year-region level. We include the same X_{it} time-region controls as in the previous set of regressions and our baseline specification is as follows:

$$\begin{aligned} house\_price\_growth_{i,t+1} = \alpha + \beta \cdot investor\_participation_{i,t} \cdot household\_earnings_{i,t} \\ + X_{i,t} + \epsilon_{i,t} \end{aligned} \tag{3}$$

Table 4 shows our results. As we would expect, higher local household income growth is indeed associated with higher future house price growth for both measures used. However, the negative coefficient on the interaction term between both household income measures and investor presence suggests that this relationship is weaker in markets where institutional investors play a greater role. When we use compensation of employees, this finding is robust to the inclusion of country-fixed effects.

From a financial stability perspective this intuitive result could have a number of implications. First, this dynamic may insulate housing markets from the effect of local economic shocks, for example supporting house prices during periods of low wage growth. However, most definitions of overvaluation rest on the price of an asset deviating from what can be explained by economic fundamentals. Following this approach, the presence of institutional investors in markets may give rise to overvaluation of house prices, particularly during periods where investor demand for this type of asset is high. Moreover, this may also result housing affordability issues, including higher LTIs on mortgages within the banking system, and may increase the vulnerability of housing markets to sharp corrections, particularly in response to any turnaround in investor demand.

Table 4: The relationship between local income growth and house price growth is weaker in markets with a more pronounced institutional investor presence.

VARIABLES	(1) Compensation of employees No FE	(2) Compensation of employees Country FE	(3) HHs income No FE	(4) HHs income Country FE
GDP per capita	5.72e-05***	1.44e-05	6.01e-05***	1.15e-05
	(1.97e-05)	(1.49e-05)	(2.20e-05)	(1.65e-05)
House price growth	-0.0620	-0.194***	-0.0201	-0.156***
	(0.0498)	(0.0476)	(0.0485)	(0.0512)
GDP growth	-0.00193	0.000480	0.00363	0.00495
	(0.0113)	(0.00864)	(0.0112)	(0.00862)
Population growth	0.00987	0.812***	-0.0689	0.782***
	(0.224)	(0.269)	(0.245)	(0.291)
Investor participation	11.06***	7.527**	7.421***	1.800
	(3.728)	(3.740)	(1.775)	(1.734)
Comp. employees growth	0.478***	0.316***		
	(0.0664)	(0.0755)		
Investor partic. #				
Comp. empl. growth	-1.464**	-1.081*		
	(0.606)	(0.604)		
Household income growth			0.315***	0.195**
			(0.0746)	(0.0822)
Investor partic. #				
Household income growth			-0.933**	-0.0495
			(0.362)	(0.440)
Constant	-1.788***	-0.316	-1.569***	-0.970**
	(0.513)	(0.492)	(0.585)	(0.477)
Observations	1,544	1,544	1,505	1,505
R-squared	0.073	0.158	0.047	0.141
Country FE	NO	YES	NO	YES

Dependent variable: 1-year-ahead house price growth. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

5.3.2 Sensitivity to monetary policy

Next, we examine whether the presence of institutional investors affects the link between monetary policy and house prices. While we have shown in Section 4 that institutional investors do respond to monetary policy shocks, we now want to know if their presence makes house prices more responsive to monetary policy shocks than in markets without institutional investors. This is a particularly important question given that the euro area as a whole is subject to a single monetary policy but we have shown that the composition of buyers varies quite substantially across regions.

Monetary policy affects the willingness and capacity of households and institutional investors to purchase real estate via different channels. Households may be primarily affected by variations in mortgage interest rates and the willingness of the banking system to extend credit. To a lesser extent they may be affected by the relative returns on housing versus other investment assets households could invest in. As discussed in Section 4, institutional investors may be more affected via this trade-off between real estate and other asset classes in terms of returns, with low interest rates driving a search for yield among investors. This may operate via intentional portfolio allocation decisions by the institutional investor themselves or - for example among investment funds - inflows of funds from other investors making these types of decisions. Institutional investors may also be affected by the price of borrowing from financial markets, with this determining their capacity and willingness to increase leverage to purchase (more) real estate.

We repeat our specification shown in Equation 3, replacing household income variables with the shadow rate variable used in our BVAR analysis. As this variable is available at a higher frequency we can return to carrying out our analysis at a quarterly, instead of annual, frequency. Results are shown in the first and second columns of Table 5. As we would expect, we find a negative and statistically significant relationship between the shadow rate and future house price growth. We also find a negative and statistically significant result for the interaction with investor presence. This finding holds with and without country fixed effects.

This suggests that institutional investors may amplify the transmission of monetary policy via housing markets. Indeed this makes sense given the period in question, when unprecedentedly low returns on traditional safe assets pushed institutional investors into riskier asset classes (see for example Giuzio et al. (2021)). Among real estate funds this drove persistent fund inflows, resulting in the sector more than tripling in size in the decade following 2012 Daly et al. (2023). So while households were also facing unprecedentedly low interest rates on mortgage borrowing, they may not have had the same pressure to increase real estate investments. This finding also provides further evidence for the argument in Schnabel (2021) that institutional investors may have played a role in the persistent house

price growth seen over this period. [10]

5.3.3 Sensitivity to financial market and global shocks

Finally we examine whether institutional investors create a link between local housing markets and global or financial market shocks.

Figure 2a shows that about half of purchases are carried out by buyers from outside the euro area. This suggests that their willingness or capacity to purchase euro area real estate may be affected by a range of global factors, creating a link between these factors and euro area house price dynamics in regions where their presence is particularly pronounced. We re-calculate participation by investors from inside and outside the euro area separately and then in columns 3 and 4 of Table 5 we repeat our analysis, this time interacting investor participation by non-euro area investors with the US shadow rate. We control for the euro area investors participation and shadow rate, as the latter may be correlated with the US rate. However, we do not find a statistically significant result on the interaction between US monetary policy and the presence of international investors, suggesting that institutional investors may not increase the exposure of euro area housing markets to this type of global shock.

Table 6 shows a final set of specifications which interact our investor participation variable with VSTOXX, a measure of volatility in euro area equity markets. We enter this into our regressions as its average value over a quarter and its maximum value, with the latter aiming to capture sharp spikes in the measure within a given quarter. Here we might expect housing markets with a high level of institutional investor presence to experience a bigger decline in house price growth following a financial market shock. This could be - for example - because institutional investors fund themselves directly from financial markets or because financial market volatility reduces inflows to real estate investment funds.

When we run our regression with 4 quarter ahead house price growth as our dependent variable, as we have done throughout the rest of the paper, we do find a negative and statistically significant coefficient on the interaction term between VSTOXX and investor participation (columns 1 and 2). This supports our hypothesis. The positive and significant coefficient for VSTOXX entered alone is less intuitive. However, it is possible that households respond more slowly to this type of shock than institutional investors. For example, their exposure to financial market volatility may operate via banks' credit supply and it may take time for banks' decreased appetite for mortgage lending following market

[10] As a robustness test we also run this analysis with alternative measures of the shadow rate. While results remain broadly the same in terms of coefficient sign and significance, the size of the interaction terms' coefficients decrease substantially. Shadow rate measures deviate from one another during the period when monetary policy was most accommodative - suggesting that the strength of the result with our chosen shadow rate variable comes from investor behaviour during this period.

Table 5: The presence of institutional investors increases the sensitivity of house prices to euro area monetary policy

VARIABLES	(1) EA shadow rate Country FE	(2) EA shadow rate Region FE	(3) US shadow rate Country FE	(4) US shadow rate Region FE
House price growth	-0.105***	-0.139***	-0.125***	-0.153***
	(0.0360)	(0.0363)	(0.0340)	(0.0345)
GDP per capita (thousand)	0.0164	0.256	-0.0233	-0.300
	(0.0517)	(0.235)	(0.0529)	(0.211)
GDP growth	-0.00618	-0.0141	-0.0811	-0.0840
	(0.0659)	(0.0766)	(0.0827)	(0.0896)
Population growth	1.030***	1.035***	1.044***	1.113***
	(0.263)	(0.347)	(0.258)	(0.337)
Investor partic. (non-EA)			3.427	3.841
			(5.109)	(6.281)
US shadow rate			0.640***	0.681***
			(0.0966)	(0.103)
Investor partic. (non-EA) # US shadow rate			-1.607	-1.541
			(1.511)	(1.465)
EA shadow rate	-0.408***	-0.371***	-0.478***	-0.552***
	(0.0723)	(0.0845)	(0.0723)	(0.0930)
Investor presence (domestic and EA)			-0.184	0.170
			(0.768)	(1.072)
Investor presence	-0.459	0.443		
	(0.494)	(1.112)		
Investor partic. # EA shadow rate	-0.882***	-0.904***		
	(0.278)	(0.294)		
Constant	-0.140	-1.389	0.594	3.172**
	(0.380)	(1.667)	(0.380)	(1.567)
Observations	6,452	6,452	6,452	6,452
R-squared	0.152	0.044	0.178	0.075
Country FE	YES	NO	YES	NO
Region FE	NO	YES	NO	YES
Number of NUTS2		133		133

Dependent variable: 4-quarter-ahead house price growth.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Markets with a high institutional investor presence appear to be more sensitive to financial market shocks.

VARIABLES	(1) Max VSTOXX 4q horizon	(2) Mean VSTOXX 4q horizon	(3) Max VSTOXX 12q horizon	(4) Mean VSTOXX 12q horizon
GDP per capita	6.99e-05	7.22e-05	0.000122**	0.000116**
	(5.34e-05)	(5.35e-05)	(5.28e-05)	(5.23e-05)
House price growth	0.0705**	0.0701*	-0.133***	-0.127***
	(0.0356)	(0.0356)	(0.0320)	(0.0320)
GDP growth	0.0516	0.0540	0.148**	0.133**
	(0.0541)	(0.0539)	(0.0603)	(0.0570)
Population growth	0.767***	0.755***	-0.357	-0.333
	(0.276)	(0.276)	(0.252)	(0.248)
Investor participation	3.584***	4.131***	4.164*	4.651*
	(1.055)	(1.265)	(2.321)	(2.401)
Max VSTOXX	0.0250**		-0.110***	
	(0.0104)		(0.0157)	
Investor partic. # Max VSTOXX	-0.0939***		-0.0938	
	(0.0324)		(0.0847)	
Mean VSTOXX		0.0338***		-0.144***
		(0.0124)		(0.0193)
Investor partic. # Mean VSTOXX		-0.130***		-0.131
		(0.0439)		(0.0992)
Constant	-1.041**	-1.196**	2.372***	2.971***
	(0.468)	(0.479)	(0.524)	(0.549)
Observations	6,476	6,476	5,411	5,411
R-squared	0.157	0.158	0.190	0.196
Country FE	YES	YES	YES	YES

Dependent variable: 4-quarter-ahead house price growth. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

volatility to feed through to house prices. At the same time, if VSTOXX acts as a early warning signal for crises, it may typically spike during periods when house price growth is still high, thus explaining the positive and statistically significant coefficient.

We test this hypothesis by re-running our regression over a range of different time horizons. Columns 3 and 4 show results for 12 quarter ahead house price growth. Here we find that all markets are typically experiencing lower house price growth following a VSTOXX shock, regardless of investor participation.

We interpret this combination of results as follows: financial market shocks are ultimately associated with lower house price growth across all markets but the participation of institutional investors speeds up this transmission and creates downward pressure on house prices in the quarters immediately following the shock.

All results shown in Table 6 are robust to replacing VSTOXX with VIX and to the inclusion of a range of fixed effects. Further testing examining non-linearity in these effects does not yield significant results.

6 Policy considerations

The results that have been discussed thus far support the idea that institutional investors, especially investment funds, play a systemically relevant role in the euro area RRE market, that they are responsive to monetary policy and that they may drive house price overvaluation. From a monetary policy perspective, this suggests that the actions of these investors should be taken into account when assessing the transmission of monetary policy via real estate markets and its unintended consequences, particularly if the role of investors in the market continues to grow.

Our findings also provide an empirically-grounded justification to widen the macroprudential policy framework to reduce risks associated with structural vulnerabilities in the non-bank sector. A central concern of policy makers regarding real estate funds - who we have shown to be the dominant type of investor in the euro area - is liquidity mismatch. Real estate funds hold highly illiquid assets but in the euro area 80 per cent of their assets are in open-ended structures, raising the possibility that sharp redemptions could drive firesale activity by funds (Daly et al. (2023)). Given we have shown that these investors are able to influence market prices, this firesale activity could create negative feedback loops between market prices and fund redemptions. Where institutional investor activity has driven overvaluation in the market, prices may be more vulnerable to a disorderly market correction. Finally, the use of leverage by funds may create additional risks and increase the procyclicality of investment activity.

As discussed in Daly et al. (2023), suitable policies could include managing liquidity demands and internalizing the costs of redemptions during market stress. Fund managers should have access to a range of liquidity management tools (LMTs) to manage the fund's liquidity position in all market conditions. These LMTs should be effective and usable, and funds should implement more targeted LMTs such as redemption fees and redemption gates. To address the underlying structural vulnerability of investment funds, policies that fundamentally reduce liquidity mismatch should also be explored. Open-ended funds hold inherently illiquid assets, and a closed-end structure might be more appropriate. Policy measures that address the structural liquidity mismatch could also be considered, such as increasing the share of liquid assets held, lower redemption frequencies, longer notice and settlement periods, and longer minimum holding periods. More frequent valuations would improve transparency and asset value, reducing the risk of first-mover advantage.

Muñoz and Smets (2022) provides a theoretical examination of the impact of leverage limits on real estate funds. They find that such an instrument could be effective in smoothing house price, business cycle and credit dynamics. Notably, such an instrument has also been introduced by the Central Bank of Ireland in the form of a sixty per cent leverage limit on the ratio of property funds' total debt to their total assets. In line with our findings, this measure was motivated by the pronounced presence of funds in Irish property markets and by concerns that a shock to the fund sector could have negative implications for wider Irish real estate market outcomes as a result.[11]

By mitigating structural vulnerabilities in the non-bank sector, macroprudential policies can have a number of benefits from a financial stability point of view. Most importantly, they could reduce the risk of price corrections or housing bubbles. Policies aimed at mitigating liquidity mismatches can also improve financial system resilience by controlling investor behavior, which is crucial during economic downturns. Moreover, they would foster transparency in transactions and reporting requirements, reducing the risk of market manipulation or excessive risk-taking. Ultimately, such policies could provide long-term stability for homebuyers by making market dynamics more closely linked to economic fundamentals and hence more predictable and also accessible. However, it is essential to strike a balance between restrictive measures and avoiding unnecessary disruption to the functioning of the market. Policymakers must carefully assess market conditions and calibrate macroprudential measures to address specific risks while avoiding unnecessary disruption.

Of course our findings also have implications for wider policies related to housing, such as housing supply and housing access. For now we will consider these issues beyond the scope of our work but also to be important areas for future research.

[11] For further detail see here: https://www.centralbank.ie/docs/default-source/financial-system/financial-stability/macroprudential-policy/nbfi/macroprudential-measures-for-irish-property-funds.pdf

7 Conclusion

Institutional investors, such as investment funds, play an increasingly important role in euro area RRE markets. Nevertheless, evidence on how their behaviour can affect market dynamics remains scarce, in large part due to a lack of data available. We exploit information from a novel transaction-level data set to link the presence of institutional investors to house price dynamics in the euro area. In a BVAR setting we find that a demand shock from institutional investors has a positive and persistent effect on residential house price growth and mortgage lending volumes. Investors also tend to increase their demand following a loosening in monetary policy. Complementing our findings in a regional panel regression framework, we also show that house prices in regions with high presence of institutional investors tend to grow faster and become detached from regional economic fundamentals, such as household income or wage growth. Institutional investors may as such contribute to overvaluation and become drivers of affordability concerns. Finally, they may increase the sensitivity of housing markets to financial market shocks and may amplify the effects of monetary policy.

Taken together these findings suggest that institutional investors play a macroeconomically relevant role in euro area housing market dynamics and that understanding this role is an important component of assessing the vulnerability of different housing markets to real economy, monetary policy and global shocks. Moreover, the predominance of investment funds among these investors gives rise to the possibility that vulnerabilities among real estate funds could have implications for wider euro area real estate markets. Our findings suggest that widespread firesales by these funds could have implications for euro area house prices and further emphasise the importance of widening the macroprudential toolkit to allow financial stability authorities to mitigate financial stability risks from this sector.

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