Financialization of Housing Markets: Can REITs be the Culprit of Rising House Prices?

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Abstract

In this paper we study the implications for house price dynamics of the ongoing financialization of housing, focusing on real estate investment trusts (REITs). Building on the dramatic rise in REITs valuation in the last decade, we ask whether housing markets exposure to financial market dynamics is exacerbated by REITs. Employing an IV approach to tackle identification and endogeneity issues, we find that REITs push up house prices significantly around the world. The effect is stronger in more financially developed countries, where REITs have grown the most. Finally, we look at the long-run effects estimating a CS-ARDL model and find that REITs not only affect house prices dynamics in the short-run, but they also exert significant long-run effects on house prices.

Keywords: Financialization; House prices; Real estate investment trusts (REITs); Institutional investors.

JEL classification: E44, F32, G15, G23.

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1 Introduction

In the last decade share prices of real estate investment trusts (so-called, REITs) have increased dramatically. This is good news for investors, both institutional and retail, that hold these financial instruments to invest in housing markets around the world (Subrahmanyam, 2007; Hoesli and Oikarinen, 2012; Cotter and Roll, 2015). However, is this good news for housing markets? Financialization has shaped housing markets. For instance, financial innovations in housing finance have significantly affected housing demand, supply and affordability (Duca, Muellbauer and Murphy, 2010; Aalbers, 2016; Fernandez and Aalbers, 2016). While the focus of the literature has been on housing finance, other types of financial innovations, such as REITs have taken place contributing to the financialization of housing.[1] In this paper, we focus on REITs as investment funds dedicated to the real estate sectors that have originated in financial markets of both advanced and emerging economies. As a means of expanding investors' diversification opportunities, the development of REITs is often encouraged by domestic monetary authorities for its contribution to financial development, both in terms of deepening and widening access to financial markets (International Monetary Fund, 2008; Cannon and Cole, 2011). However, the particular nature of their targeted asset class has important implications for domestic economies, beyond the benefits for financial markets development. Housing provides an intrinsic utility and it is a key tenet of social policies around the world (UN, 2017). Housing can be used to smooth consumption intertemporally given its pledgeability, in addition to offering capital gains and periodic payments in the form of rents as a traditional financial asset. These characteristics make the understanding of the implications of the financialization process on housing markets particularly pressing. Introducing housing in domestic and international investors portfolios, REITs have the potential to expose housing markets

[1] The presence of institutional investors in rented real estate has recently attracted public outrage and regulators have started to take action in various countries. See, for example, "Barbarians at the garden gate", *The Economist*, 20 November 2021.

to financial shocks that originate both domestically and internationally, and thus disrupt housing markets. House price hikes driven by financial investors may affect home affordability resulting in social and public finance costs. In this paper, we study how financialization, and the entry of institutional investors in the real estate market via REITs, contributes to house price growth and we disentangle the long-run exposure of housing to REITs from the short-run dynamics over the period 2000 to 2019 for a representative group of advanced economies and emerging markets.

Since the collapse registered during the global financial crisis (GFC), house prices around the world have recovered their upward trajectory and have been increasing across advanced and emerging markets alike (see Figure 1). Mirroring the dynamics of house prices, REITs have been increasing rapidly in the period leading to the global financial crisis (GFC) of 2007/08, collapsing during the crisis, and then recovering in the post-crisis period, outpacing their pre-crisis peak (Figure 1). Although this pattern is more pronounced in advanced economies, where REITs prices have doubled in the last decade, emerging markets have also experienced rising REITs prices that have increased by over 65% since 2010.[2] REITs prices seem to respond to financial shocks as stock indexes do. Figure 1 shows that REITs prices in both advanced and emerging markets exhibit frequent ups and downs corresponding to episodes of market turbulence. For instance, the temporary retrenchments in the 2013/15 period corresponding to the 2013 taper tantrum episode and subsequent disappointing news on economic growth in EMs, especially in China, and in the second half of 2018 due to strong US dollar and escalation of trade tensions between the US and China (Bank for International Settlements, 2013, 2018). This high volatility of REITs valuation motivates us to investigate its implications on the stability of housing markets around the world.

Our work contributes to the literature on financialization and its implications for housing mar-

[2] The rise of REITs prices have also outpaced the general rise in stock markets, thus indicating specific renewed interest by investors in this product.

kets by studying how the entry of institutional investors in the real estate market via REITs contributes to house price dynamics in the long-run. While there is no unique definition, the term financialization is generally used to indicate the increasing role of finance in the economy (Turner, 2010; Mazzucato, 2018). The UN defines financialization of housing as the "structural changes in housing and financial markets and global investment whereby housing is treated as a commodity" (UN, 2017, p. 3). Studying commodity markets, Basak and Pavlova (2016) define financialization as the entry of institutional investors in the commodity market. Traditionally, the literature has studied the financialization of housing focusing on housing finance, including mortgage market development and the related securitization activity, and its impact on housing markets within and across countries.[3]

More recently, the emergence of institutional investors has been studied in the US housing market (Lambie-Hanson, Li and Slonkosky, 2019; Ghent, 2021).[4] Mills, Molloy and Zarutskie (2019) suggest that this trend is primarily driven by tight mortgage markets, large housing supply and technological advances. Garriga, Gete and Tsouderou (2021) find that smaller institutional investors are more active locally than larger ones and their investment activity matters for house prices locally. It is difficult to generalize these findings based on the US to other countries, especially since REITs are investment vehicles for an heterogeneous investor base, ranging from institutional investors to individuals. There is evidence that REITs investor base is significantly different among advanced economies, including the US (Brounen, Kok and Ling, 2012; Carlo, Eichholtz and Kok, 2021). We extend this work by focusing on REITs in a cross-country setting, looking especially at

[3] This literature is vast. A large body of work identifies mortgage market development and securitization as key forces behind the rise of house prices and transaction volume in housing markets, which led to the GFC (Brunnermeier, 2009; Duca, Muellbauer and Murphy, 2010; Aalbers, 2016; Justiniano, Primiceri and Tambalotti, 2019; Mian and Sufi, 2021). Moreover, these developments in housing finance have increased house price comovement within and across countries (Diamond and Rajan, 2009; Claessens, Kose and Terrones, 2011; Cotter, Gabriel and Roll, 2015; Milcheva and Zhu, 2016; Landier, Sraer and Thesmar, 2017; Choi and Hansz, 2021).

[4] There is also a strand of the literature, which studies the impact of speculative activity by retail investors in real estate, again mostly covering the US market (Chinco and Mayer, 2016; Bayer, Mangum and Roberts, 2021).

the impact of financial development, pension systems, mortgage market development, and foreign entry, across countries.

Focusing on a panel of 32 countries from 2000 to 2019, we study empirically the role of REITs in the financialization of housing by estimating the impact of REITs performance on house prices. We deal with potential endogeneity by employing an instrumental variable (IV) two-stage least squares (2SLS) estimation. We then turn to the identification of a long-run relationship between house prices and REITs to determine whether the financialization process has had significant long-run consequences for housing markets, beyond the short-term dynamics of house prices. We differentiate between short-run dynamics and long-run effects by estimating a cross-sectionally augmented autoregressive distributed lag (CS-ARDL) model that allows us to deal with both endogeneity issues arising from the feedback effect from house prices to REITs valuation and omitted common variables biases in the modelling of house price dynamics. We show that house prices respond positively to REITs, and that there is a positive effect in the long run, as well as in the short-run. We subject our analysis to numerous tests, including an alternative measure for REITs activity based on investment flows, a longer sample period 1990-2019 for the countries that we have data for, and a subset for which we have urban area house price data, to confirm that our results are not sample dependent, and our results remain robust.

In the next section we study the evolution of the financialization of housing around the world. In section 3 we set up the research strategy of the paper. In section 4 we describe the data. The empirical analysis of the impact of REITs on house prices and the financialization of housing is reported in section 5. Section 6 reports some robustness tests. Finally, section 7 concludes.

2 Financialization of housing

In this section we examine the financialization of housing by considering the intertwined developments of REITs and house prices.

As shown in Table 2 (column 1), in most countries real house prices comove with REITs, with correlation coefficients ranging as high as over 95% in Hong Kong, Malaysia, Sweden, and Switzerland to below 10% in Austria and The Netherlands. There are four countries in which as house prices increase REITs decline, namely China, Indonesia, Japan, and Turkey. The presence of restrictions on foreign investors in the domestic real estate market is not likely to explain these differences across countries (column 2). In fact, although China, Indonesia and Turkey all have restrictions in place, the Japanese real estate sector is open to foreign entry (Fernández, Klein, Rebucci, Schindler and Uribe, 2015).

Interestingly, countries with the strongest comovement are the ones that exhibit the largest increase in REITs in the past decade (column 4). For instance, in Sweden REITs experienced a striking threefold increase in the last decade, and at the same time house prices increased by almost 50% (column 3). This is common to other countries as well, for instance REITs in New Zealand, Thailand, and the Philippines more than doubled and their comovement with house prices is at over 90%. Few countries do not exhibit large changes in REITs. The Netherlands have actually experienced a contraction in REITs and Germany have registered a modest increase in the last decade, both of them registering low comovement with house prices. This pattern does not apply to all countries, and some countries exhibit increasing REITs and low comovement with house prices (as in the case of Austria), or declining REITs and high comovement (as in the case of Spain). This indicates that other factors are also influencing house prices. Interestingly, in general countries with stronger comovement in house prices and REITs are the ones not only where REITs have increased the most in the past decade, but also the ones where REITs valuations are higher

than stock market index. This indicates that the increase in REITs largely exceeds the growth of the stock market, as measured by its index, pointing towards great performance of and interest in REITs among investors.

To better evaluate the dynamics of the financialization of housing, we focus on four countries in Figure 2. We select Sweden and Malaysia as representatives of the advanced and emerging market groups with high comovement between house prices and REITs (panel a), and Germany and China as representatives of advanced and emerging economies with low and negative comovement (panel b), respectively.

We can point to two regularities across the countries. First, in Sweden and Malaysia, there is an evident sharp increase in REITs across the last two decades, albeit with temporary retrenchments at times of market turbulence (such as during the GFC and the episodes of market turbulence in emerging markets in 2013-2015). The increase in REITs in Germany is more modest, and takes place in the last part of the sample, while in China there is an overall decline with few episodes of high volatility. Second, in Sweden and Malaysia the increase in REITs have outpaced the stock market index since the post-GFC, whereas REITs are generally lower than the stock market index in Germany and China. These points suggest that in countries with greater financialization of housing as measured by the REITs valuation and their development in the last two decades, house prices and REITs tend to comove. While in countries with less financialized housing markets, house price dynamics are relatively less associated with developments in REITs.

We turn to the formal investigation of the implications of the financialization of housing for house price dynamics and their exposure to financial shocks in the next section.

3 Methodology and research design

Mortgage market development and securitization are identified as key forces behind the rise of house prices and transaction volume in housing markets in the period leading to the GFC (Brunnermeier, 2009; Aalbers, 2016; Justiniano, Primiceri and Tambalotti, 2019; Mian and Sufi, 2021). Studying commodity markets, Basak and Pavlova (2016) argue that, as a result of the growing importance of institutional investors, the financialization of commodity markets has pushed up commodity prices. Similarly, REITs by encouraging institutional investors' participation in the real estate market, channel domestic and foreign savings into housing markets. Thus, they represent a potential driver of housing market financialization with implications for housing markets, including the dynamics of house prices. However, their role in this respect has been largely neglected in the literature, which concentrates more on housing finance.

We start by estimating a panel model of house prices and REITs including a set of controls and employing IV approach and 2SLS estimation to deal with potential endogeneity arising from reverse causality between house price growth and REIT returns and from the potential presence of omitted variable biases in a simple OLS estimation of our models. Next, we turn to study the long-run relationship between house prices and REITs and estimate a CS-ARDL model that tackles endogeneity explicitly with estimators that deal with both cross-sectional dependence and error serial correlation.

3.1 IV approach

To investigate the role of REITs in the financialization of housing, we build a panel model of house price growth and REIT returns for a group of representative advanced and emerging markets. And

our baseline is a panel model with country fixed effects of house prices on REITs, as follows:

$$house_{i,t} = \beta_0 + \beta_1 reits_{i,t-1} + \beta_2 controls_{i,t-1} + \theta_i + \epsilon_{i,t} \quad (1)$$

where *house* are percentage changes in house prices in country i and *reits* are REITs returns.[5] *controls* includes determinants of the domestic demand for housing such as bank flows, real gross domestic product (GDP) growth, short-term interest rates, and domestic private credit.[6] We also include the returns on the domestic stock market index as a measure of local financial market conditions, and the VIX and world aggregated real GDP growth as measures of financial conditions and demand in global markets. As common in this setting, we lag all explanatory variables one period to account for general endogeneity concerns. We estimate the model for the full sample period, 2000-2019. Our main coefficient of interest is β_1 that captures the impact of REITs on house prices.[7]

The identification of a causal effect of REITs returns on house prices is not trivial. REITs are funds invested in real estate and their value is directly related to the value of the underlying assets, real estate. As asset managers base their investment decision on expected future values, and house price returns are persistent, the inclusion of lags of REITs returns does not solve our identification challenge. In addition, there are common factors that drive both house prices and REITs returns, such as interest rates or economic growth. Although we include an extensive set of controls, we cannot rule out the possibility of omitted variable bias in our estimation. Moreover, given the substantial liquidity differential between the two markets, common factors may affect

[5] In section 6, we test the robustness of our results to an alternative measure for REITs based on the investment flows into REITs that is only available for a relatively small set of eight advanced economies.

[6] In unreported results, we include the growth of urban population as an additional control variable (Aizenman and Jinjarak, 2009), but we find it to be insignificant and so we do not include it in our baseline model for parsimony.

[7] Moreover, we conduct unit root testing of all variables and for stationarity we include the first-difference of I(1) variables.

the more liquid REIT market first and the less liquid housing market subsequently, resulting in an apparent lagged impact of REITs on house prices. Thus, the inclusion of controls in our model may not completely solve the endogeneity issue and an OLS estimation of our model may thus be biased.

The literature on the effects of financial investment in housing markets has traditionally relied on an IV approach to deal with these endogeneity concerns. The challenge of this approach is identifying an appropriate instrument that affects the variable of interest, be this demand for housing from retail or foreign investors, while being exogenous to house prices. In our setting, we provide evidence of a causal link between REITs return and house price growth by employing IV and 2SLS estimation of our model in equation (1).

Our choice of instrument needs to account for the endogeneity between house prices and REITs prices. To do so, our instrument must capture the exogenous variation in REITs demand for housing as an investment. In other words, as REITs investments in the housing market may be driven by dynamics of house prices in various ways, our instrument for REITs investment activity needs to rule out house price dynamics as a driver. To this end, our choice of instrument for exogenous housing investment demand by REITs is the demand for REITs instruments by pension funds that is due to changes in the share of their retired members. To capture this measure, we consider the change in the share of the retired population in the countries where pension funds are part of the pension system and are allowed to invest in alternative assets including REITs. Our instrument is thus the interaction between the change in the share of retired population ($\Delta Retired$) and the maximum share, or threshold, of pension funds' total investments that is allowed into REITs by the legislation/regulation of each country ($Threshold$), as $IV_{i,t} = \Delta Retired_{i,t} \times Threshold_{i,t}$.[8] As

[8] We conduct robustness checks with alternative related instruments such as 1) the changes in the retired population alone $IV = \Delta Retired$, 2) the share of pension funds' total investments in REITs allowed by the legislation/regulation of each country alone $IV = Threshold$, 3) adding the twice lagged REITs as an additional instrument, and 4) $IV_{i,t} = \Delta Retired_{i,t} \times Threshold^{dummy}_{i,t}$ where $Threshold^{dummy}$ is a dummy that takes the

a valid instrument it must be exogenous to house price dynamics and affect REITs investment activity.

With respect to exogeneity, the share of retired population in a country is determined by the number of workers that reach the age of retirement and is thus unrelated to house price dynamics. To control for the fact that the retired population may be related to the lagged work force, and thus lagged economic activity and indirectly house prices, we take the ratio of the retired population over the total population. We also control for the performance of the economy in our models. Retirement takes place at different ages in different countries, but it hovers around the age of 65 (World Bank Survey). The measure *Retired* is the share of population over 65 years of age, and it is available for the countries in our sample from the World Bank.

Pension funds are key investors in REITs (Ciochetti, Craft and Shilling, 2002; Hartzell, Sun and Titman, 2014; Andonov, Eichholtz and Kok, 2015; Carlo, Eichholtz and Kok, 2021; Ghent, 2021). As the share of pension funds' members that retire increases, their investment strategy becomes more conservative (Rauh, 2009). This is also reflected in a reduction in their share of investments in alternative assets, including REITs (Andonov, Bauer and Cremers, 2017). Thus, we argue that an increase in the share of retired population affects REITs investment activity as it triggers a portfolio rebalancing by pension funds away from alternative investments and towards more conservative assets.

Pension funds can be private or public and they operate by collecting contributions from their members, as well as their employers, in exchange for the payment of a pension, in the form of a lump sum and/or instalments, upon members' retirement.[9] As pension funds receive members'

value of 1 if REITs investments are allowed at all, and 0 otherwise. These results are qualitatively similar and we do not report them for brevity, but they are available from the authors upon request.

[9] We exclude China, Malaysia, Philippines, and Singapore from our sample due to lack of information on their pension system or the lack of pension funds within it.

contributions, they invest in a variety of assets, among which there is the investment in real estate.[10] In addition to REITs, pension funds can invest in real estate directly. This may pose an issue for our identification strategy, if our instrument affects house prices directly by-passing REITs. To control for such direct effect, we estimate an augmented model in which we consider the heterogeneous legislation on pension funds investments in the countries and include a measure for the reforms that allow direct investments into housing market. This measure is the interaction between the relative share of retired population and the share of pension funds' total investments allowed into real estate directly in each country, as $IV_{i,t} = \Delta Retired_{i,t} \times Threshold_{i,t}^{Direct}$.[11] We collect information on countries' pension systems and the regulation of pension funds' investment activities from the OECD Annual Survey of Investment Regulation of Pension Funds and Other Pension Providers. From the Survey (Table 4, specifically), we extract the share of total investments that is allowed in real estate directly and indirectly, separately, for each year from 2002 to 2019 for the countries in our sample.

3.2 Impact of financial development

Having documented the impact of REITs on the housing market, we turn to an investigation of the mechanisms and dynamics of this exposure. Different countries are at different stage of financial development and the financialization of housing is related to the presence of sophisticated institutional investors that channel savings into the property markets. In fact, there is a link between financial liberalization and the financialization of the economy. Financial liberalization leads to more sophisticated instruments and intermediaries, especially the expansion of the activities of

[10] Some pension funds allow members to decide their investment strategy in various ways. An in-depth review of pension systems is beyond the scope of our paper, but we direct the interested reader to the OECD and World Bank Databases and Surveys on countries' pension policy.

[11] As a robustness, we build our instrument with the $Threshold^{Direct}$ term as a dummy that takes the value of 1 if direct investments in real estate are allowed at all, and 0 otherwise. Moreover, we consider $Threshold^{Direct}$ alone as an instrument. These results are qualitatively similar and unreported for brevity, but they are available from the authors upon request.

non-banks, and thus encourages the development of REITs. Moreover, economic growth promotes stability and increases private saving ratios, leading to a higher demand for capital market instruments (Rojas-Suarez, 2012). Furthermore, entry of foreign investors encourages the development of new instruments and promote technological improvements (Prasad, Rogoff, Wei and Kose, 2003). The relationship is likely to be bidirectional, as financialization also promotes financial deepening. Although REITs are present in a large set of countries, not all countries are at the same level of financial development, and so the financialization of housing, and expansion of REITs activity, will also be at different levels. Given its relation to highly sophisticated financial systems, we expect housing markets' exposure to REITs to increase with countries' financial development.

To do so, we augment the baseline model (1) with an interaction term of the REITs with an indicator for financial development, as follows:

$$house_{i,t} = \beta_0 + \beta_1 reits_{i,t-1} + \gamma reits_{i,t-1} \times FD_{i,t-1} + \beta_2 controls_{i,t-1} + \theta_i + \epsilon_{i,t} \tag{2}$$

where FD is the Financial Development Index, a benchmark indicator by the World Bank taking into account various factors that reflect the development of financial systems across countries (Cihak, Demirgüç-Kunt, Feyen and Levine, 2012). As the FD Index is available until 2018, the sample period for this analysis is 2000-2018. Our main coefficient of interest is γ that measures the impact of financial development on the exposure of house prices to REITs.

3.3 Short- and long-run effects - CS-ARDL approach

After establishing the causal link between house prices and REITs, we move to explore the long-run effect as well as the short-term dynamics of this link.

To do so, we estimate an ARDL model where house price growth is explained by its lagged values, and current and lagged values of REITs returns, as well as an unobserved set of common

factors. The dynamic specification of ARDL models is selected to eliminate serial correlation from the residuals. We select the optimal number of lags based on the SIC criterion on a country-by-country basis and then impose the same lag structure for all countries in our panel for the interpretation of short- as well as the long-run estimations. Moreover, as shown by Chudik and Pesaran (2015), the inclusion of a number of lags of the cross-sectional averages of the dependent and independent variables in the model deals with the omitted variable biases and returns consistent estimators. This model is known as the cross-sectionally augmented ARDL model, or CS-ARDL.[12] We employ mean-group (MG) estimators and allow for an heterogeneous exposure of house prices to REITs both in the short-run and in the long-run across our sample of countries. As shown in section 2, there is a significant variation in the level of financialization of housing markets across countries. We expect differences in both the structure of countries' financial system and the stage of financial development to be reflected in different effects of REITs on house prices. And these effects will not only relate to short-run dynamics but also long-run effects.

The CS-ARDL form of our baseline model is as follows:

$$house_{i,t} = \mu_i + \lambda_i house_{i,t-1} + \sum_{j=0}^{1} \theta_{j,i} reits_{i,t-j} + \sum_{l=1}^{4} \gamma_{i,l} \bar{z_{t-l}} \epsilon_{i,t} \tag{3}$$

where $house_i$ is house price growth and $reits$ are REITs returns in country i.[13] In accordance with the SIC criterion, we estimate an ARDL(4,2). Following (Chudik and Pesaran, 2015), we include $\sqrt[3]{80} = 4$ lags of the cross-sectional averages to deal with cross-sectional dependence. We estimate the model for the full sample period, 2000-2019, by applying least squares.

[12] While there is no requirement for the stationarity of the variables in ARDL models (and our variables are a combination of I(0) and I(1)), a long-run relationship between the variables is necessary. We thus test our panel for cointegration prior to estimating our model and both the Westerlund test and the Pedroni test for cointegration can reject the null of no cointegration at 1%. We also note that the existence of a statistically significant adjustment term is itself evidence of the presence of cointegration.

[13] In section 6, we test the robustness of our results to an alternative measure for REITs based on the investment flows into REITs that is only available for a relatively small set of eight advanced economies.

We then augment our baseline model 3 to include the set of explanatory variables related to the demand for housing both nationally and internationally. The inclusion of these fundamentals controls for known common factors driving both house prices and REITs (Bond and Chang, 2012; Hoesli and Oikarinen, 2012). As in the previous analysis, these factors are bank flows, real gross domestic product (GDP) growth, short-term interest rates, and domestic private credit growth.[14] Global factors include the VIX and world aggregated real GDP growth, as measures of financial conditions and demand in global markets.

4 Data

We measure the impact of financial investors in the real estate sector of the countries in our sample by employing the General Index from Global Property Research (GPR) that is the stock price index of all listed real estate companies with a market capitalization in excess of $50 millions and over 75% of operations in the property sector. The data coverage includes 42 countries, but due to the limited number of time-series observations, we restrict our sample to 32 countries.[15] Real residential house prices are taken from the BIS residential house price database.[16] Description of the variables included in the analysis is provided in Table 1A in the Appendix.

[14] Our results are robust to the inclusion of stock market returns, to control for general stock market trends and dynamics. However, we do not include the measure in our augmented model due to multicollinearity issues.

[15] In our analysis we focus on listed companies with over 75% of operations in real estate, thus including not only REITs but also other types of public companies. The more specific GPR REITs index is available for a limited selection of advanced economies, 11 out of 42. Given the significantly lower number of observations (approx. 900 vs over 2,000) as well as limited coverage, we rely on the General Index for the main analysis. As a robustness test, we rerun our analysis with the GPR REITs index and we confirm our main findings. Moreover, our sample includes companies that invest in real estate sectors other than residential real estate. Unfortunately our data does not differentiate amongst investment policies and thus all investments in real estate are included in our dataset. This likely results in an underestimation of the impact of REITs activity on residential housing markets in our analysis.

[16] The BIS database provides house price data for urban areas in some cases and a national index of house prices for the whole country in other cases. This is likely to lead to underestimation of the impact of REITs on housing markets, as they generally invest in urban areas. As a robustness test, we conduct our main analysis and estimate model (**??**) for the subset of countries for which we have house prices from cities, and we find that the impact of REITs is stronger in those cases as expected. However, the effect is significant and qualitatively similar for the whole sample as well, thus supporting the use of this database in our analysis. We report this analysis in the robustness section.

Our sample includes 21 advanced economies and 11 emerging markets, from January 2000 to December 2019.[17] Advanced economies include Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Hong Kong, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Singapore, Spain, Sweden, Switzerland, United Kingdom, and the United States. Emerging markets include Brazil, China, India, Indonesia, Malaysia, Philippines, Poland, Russia, South Africa, Thailand, and Turkey.[18] We conduct our analysis at quarterly frequency and we build our quarterly series by taking the average of the monthly prices in the quarter.

In order to capture the impact of financial shocks on housing, we include a measure of financial conditions in global financial markets. Following the vast literature on global liquidity, we employ the VIX as a measure of global risk and risk aversion in global markets (Cerutti, Claessens and Ratnovski, 2017; Miranda-Agrippino and Rey, 2020). Since we are interested in the impact of global shocks on the housing markets via international investors through REITs, we control for bank flows that are a well documented source of cross-border credit to the local banking sector (Cesa-Bianchi, Cespedes and Rebucci, 2015; Banti and Phylaktis, 2019).

We also employ a set of controls for traditional determinants of house prices and the demand for housing, such as annual growth of the real GDP, domestic short-term interest rates, and domestic private credit by banks (Aizenman and Jinjarak, 2009). We include stock market returns to account for the general performance of financial markets. Moreover, we include world real GDP growth to capture global demand.

Table 1 reports the descriptive statistics of REITs and house prices. REITs prices are higher

[17] Country classification is according to the IMF 2021 World Economic Outlook.

[18] REITs and house price data is available from 1984 but we take 2000 as starting year to obtain a significant cross-section of emerging markets. We also conduct the analysis on the full sample period for the available countries and we report these results in the robustness section 6. Due to data availability, data series start later for some countries: 3Q2008 for Brazil, 1Q2006 for China, 2Q2006 for Greece, 2Q2008 for Indonesia, 2Q2010 for Israel, 1Q2008 until 4Q2017 for the Philippines, 1Q2010 for Poland and Turkey, and 4Q2005 for Russia and Thailand. There are three missing observations in the REIT series for Spain during the GFC, from 3Q2008 to 1Q2009.

on average in advanced than in emerging markets, although the coefficient of variation is similar across the two groups. Similarly, the average quarterly change in house prices for the period is around 0.55% for advanced and 0.64% for emerging economies, while the coefficient of variation is similar across the two groups of countries.

We report the correlation matrix of the variables in Table 3. We show that house prices are positively correlated with REITs prices. Moreover, as expected, house prices increase with bank flows, domestic GDP growth, private bank credit, and equity returns. Turning to the global factors, house prices decrease with the VIX and increase with the world GDP growth. Similarly, REITs are positively correlated with bank flows, domestic GDP growth, stock returns and the world GDP growth, and negatively correlated to domestic short-term interest rates, private bank credit and the VIX.

5 Empirical results

In this section, we explore the role of REITs in the financialization of housing in two ways. First, we establish a relationship between house prices and REITs and deal with endogeneity concerns with an IV approach and 2SLS estimation of our baseline model of house prices and REIts valuation. Then, we turn to the study of long-run effect of REITs on house prices to establish the fundamental role that the financialization process plays in shaping housing markets, beyond its impact on the short-run dynamics of house prices.

5.1 The exposure of house prices to REITs

We present the results of the 2SLS estimation of our baseline model (1) in Table 4. We find that REITs are positively associated with house price growth. The relationship stays significant after controlling for the well-known determinants of the demand for housing both locally and internationally.

As far as our choice of instrument is concerned, as shown by the results of the first stage reported in Table 5, an increase in the share of the retired population is associated with subsequent lower REITs returns. Moreover, in unreported tests, we run FE regressions of house price growth on REITs, our choice of instrument, and the control variables and find no evidence of a significant impact on our instrument ($IV_{i,t} = \Delta Retired_{i,t} \times Threshold_{i,t}$).

We confirm our findings when controlling for pension funds' direct investments into real estate in Table 6. As expected, pension funds' direct investments into real estate are not a significant determinant of REITs, but they are a significant determinant of house prices, over and above our REIT variable of interest. But importantly, we highlight that both the significance and magnitude of the effect of REITs on house prices do not change in this specification.

5.2 The role of financial development

The development of REITs is intertwined with financial development, as deeper financial systems are characterized by higher savings, and more sophisticated investors and financial instruments. We study the role of financial development in the financialization of housing by estimating model (2) with interaction terms of REITs and the World Bank Financial Development (FD) Index.

We report the results in Table 7. We confirm that house prices are positively related to REITs prices. We find a positive coefficient for the interaction term between REITs and FD, indicating that there is a positive relationship between the exposure of house prices to REITs and financial development. We conclude that housing market exposure to REITs is related to the sophistication of investors and it is thus stronger when countries' financial developed is higher.

5.3 Long-run exposure of house prices to REITs and short run dynamics

Focusing on the long run impact of REITs on house prices, we report the results of the estimation of the CS-ARDL baseline equation 3 in Table 8. We present the baseline model in column (1) and

then we augment the model to include a set of controls in column (2).

We find that in the long run, house price growth is affected by REITs. The positive and significant coefficient indicates that house prices increase with REITs prices. This effect is robust to the inclusion of our set of controls. We find the effect to be economically significant, as a one unit increase in REITs returns increases house prices by 7.8%.

Turning to the short-term dynamics of our CS-ARDL model, we show in Table 9 that there is significant dynamics between REITs and house price growth in the short-run as well.

6 Robustness tests

To test the robustness of our results 1) we re-estimate our model of house price growth on REITs valuation and a series of controls with instrumental variable (IV) estimators in two-stage least squares (2SLS) regressions to account for endogeneity concerns in a more traditional setting; 2) we employ an alternative measure for REITs activity based on investment flows into REITs that is only available for a subset of advanced economies; 3) we repeat our analysis for a longer sample period 1990-2019 for the countries that we have data for to confirm that our results are not sample dependent; and 4) we show that our results hold, and are even stronger, for the subset of countries for which our house price series capture house prices for cities and urban areas in general.

6.1 Alternative measure for REITs - investment flows into REITs

In our main analysis, we measure REITs activity by their stock market performance. In this section, we employ an alternative measure based on the fund flows into REITs (Ling and Naranjo, 2003). This variable is the net of share purchases and redemptions by investors and it is only available for a subset of advanced economies. Quarterly investment flows into real estate funds expressed in millions of Euros are available from the ECB Statistical database starting in 2009 for Austria,

Finland, France, Germany, Greece, Italy, Netherlands, Poland, and Spain.[19] For the US, we take quarterly transactions in the equity capital of REITs from the Flow of Funds Accounts available from the FRED database in million USD starting in 2000 (Ling and Naranjo, 2003).

We report the results of the CS-ARDL model presented in equation (1) in Table 10 (column 1). We confirm the main findings in the larger set of countries and show that REITs flows are positively and significantly related to house prices in the long-run.

In conclusion, we confirm that REITs activity, as measured by investment flows into REITs, affects domestic house prices, although we are restricting this analysis to a subset of advanced economies for which data is available.

6.2 Longer sample period 1990-2019

We have restricted the main analysis to the 2000-2019 sample period so that we have data for a representative set of emerging markets. Nonetheless, house prices and REITs data for some countries in our sample goes back to 1984. While house prices and REITs data start in 1984, data for the VIX start in 1990 and so we set the extended sample period from 1990 to 2019, taking advantage of the longest period available for our dataset. Hence, here we estimate our baseline CS-ARDL model (1) for an unbalanced panel for the longer period 1990-2019.

Table 10 (column 2) confirms our main findings. House prices are positively associated with REITs in all specifications. We confirm the stronger impact for more financially developed financial systems and the weaker exposure for countries with less market-based pension systems. We find that the level of mortgage market development is weakly related to the exposure of house prices to REITs for the longer sample period. Finally, we confirm the strong effect associated with entry of foreign investors in the housing market. Thus, our results in the main analysis are not sample

[19] We exclude Belgium from the set of countries included in the analysis due to missing observations.

dependent.

6.3 Urban house prices

The BIS database provides house price data for urban areas in some cases and a national index of house prices for the whole country in other cases. This is likely to lead to underestimation of the impact of REITs on housing markets, as they generally invest in urban areas. As a robustness test, we conduct our main analysis and estimate our baseline CS-ARDL model (1) for the subset of countries for which we have house prices from cities.

We report the results in Table 10 (column 3). We find that the long-run effect of REITs on house prices is stronger in this subset of countries as expected.

7 Conclusion

The role of finance in housing markets have attracted considerable attention in the wake of the GFC, when the emergence of complex financial instruments in mortgage markets precipitated a global credit crunch (Brunnermeier, 2009; Diamond and Rajan, 2009). Although developments in mortgage markets have received considerable attention, other sources of financial innovation have also developed rapidly in the last decade, posing a potential seed of instability in housing markets. This paper documents the role of REITs in the financialization process of housing around the world. Although REITs have been relatively less studied in the literature, they have registered dramatic increases in their valuation in the last decade, exceeding the generalized rises of stock markets.

We show that the impact of REITs is stronger for countries with a higher level of financial development, and it is thus associated with larger saving pools and more sophisticated investors. We show that countries' diverse pension systems are reflected in the financialization of housing, with more market-based systems encouraging the development of those instruments that channel investments in real estate. Documenting that foreign investors play a key role in the financialization

of housing, we confirm the role of global finance on domestic economies. Indeed, we show that REITs channel financial shocks originating not only in domestic financial markets, but also globally. We find our results to be robust to numerous tests.

In conclusion, as instruments of the financialization of housing markets, REITs contribute potentially to the build-up of vulnerability to the stability of housing markets around the world.

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Appendix

Table 1A: Description of the variables included in the analysis

Variables	Abbreviation	Data source
House price index	house	BIS residential house price database
Real Estate Investment Trusts (REITs) price index	reits	Global Property Research (GPR)
External claims (deposits and loans) of reporting banks vis-à-vis banks of each country	bank	BIS Locational Statistics
Real GDP growth rate	GDP	IMF
Domestic short-term interest rates	rates	IMF
Domestic private credit by banks	credit	IMF
Domestic stock market index	equity	IMF
VIX index	VIX	CBOE
World real GDP growth rate	world GDP	IMF
Pension system classification	pension	Esping-Andersen (1990)
Mortgage market development index	mortgage	International Monetary Fund (2008)
Restrictions on real estate purchases and sales by nonresidents	restricted	Fernández et al. (2015)
Federal funds rate	FF	FRED
US dollar broad index	USD	FRED

Table 1: Descriptive statistics

	a. REITs price index	
	Advanced economies	Emerging markets
mean	110.45	101.00
median	114.79	113.63
st dev.	46.33	42.99
max	207.18	168.35
min	36.11	33.15
	b. House prices (%)	
	Advanced economies	Emerging markets
mean	0.55	0.64
median	0.60	0.48
st dev.	0.87	0.95
max	2.15	2.84
min	-2.58	-2.36

Notes: Descriptive statistics of the quarterly series of the main variables, REITs price index and house prices for advanced and emerging markets for the period 2000-2019. REITs are indexed at 2010, while house prices are quarterly changes in the house price index reported in percentage. REITs and house prices are averages across the countries in the groups.

Table 2: Financialization of housing

	(1) Correlation house prices/REITs 2000-19	(2) Controls on foreign entry in housing market	(3) Change in house prices 2010-19	(4) Change in REITs 2010-19	(5) Level of REITs in 2019	(6) Difference REITs and stock index in 2019
Australia	0.84	1.00	0.15	1.50	240.72	95.82
Austria	0.07	0.84	0.38	1.35	225.61	94.76
Belgium	0.83	0.00	0.08	1.49	252.49	104.99
Brazil	0.69	0.37	-0.02	0.36	110.94	-50.29
Canada	0.94	0.00	0.39	1.25	202.94	63.86
China	-0.50	1.00	0.10	0.01	91.19	-12.82
Finland	0.87	1.00	-0.01	1.11	205.54	66.85
France	0.76	0.00	0.05	1.00	199.91	34.54
Germany	0.13	0.00	0.38	0.26	131.18	-39.46
Greece	0.33	0.00	-0.36	1.12	263.43	212.10
Hong Kong	0.97	0.00	0.99	0.91	173.88	48.65
India	0.78	1.00	0.79	1.92	273.39	52.91
Indonesia	-0.41	1.00	0.01	1.18	183.19	-18.77
Israel	0.54	0.16	0.53	1.12	168.50	50.50
Italy	0.24	0.00	-0.24	0.31	139.70	11.56
Japan	-0.65	0.00	0.07	1.27	214.08	24.70
Malaysia	0.95	0.89	0.66	1.55	234.08	118.78
Netherlands	0.07	0.00	0.03	-0.18	82.75	-79.48
New Zealand	0.94	1.00	0.55	2.55	342.12	91.86
Norway	0.81	0.53	0.27	0.45	158.91	-78.45
Philippines	0.90	1.00	0.57	3.31	371.68	163.57
Poland	0.52	1.00	0.04	-0.72	28.95	-105.53
Russia	0.29	0.53	-0.47	-0.07	92.98	-109.48
Singapore	0.78	1.00	0.05	1.06	190.79	81.73
South Africa	0.64	0.00	-0.02	0.38	120.26	-76.23
Spain	0.91	0.16	-0.18	-0.59	47.46	-39.12
Sweden	0.95	0.58	0.46	3.87	428.98	228.73
Switzerland	0.98	1.00	0.37	1.19	206.22	42.06
Thailand	0.90	1.00	0.27	4.91	471.95	283.31
Turkey	-0.34	1.00	0.04	-0.53	44.59	-131.65
United Kingdom	0.79	0.00	0.13	1.03	202.85	68.78
United States	0.25	1.00	0.28	2.06	272.83	87.80

Notes: The table reports some descriptive analysis of the REITs and house price series for each country. EMs are indicated in bold (according to the IMF 2021 WEO classification). Column (1) reports the correlation between house prices and REITs during our sample period 2000-2019. Column (2) reports the indicator for the presence of controls on foreign entry in the real estate sector, as the averaged REI index by Fernández et al. (2015). Columns (3) and (4) report the changes in the post-crisis period, from 2010 to 2019, experienced by house prices and REITs, respectively. Column (5) reports the level of REITs in 2019. Column (6) reports the difference between REITs and stock price index. All series are indexed at 2010. The sample period is 2000-2019.

Table 3: Correlation matrix

	house	reits	bank	GDP	rates	credit	equity	VIX
reits	0.23***							
bank	0.15***	0.30***						
GDP	0.25***	0.26***	0.20***					
rates	-0.03	-0.08 ***	0.04*	0.10***				
credit	0.09***	-0.08***	0.07***	-0.06***	0.03*			
equity	0.16***	0.65***	0.20***	0.33***	0.02	-0.06***		
VIX	-0.12***	-0.32***	-0.13***	-0.22***	0.13***	0.05**	-0.44***	
world GDP	0.09***	0.40***	0.10***	0.15***	-0.05**	-0.01	0.41***	-0.09***

Notes: Correlation matrix of all the variables in the model. *house* are percentage changes in house prices, *reits* are log-differenced REITs price indices, *bank* are log-differenced claims by foreign banks on the domestic bank sector, *GDP* is the domestic growth in real GDP, *rates* are domestic short-term interest rates, *credit* is log-differenced domestic private credit by banks, *equity* are the returns on the domestic stock market index, *VIX* is the log of the implied volatility in US markets, *world GDP* is the first difference of the growth in real aggregated world GDP. For panel variables, the average correlation coefficient among the correlation coefficients for each country is reported in the table. Significance of the coefficients is reported as ***,**, and * for 1%, 5%, and 10% respectively. The sample period is 2000-2019.

Table 4: House prices and REITs - IV approach

	(1)	(2)
reits	0.2982***	0.4224***
Controls	NO	YES
Underidentification Kleibergen-Paap F-stat	6.82***	6.525***
Weak-instrument Anderson-Rubin Wald stat	10.94***	9.34***
cross-sections	32	32
obs	2050	2050

Notes: Results of the IV 2SLS estimation of the baseline (column 1) and augmented (column 2) models. The dependent variable is the percentage changes in house prices. *reits* are log-differenced REITs price indices. Controls include: bank flows, domestic real GDP growth, domestic short-term interest rates, domestic private credit by banks, log of implied volatility in the US market as proxied by the VIX, and world real GDP growth. All variables are lagged one period. The model includes country fixed effects and it is estimated by two-stage least squares. The instrument used is the interaction between the change in the relative share of retired population and the share of pension funds investments into REITs allowed. Statistics of the underidentification test and weak instruments test are reported below the estimations. Standard errors are heteroskedasticity robust. Significance of the coefficients is reported as ***,**, and * for 1%, 5%, and 10% respectively. The sample period is 2000-2019.

Table 5: House prices and REITs - IV approach: first stage

	(1)	(2)
$\Delta Retired \times Threshold$	-1.104**	-0.836**
Controls	NO	YES
cross-sections	32	32
obs	2050	2050

Notes: Results of the first stage of the IV 2SLS estimation of the baseline (column 1) and augmented (column 2) models. The dependent variable is *reits*, the log-differenced REITs price indices. Controls include: bank flows, domestic real GDP growth, domestic short-term interest rates, domestic private credit by banks, stock market index returns, log of implied volatility in the US market as proxied by the VIX, and world real GDP growth. All variables are lagged one period. The model includes country fixed effects and it is estimated by two-stage least squares. The instrument is the interaction between the change in the relative share of retired population and the share of pension funds investments into REITs allowed, as $\Delta Retired \times Threshold$. Standard errors are heteroskedasticity robust. Significance of the coefficients is reported as ***,**, and * for 1%, 5%, and 10% respectively. The sample period is 2000-2019.

Table 6: House prices and REITs - IV approach controlling for direct investments into real estate by funds

reits	0.1261***
$\Delta Retired \times Threshold^{Direct}$	-0.3608***
Controls	YES
Underidentification Kleibergen-Paap F-stat	25.84***
Weak-instrument Anderson-Rubin Wald stat	4.62***
cross-sections	32
obs	2043
First stage	
$\Delta Retired \times Threshold$	-0.6978*
$\Delta Retired \times Threshold^{Direct}$	-0.026
Controls	YES
cross-sections	32
obs	2050

Notes: Results of the IV 2SLS estimation of the augmented model of house prices and REITs with the addition of a control for direct investments by pension funds into REITs. The dependent variable is the percentage changes in house prices. *reits* are log-differenced REITs price indices. Controls include also: bank flows, domestic real GDP growth, domestic short-term interest rates, domestic private credit by banks, log of implied volatility in the US market as proxied by the VIX, and world real GDP growth. All variables are lagged one period. The model includes country fixed effects and it is estimated by two-stage least squares. The instrument used is the interaction between the change in the relative share of retired population and the share of pension funds investments into REITs allowed. Statistics of the underidentification test and weak instruments test are reported below the estimations. Standard errors are heteroskedasticity robust. Significance of the coefficients is reported as ***,**, and * for 1%, 5%, and 10% respectively. The sample period is 2000-2019.

Table 7: House prices and REITs - the role of financial development

reits	0.3808**
$reits \times FD$	0.0589*
Controls	YES
Underidentification Kleibergen-Paap F-stat	7.07***
Weak-instrument Anderson-Rubin Wald stat	11.43***
cross-sections	32
obs	1895
First stage - dep. var. *reits*	
$\Delta Retired \times Threshold$	-0.9412***
$\Delta Retired \times Threshold \times FD$	-31.4233**
Controls	YES
cross-sections	32
obs	1895
First stage - dep. var. $reits \times FD$	
$\Delta Retired \times Threshold$	-0.4953*
$\Delta Retired \times Threshold \times FD$	235.7921***
Controls	YES
cross-sections	32
obs	1895

Notes: Results of the IV 2SLS estimation of the augmented model of house prices and REITs with the addition of an interaction of REITs with a financial development indicator. The dependent variable is the percentage changes in house prices. *reits* are log-differenced REITs price indices. *FD* is the Financial Development Index by the World Bank. Controls include also: bank flows, domestic real GDP growth, domestic short-term interest rates, domestic private credit by banks, stock market index returns, log of implied volatility in the US market as proxied by the VIX, and world real GDP growth. All variables are lagged one period. The model includes country fixed effects and it is estimated by two-stage least squares. The instrument used is the interaction between the change in the relative share of retired population and the share of pension funds investments into REITs allowed. Statistics of the underidentification test and weak instruments test are reported below the estimations. Standard errors are heteroskedasticity robust. Significance of the coefficients is reported as ***,**, and * for 1%, 5%, and 10% respectively. The sample period is 2000-2018, when FD data is available.

Table 8: House prices and REITs - Long-run relationship

	(1)	(2)
	Long run results	
reits	0.119***	0.078***
adjustment term	-0.700***	-1.147***
Controls	NO	YES
CD test	-0.31	-0.93
RMSE	0.02	0.01
R^2	0.62	0.39
cross-sections	32	32
obs	2016	1777

Notes: Results of the CS-ARDL(4,2) model. The dependent variable is the percentage changes in house prices. *reits* are log-differenced REITs price indices. Lags of the dependent and independent variables are determined according to the BIC criterion from individual ARDL regressions. Lags of the cross-sectional averages are determined according to (Chudik and Pesaran, 2015). Controls include: bank flows, domestic real GDP growth, domestic short-term interest rates, domestic private credit by banks, log of implied volatility in the US market as proxied by the VIX, and world real GDP growth. The model includes country fixed effects and it is estimated by least squares. Statistics of the cross-sectional dependence (CD) test by Pesaran (2015) and RMSE are reported below the estimations. Significance of the coefficients is reported as ***,**, and * for 1%, 5%, and 10% respectively. The sample period is 2000-2019.

Table 9: House prices and REITs - short run dynamics

	(1)	(2)
Short run estimations		
$reits_t$	0.024^{***}	0.026^{**}
$reits_{t-1}$	0.0272^{***}	0.033^{*}
$reits_{t-2}$	0.009	0.002
Controls	NO	YES
CD test	-0.31	-0.93
RMSE	0.02	0.01
R^2	0.62	0.39
cross-sections	32	32
obs	2016	1777

Notes: Short run results of the CS-ARDL(4,2) model. The dependent variable is the percentage changes in house prices. *reits* are log-differenced REITs price indices. Lags of the dependent and independent variables are determined according to the BIC criterion from individual ARDL regressions. Lags of the cross-sectional averages are determined according to (Chudik and Pesaran, 2015). Controls include: bank flows, domestic real GDP growth, domestic short-term interest rates, domestic private credit by banks, log of implied volatility in the US market as proxied by the VIX, and world real GDP growth. The model includes country fixed effects and it is estimated by least squares. Statistics of the cross-sectional dependence (CD) test by Pesaran (2015) and RMSE are reported below the estimations. Significance of the coefficients is reported as ***,**, and * for 1%, 5%, and 10% respectively. The sample period is 2000-2019.

Table 10: House prices and REITs - Robustness tests

	Investment flows into REITs	extended sample period 1990-2019	Urban house prices
reits	0.016*	0.127***	0.142***
	1.850	*4.650*	*2.150*
adjustment term	-1.000***	-0.647***	-0.886***
	-6.380	*-8.420*	*-5.080*
CD test	-2.38**	0.66	-2.39**
RMSE	0.01	0.02	0.02
R^2	0.62	0.59	0.60
cross-sections	10	32	9
obs	409	2980	491

Notes: Results of different specifications of the CS-ARDL baseline model. The dependent variable is the percentage changes in house prices. In column (1), the independent variable is *flows* are fund flows into REITs and the sample period is 2000-2019. In column (2) the independent variable are log-differenced REITs price indices and the analysis is conducted with the extended sample period from 1990 to 2019. In column (3) the independent variable are log-differenced REITs price indices and we run the model on the subset of countries for which house price data is from urban areas. Lags of the dependent and independent variables are determined according to the BIC criterion from individual ARDL regressions. Lags of the cross-sectional averages are determined according to (Chudik and Pesaran, 2015). The model includes country fixed effects and it is estimated by least squares. Statistics of the cross-sectional dependence (CD) test by Pesaran (2015) and RMSE are reported below the estimations. T-stats are reported below the coefficients. Significance of the coefficients is reported as ***,**, and * for 1%, 5%, and 10% respectively.

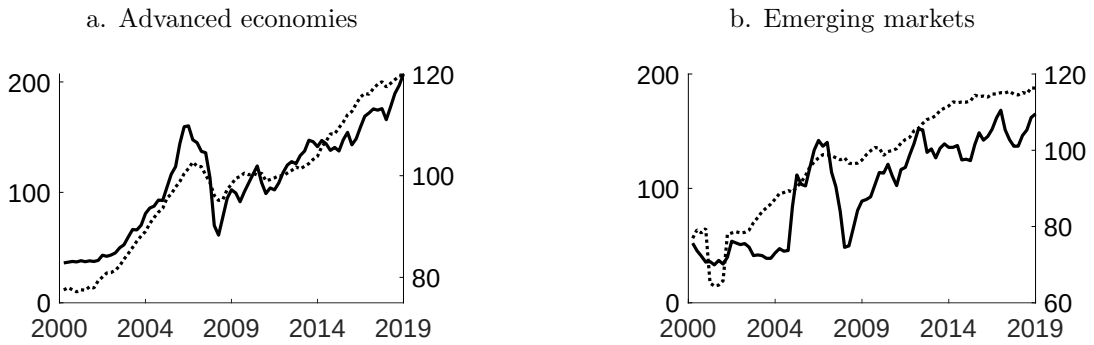

Figure 1: REITs and house prices. The figure shows the quarterly series of REITs (solid line, left hand side axis) and house prices (dotted line, right hand side axis), averaged across advanced and emerging markets. Countries are classified according to the IMF 2021 WEO classification. Base year is 2010.

a. High comovement

b. Low comovement

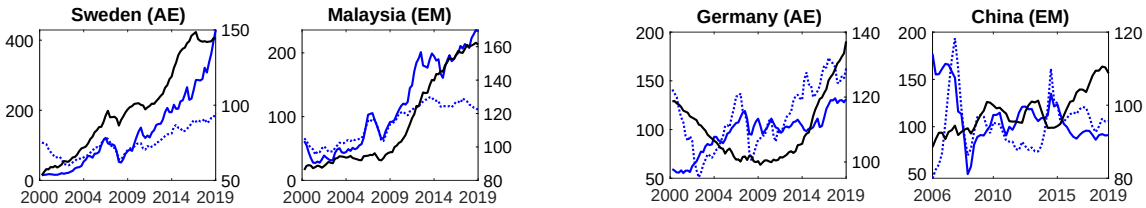

Figure 2: REITs and house prices for representative countries. The figure reports the quarterly series of house prices (black line, right hand side axis), REITs (blue solid line), and stock market index (blue dotted line) for four representative countries. Sweden and Malaysia are advanced (AE) and emerging (EM) economies with high correlation between house prices and REITs, while Germany and China are advanced and emerging economies with low and negative correlation. Base year is 2010.