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Don't Look Up: House Prices in Emerging Europe

Serhan Cevik and Sadhna Naik

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Don't Look Up: House Prices in Emerging Europe**Prepared by Serhan Cevik and Sadhna Naik¹**

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Abstract

This paper investigates how housing prices respond to economic, financial and demographic conditions in emerging markets in Europe. We use quarterly data covering 10 countries over the period 1998–2022 and implement a panel quantile regression approach to obtain a granular analysis of real estate markets. Overall, economic, financial and demographic factors explain the changes in real house prices in emerging Europe, with income growth having the most significant impact. Quantile regression estimations show that income growth matters more for higher housing prices than those at the lower quantiles of the property market. We also find that an increase in short-term or long-term interest rates have a price-dampening impact, indicating that a higher cost of borrowing is associated with lower real house prices. These results indicate that the downturn in house prices could deepen with the looming economic recession and soaring interest rates.

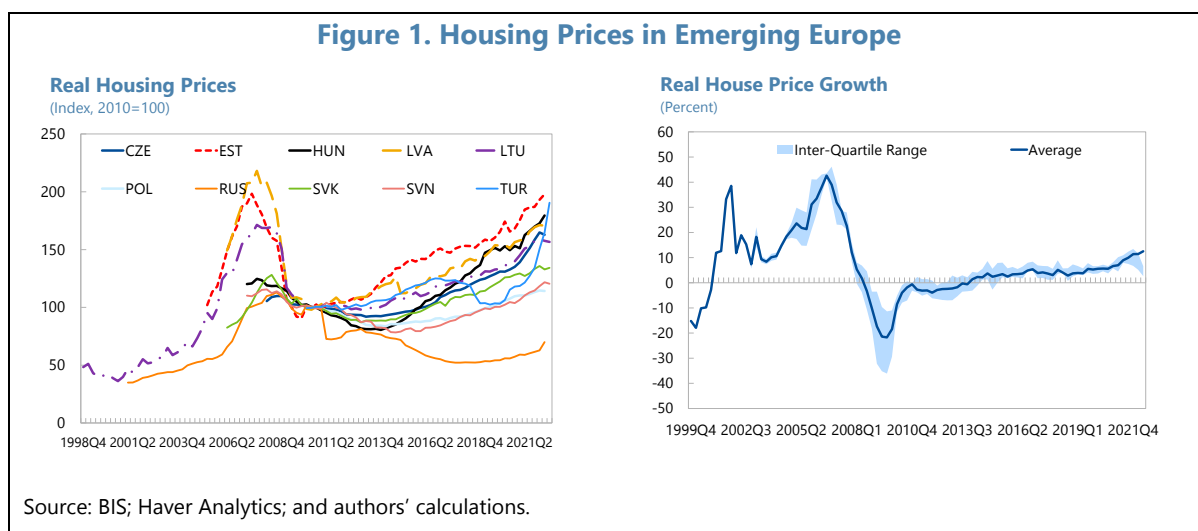
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Author's E-Mail Address:	scevik@imf.org ; snaik@imf.org

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I. INTRODUCTION

The global economy is in the midst of sweeping realignments that have a significant bearing on all asset prices. The sudden and widespread surge in consumer prices after decades of low and stable inflation has forced central banks to tighten monetary policy even against the rising risk of recession. Higher interest rates and greater uncertainty have raised the cost of capital and put downward pressure on elevated asset prices, including the most important of all—housing. Since the global financial crisis (GFC) in 2008, housing prices have experienced an uninterrupted boom across the world, increasing as much as 50 percent in the case of emerging market economies in Europe. Figure 1 illustrates the major upswing in real house prices across the region, albeit at varying magnitudes. There is empirical evidence pointing towards a strong relationship between macroeconomic fundamentals and the housing market (Goodhart and Hofmann, 2008; Holly, Pesaran, and Yamagata, 2010; Davis and Zhu, 2011; Duca, Muellbauer, and Murphy, 2021). The reversal of exceptionally easy financing conditions is therefore a clear threat to house prices. But the property sector also plays a critical role in the economy, with potential spillovers from housing market risks to economic and financial developments (Mian, Rao, and Sufi, 2013; Kohlscheen, Mehrotra, and Mihaljek, 2020). Therefore, in the light of downside risks to the global economy and financial markets, it is crucially important to understand the main determinants of residential property prices and potential impact of a slowdown in income growth and a sustained increase in interest rates.

This study contributes to the literature by providing a granular investigation of house price developments in ten developing countries in Europe. Using a panel of quarterly observations in 10 emerging European markets during the period 1998–2022, we empirically delve deeply into the economic, financial and demographic determinants of housing prices and draw policy implications. To provide a granular analysis, we use a panel quantile regression approach and estimate the impact of explanatory variables on different points across the distribution of housing prices in our sample. This allows us to observe whether the underlying factors affect houses in the upper-price range differently as compared to houses in the lower-



price range. Overall, our empirical analysis indicates that economic, financial and demographic factors explain the changes in real house prices in emerging Europe, with income growth having the most significant impact. This result is consistent with income convergence towards the rest of Europe. While a rise in real GDP growth is associated with an increase in housing prices, this effect is not homogenous across the conditional distribution of real house prices. The coefficient on real GDP growth for the 25th percentile is smaller than the income elasticity of house prices in the 75th percentile. This difference becomes even more apparent when we focus on the bottom 5th percentile and the top 95th percentile. These quantile regression estimations show that income growth matters more for higher housing prices than those at the lower quantiles of the property market. Second, we find that interest rates are also an important factor for the housing market in emerging Europe. An increase in short-term or long-term interest rates have a price-dampening impact, indicating that a higher cost of borrowing is associated with lower real house prices. However, this effect does not appear to be statistically significant at all points of the distribution of real house prices. Furthermore, the interest rate elasticity of house prices becomes more significant across the distribution of residential property prices when we estimate the model using long-term interest rates. Robustness checks along several dimensions, including a granular analysis with real household disposable income and household debt-to-income ratio and an alternative estimation using the instrumental variable (IV) quantile regression model, confirm the baseline results.

The house price cycle has already turned down in emerging Europe, which could deepen with the looming economic recession and soaring interest rates. Housing prices in our European sample remained buoyant as of the first half of 2022, but high-frequency data already shows growth deceleration in some countries. The empirical analysis presented in this paper indicates that monetary policy shocks and slower income growth could lead to a major correction in real housing prices, especially in countries with greater share of variable-rate mortgages and higher household debt-to-income ratios. In particular, our findings based on the quantile regression approach suggest that the lower quantiles of the real estate market in emerging European countries are significantly more vulnerable to the end of cheap borrowing and a slowdown in economic activity. In turn, large house price adjustments can have adverse effects on economic performance and financial stability, as experienced during the GFC and other episodes in history. What can policymakers do at the current juncture? Macroprudential measures should help build additional buffers in the banking system, increase resilience of borrowers to asset price or income shocks, and thereby minimize downside risks to financial stability. Before the onset of a housing market correction, the authorities should conduct stress tests for banks and other non-bank financial institutions that have high exposures to real estate, and possibly require higher provisioning for mortgage loans for those that are found to be vulnerable based on the stress tests. During a significant downturn in the housing market, sectoral macroprudential measures, such as capital requirements and limits on loan-to-value and debt service-to-income ratios, can be relaxed to contain the procyclical feedback loop between lower credit and house prices. Furthermore, real estate taxes can also be used as a countercyclical tool to have a stabilizing effect on house prices over the economic cycle, at least in countries with a well-developed system of recurrent property taxation.

The remainder of this paper is structured as follows. Section II provides an overview of literature. Section III describes the data used in the empirical analysis. Section IV explains the econometric methodology. Section V presents the findings. Finally, Section VI summarizes and provides concluding remarks.

II. LITERATURE REVIEW

The relationship between residential real estate prices and macro-financial factors is well documented in the literature. Cross-country studies across different groups of advanced and emerging market economies show strong linkages between macroeconomic and financial factors and the housing market. Over the long run, housing prices are found to be determined by a combination of demand-side factors (such as income and wealth, financial conditions, and demographic developments) and supply-side factors (such as the availability and state of housing units). A wide range of empirical studies has confirmed this relationship across different countries and over time. For example, analyzing housing prices in 6 advanced economies, Sutton (2002) finds that favorable macroeconomic conditions—captured by changes in income, interest rates and stock prices—have a significant effect on the evolution of housing prices, but the magnitude of change in housing prices tends to move beyond what is warranted by the underlying fundamentals. However, the estimated elasticity of house prices with respect to economic, financial and demographic factors show significant variation depending on the sample of countries, the time period, and the empirical methodology used in the analysis (Terones and Otrok; Tsatsaronis and Zhu, 2004; Girouard and others, 2006; Égert and Mihaljek, 2007; Adams and Füss, 2010; Agnello and Schuknecht, 2011; Cerutti, Dagher, and Dell’Ariccia, 2015).

There is also growing evidence from emerging market economies corroborating the impact of economic and financial factors on housing prices. Focusing on countries in Central and Eastern Europe (CEE), Égert and Mihaljek (2007) find that housing prices are determined by income per capita, real interest rates, credit availability, and demographic factors. Furthermore, the paper compares the impact of macro-financial factors on housing prices in the CEE region and advanced economies and obtains significant differences in the magnitude of various factors. Such findings are also highlighted by Ucal and Gökkent (2009) and Jianhua and Huidan (2013), who show that macroeconomic shocks play a large role in determining house prices in Turkey and China, respectively. Similarly, analyzing the boom-bust cycles in the former Soviet Union countries, Stepanyan, Poghosyan, and Bibolov (2010) show that house prices are determined by economic fundamentals, such as income growth, remittance flows, and external financing.

The housing market plays an important role in macro-financial developments through its multidirectional linkages. Looking at a sample of 17 advanced economies, Goodhart and Hofmann (2008) find a significant multidirectional relationship between housing prices, credit availability and the state of the economy, especially with the impact of shocks to money and credit stronger when house prices are on the rise. This analysis also shows the strengthening of these linkages during the period 1985–2006 in comparison to a longer sample dating back to the 1970s, reflecting the impact of structural reforms and improvements in credit infrastructure. Likewise, Davis and Zhu (2011) explore the linkages between property cycles and financial

stability and find that macroeconomic shocks cause changes in bank lending and property prices in advanced economies. These results also suggest that the long-run impact of credit conditions on housing prices is time-varying and dependent on the country. Focusing on a sample of CEE and southeastern European countries, Huynh-Olesen and others (2013) show that residential real estate prices moved beyond the level warranted by economic fundamentals prior to the GFC and declined below the equilibrium value afterwards. Kulikaukas (2016) reach similar conclusions in assessing the extent of valuation misalignment in the Baltic residential property markets.

Assessing whether housing prices are beyond the equilibrium value remains a contentious issue in the literature. While there is broad agreement on the influence of economic and financial factors, gauging whether house prices are out of synch with the equilibrium level remains a point of contention. Burnside, Eichenbaum, and Rebelo (2011) show that boom-and-bust cycles are a salient feature of the housing market, driven by economic fundamentals and speculative market expectations. Using a panel of 49 states in the US during the period 1975–2003, Holly, Pesaran, and Yamagata (2010) discover a cointegrating relationship between house prices and real incomes and identify a limited role for real interest rates. While divergences from the equilibrium value appears to be temporary in most states, there is evidence of persistence in deviations in some states. Taking advantage of a broader sample of 20 advanced economies, Geng (2018) finds that while macro-financial factors account for a significant share of variation in housing prices, overvaluation in the housing market—a significant deviation from the sustainable level based on macroeconomic factors over the long run—can be persistent across all countries.

III. DATA OVERVIEW

The empirical analysis is based on a panel dataset of quarterly observations of selected housing prices in 10 emerging markets in Europe during the period 1998–2022.² The selected residential house price index is obtained from the Bank of International Settlements (BIS). For all countries in the sample, we use nationwide residential property in real terms adjusted for consumer price inflation. The BIS publishes more than 300 series from 61 countries in the detailed residential property price dataset, which differ significantly from country to country, varying in frequency, type of property, geographical coverage, price units, and method of compilation. In this paper, to facilitate cross-country comparison, we use the harmonized series according to an internationally agreed framework for property prices (Eurostat, 2013). As presented in Table 1, the mean value of real house price growth is 2.7 percent per year during the sample period, with a minimum of -59.5 percent and a maximum of 41.5 percent. While housing price cycles appear to be synchronized across countries, there is still considerable heterogeneity in the pace of upward momentum and the extent of downward correction.

We introduce an array of economic, financial, and demographic as explanatory variables on a quarterly basis. The baseline model includes real GDP growth, consumer price inflation, the

² The countries in the sample are the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Russia, Slovenia, the Slovak Republic, and Türkiye.

unemployment rate, short-term or long-term interest rates, stock market returns in real terms, the real effective exchange rate (REER), and population growth. To provide a more granular analysis, we also use real disposable household income growth and household debt-to-income ratio.³ These series are drawn from various sources, including Eurostat, Haver Analytics, and the Organization for Economic Cooperation and Development (OECD). Summary statistics also show significant heterogeneity in all explanatory variables across countries and over time. To avoid spurious estimation results, it is necessary to analyze the time-series properties of the data by conducting panel unit root tests. We check the stationarity of all variables by applying the Im-Pesaran-Shin (2003) procedure, which allows for cross-country heterogeneity and is widely used in the empirical literature. The test results, available upon request, indicate that the variables are stationary in first-differences or after logarithmic transformation.

Table 1. Summary Statistics

Variable	Observations	Mean	Std. Dev.	Skewness	Kurtosis	Minimum	Maximum
Real House Price Growth	620	2.7	12.3	-0.9	8.1	-59.5	41.5
Real GDP Growth	620	2.6	4.9	-1.3	6.9	-20.7	20.2
Short-Term Interest Rates	648	5.2	7.7	1.7	4.9	-0.6	33.8
Long-Term Interest Rates	651	5.0	4.1	1.3	5.4	-0.4	22.7
Unemployment Rate	654	8.2	3.6	0.8	3.4	1.9	21.3
Population Growth	609	-0.1	0.8	0.1	4.0	-2.3	1.8
Consumer Price Inflation	620	4.0	4.8	3.6	30.0	-3.9	55.4
Stock Market Returns	651	5.5	28.1	0.4	5.1	-81.0	113.2
REER	660	101.2	11.2	-0.2	6.7	52.1	156.2
Real Household Gross Disposable Income Growth	536	4.8	5.6	0.7	4.9	-11.6	30.0
Household Debt-Income Ratio	613	47.0	20.3	-0.2	2.3	2.2	92.8

Source: BIS; European Commission; Eurostat; Haver Analytics; OECD; and authors' calculations.

IV. ECONOMETRIC STRATEGY AND RESULTS

To obtain a granular analysis of housing prices, we use quarterly data and a panel quantile regression approach. The standard ordinary least squares (OLS) regression considers only the conditional mean of the distribution, thus concealing characteristics and valuable information for specific segments across the distribution of house prices. Alternatively, the quantile regression approach, introduced by Koenker and Bassett (1978), would help quantify the relationship between explanatory factors and each quantile of the distribution of housing prices. In other words, the quantile regression approach models the conditional quantile functions, instead of the mean in the standard regression analysis, and also deals with nonlinearities and deviations from normality in the

³ These series are available at quarterly frequency for the Czech Republic, Hungary, Poland and Slovenia. For others, we use the interpolated annual data.

distribution of data. In this paper, we implement the panel quantile regression approach with fixed effects proposed by Machado and Santos Silva (2019) according to the following baseline model:

$$\Delta hp_{i,t,\tau} = \theta_{\tau} + \gamma_{\tau} X_{i,t} + \eta_i + \mu_t + \varepsilon_{i,t,\tau}$$

where $hp_{i,t,\tau}$ denotes the logarithm of housing prices in country i and time t at quantile τ (e.g., 10th percentile) and Δ is the difference operator. $X_{i,t}$ is the vector of explanatory variables including real GDP growth, consumer price inflation, the unemployment rate, short-term and long-term interest rates, stock market returns, the REER, and population growth. The η_i and μ_t coefficients denote the time-invariant country-specific effects and the time effects controlling for common shocks that may affect house prices across all countries in a given period, respectively. $\varepsilon_{i,t}$ is an idiosyncratic error term. This approach allows us to identify the conditional heterogeneous covariance effects of the main determinants of real house prices and provide more robust estimates even in the presence of outliers and non-normal distribution. In other words, the advantage of this estimation procedure is that we can determine whether the impact of various factors on residential property prices differ, for example, when house prices are in the upper quantile of the conditional distribution, compared with the effects at the median level or in the lower tail of the distribution.

The empirical analysis—robust to various sensitivity checks—presents a coherent picture of housing markets developments in emerging Europe. We present our baseline estimations in Table 2 with short-term interest rates and in Table 3 with long-term interest rates. The OLS fixed-effects model, displayed in all tables as a point of reference, confirms the granular estimations obtained by the panel quantile regression approach for the 5th percentile, 25th percentile, 50th percentile, 75th percentile, and 95th percentile. Explanatory variables included in the analysis are found to have the expected signs across all specifications, but the degree of statistical significance at conventional levels shows variation across variables and at different points of the conditional distribution of real house prices.

The most striking feature of the quantile regression results is the heterogeneous impact of real GDP growth at different points of the distribution of property prices. Real GDP growth is clearly the most important factor in determining real house prices in our sample of emerging market economies in Europe, which is consistent with income convergence towards the rest of Europe. A rise in real GDP growth is associated with an increase in housing prices—and this effect shows heterogeneity across the conditional distribution of real house prices. While the left tail of the housing price distribution—measured by the 25th percentile—has the coefficient on real GDP growth at 1.403 and statistically significant, the right tail of the distribution—measured by the 75th percentile—has a marginally larger coefficient on real GDP growth (1.575) with a higher degree of statistical significance. This difference becomes even more apparent when we focus on the bottom 5th percentile and the top 95th percentile. These estimations indicate that income growth matters more for higher housing prices than those at the lower quantiles. The income elasticity of real house prices increases in magnitude and statistical significance for the top 95th percentile, compared to the bottom 5th percentile.

Interest rates are the second most important factor in shaping the housing market in emerging market economies in Europe. As expected, an increase in short-term or long-term interest rates have a price-dampening impact, indicating that higher interest rates are associated with lower real house prices. However, this effect does not appear to be statistically significant at all points of the distribution of real house prices in emerging markets in Europe. First, the magnitude of the coefficient on short-term interest rates is larger and statistically significant for the 25th quantile compared to other quantiles. Second, short-term interest rates have completely opposite effects at the tail ends of the distribution. While the interest rate elasticity of real house prices is negative and larger for the 5th percentile, it becomes positive, smaller and statistically insignificant for the 95th percentile. In other words, while an increase in short-term interest rates would lead to a larger decline in real house prices at the lower quantiles of the conditional distribution, it would have no such effect at the high-end of the property market. However, this is

Table 2. Determinants of Housing Prices—Baseline Results: Short-Term Interest Rates

VARIABLES	(1) OLS FE	(2) 5th Percentile	(3) 25th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real GDP Growth	1.489*** (0.315)	1.266** (0.588)	1.403*** (0.306)	1.487*** (0.228)	1.575*** (0.301)	1.698*** (0.534)
Short-Term Interest Rate	-0.649** (0.221)	-1.400* (0.824)	-0.937** (0.427)	-0.656** (0.319)	-0.357 (0.421)	0.057 (0.748)
Unemployment Rate	-0.463 (0.258)	-0.312 (0.788)	-0.405 (0.410)	-0.462 (0.305)	-0.522 (0.404)	-0.605 (0.716)
Population Growth	-0.453 (1.935)	2.545 (4.085)	0.697 (2.121)	-0.425 (1.582)	-1.618 (2.089)	-3.269 (3.709)
Inflation	-0.117 (0.257)	-0.159 (0.823)	-0.011 (0.429)	-0.115 (0.319)	-0.225 (0.422)	-0.377 (0.747)
Real Stock Market Return	0.039 (0.038)	0.044 (0.081)	0.041 (0.042)	0.039 (0.031)	0.036 (0.041)	0.033 (0.073)
REER	-0.041 (0.126)	-0.111 (0.221)	-0.068 (0.115)	-0.041 (0.086)	-0.013 (0.113)	0.025 (0.201)
Observations	599	599	599	599	599	599
Countries	10	10	10	10	10	10
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.789					

Note: The dependent variable is the year-on-year change in real house prices. Robust standard errors are clustered at the country level and reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

not the case when we estimate the model with long-term interest rates. As presented in Table 3, the interest rate elasticity of real house prices is significantly more negative at the higher quantiles of property prices, which may reflect varying wealth effects of short- and long-term interest rates across the distribution.

The effects of other economic, financial and demographic factors are consistent, but less significant across the distribution of real house prices. The impact of unemployment on real house prices is negative as expected at all points of the conditional distribution of property prices in emerging European countries, but its coefficient is not statistically significant at conventional levels. This is likely due to real GDP growth capturing the impact of the economic cycle. Population growth is not a statistically significant factor at conventional levels across the

Table 3. Determinants of Housing Prices—Baseline Results: Long-Term Interest Rates

VARIABLES	(1) OLS FE	(2) 5th Percentile	(3) 25th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real GDP Growth	1.462*** (0.378)	1.712* (0.916)	1.553*** (0.495)	1.465*** (0.298)	1.373*** (0.240)	1.250*** (0.470)
Long-Term Interest Rate	-0.512 (0.513)	0.440 (1.379)	-0.165 (0.743)	-0.501 (0.449)	-0.851** (0.362)	-1.318* (0.711)
Unemployment Rate	-0.431 (0.412)	-0.909 (1.121)	-0.605 (0.605)	-0.437 (0.365)	-0.261 (0.294)	-0.027 (0.576)
Population Growth	-0.586 (1.980)	2.908 (5.010)	0.686 (2.702)	-0.547 (1.630)	-1.831 (1.314)	-3.546 (2.580)
Inflation	-0.447 (0.257)	-0.430 (0.955)	-0.441 (0.516)	-0.447 (0.310)	-0.453* (0.250)	-0.461 (0.490)
Real Stock Market Return	0.042 (0.040)	0.081 (0.096)	0.056 (0.052)	0.043 (0.031)	0.029 (0.025)	0.010 (0.050)
REER	-0.127 (0.115)	-0.140 (0.313)	-0.132 (0.169)	-0.127 (0.102)	-0.123 (0.082)	-0.116 (0.161)
Observations	602	602	602	602	602	602
Countries	10	10	10	10	10	10
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.781					

Note: The dependent variable is the year-on-year change in real house prices. Robust standard errors are clustered at the country level and reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

conditional distribution of housing prices, but it is still interesting to note that its coefficient is positive and larger for the lowest percentiles compared to others. This may be an indication of entry-level demand to low-cost housing, while population growth becomes irrelevant for the rest of the property market. Consumer price inflation—a proxy for macroeconomic stability in this context— has a consistently negative effect on the housing market, but this is not statistically significant (except for the 75th percentile when the model is estimated with long-term interest rates). We also find a positive correlation between real house prices and real stock market returns, but this relationship is not statistically significant and becomes weaker, especially at the higher quantiles of property prices, when we include long-term interest rates. Finally, we find that the REER has no significant effect on real house prices across the conditional distribution, but the magnitude of its coefficient increases with the quantiles of housing prices, which could be a weak sign of housing demand from non-residents for investment purposes.

To gain further insights, we use real disposable household income and household debt as alternative explanatory variables. Our baseline analysis shows that income growth is the key factor driving real house prices in emerging European markets, which is consistent with convergence towards the income level in more advanced countries. Therefore, to provide a more granular analysis, we introduce real household disposable income growth and household debt-to-income as alternative explanatory variables. These results, presented in Table 4 with short-term interest rates and Table 5 with long-term interest rates, show that real household disposable income growth is positively associated with real house price growth across the conditional distribution. This is consistent with our baseline results, but the magnitude of the coefficients on real household disposable income growth appears to be smaller than that on real GDP growth. Furthermore, real household disposable income growth is not statistically significant for the 95th percentile when the model is estimated with short-term interest rates, whereas it is highly significant for the lower quantiles of the property market. However, when estimate the model with long-term interest rates, the impact of real household disposable income growth becomes statistically significant at all points of the distribution of real house prices. The household debt-to-income ratio, on the other hand, has the expected negative sign, indicating that an increase in household indebtedness is associated with lower property prices. But this effect does not appear to be statistically significant at conventional levels.

We also estimate the models separately for the pre- and post-GFC periods to identify structural changes and confirm the robustness of our baseline findings. The GFC was an unprecedented shock with a disproportionate impact on the housing market across the world. House prices in our sample of 10 emerging European countries increased by as much as 46 percent before the GFC and declined by 36 percent after the GFC. That is why we also estimate the models separately for the pre- and post-GFC periods to identify structural changes and check the robustness of our baseline findings. These results, presented in Appendix Tables A1-A4, show that real GDP growth had a greater magnitude of impact on real house prices across the conditional distribution of real house prices before the GFC and a weaker effect after the GFC. Interestingly, short-term and long-term interest rates gained more prominence after the GFC, reflecting the realignment of risk premiums in lending after the crisis and possibly further

development of mortgage markets in emerging European countries. As an additional control variable, we introduce the average loan-to-value ratio as a measure of macroprudential policy strength and find that it is not statistically significant at conventional levels, which is largely due to the low level of household leverage in these countries on average.

Table 4. Determinants of Housing Prices—Granular Results: Short-Term Interest Rates

VARIABLES	(1) OLS FE	(2) 5th Percentile	(3) 25th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real Household Disposable Income Growth	0.493*** (0.143)	0.491** (0.236)	0.492*** (0.126)	0.493*** (0.155)	0.493* (0.269)	0.494 (0.446)
Household Debt-Income Ratio	-0.044 (0.067)	-0.047 (0.094)	-0.045 (0.050)	-0.044 (0.062)	-0.042 (0.107)	-0.041 (0.178)
Short-Term Interest Rate	-0.595 (0.604)	-1.005 (0.686)	-0.798** (0.367)	-0.592 (0.450)	-0.414 (0.780)	-0.179 (1.295)
Unemployment Rate	-1.142** (0.366)	-0.806 (0.544)	-0.976*** (0.291)	-1.145*** (0.356)	-1.291** (0.618)	-1.483 (1.026)
Population Growth	1.160 (1.725)	3.298 (2.984)	2.215 (1.594)	1.141 (1.956)	0.215 (3.389)	-1.010 (5.628)
Inflation	-0.612* (0.314)	-0.163 (0.656)	-0.390 (0.350)	-0.616 (0.430)	-0.810 (0.744)	-1.068 (1.236)
Real Stock Market Return	0.109** (0.040)	0.080 (0.055)	0.095*** (0.029)	0.109*** (0.036)	0.122* (0.062)	0.139 (0.104)
REER	-0.050 (0.099)	0.068 (0.158)	0.008 (0.085)	-0.051 (0.104)	-0.102 (0.180)	-0.169 (0.299)
Observations	526	526	526	526	526	526
Number of Countries	10	10	10	10	10	10
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.809					

Note: The dependent variable is the year-on-year change in real house prices. Robust standard errors are clustered at the country level and reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 5. Determinants of Housing Prices—Granular Results: Long-Term Interest Rates

VARIABLES	(1) OLS FE	(2) 5th Percentile	(3) 25th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real Household Disposable Income Growth	0.477*** (0.129)	0.567* (0.333)	0.513*** (0.183)	0.476*** (0.123)	0.440*** (0.149)	0.406* (0.232)
Household Debt-Income Ratio	-0.042 (0.069)	-0.106 (0.133)	-0.068 (0.073)	-0.042 (0.049)	-0.016 (0.059)	-0.008 (0.093)
Long-Term Interest Rate	-0.587 (0.601)	0.563 (1.094)	-0.122 (0.596)	-0.600 (0.405)	-1.061** (0.485)	-1.502** (0.759)
Unemployment Rate	-1.184** (0.408)	-1.707* (0.930)	-1.396*** (0.511)	-1.178*** (0.344)	-0.969** (0.415)	-0.768 (0.647)
Population Growth	0.779 (1.677)	3.770 (3.990)	1.988 (2.192)	0.745 (1.475)	-0.454 (1.778)	-1.599 (2.777)
Inflation	-0.857*** (0.212)	-0.590 (0.706)	-0.749* (0.389)	-0.860*** (0.261)	-0.967*** (0.315)	-1.069** (0.492)
Real Stock Market Return	0.114** (0.049)	0.131* (0.078)	0.121*** (0.043)	0.114*** (0.029)	0.107*** (0.035)	0.100* (0.054)
REER	-0.141 (0.126)	0.017 (0.231)	-0.077 (0.127)	-0.142* (0.086)	-0.206** (0.103)	-0.266* (0.161)
Observations	529	529	529	529	529	529
Number of Countries	10	10	10	10	10	10
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.804					

Note: The dependent variable is the year-on-year change in real house prices. Robust standard errors are clustered at the country level and reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

We also check the robustness of our baseline results by implementing the IV quantile regression model to account for potential endogeneity. Since the changes in housing prices may also influence income growth, an econometric analysis of this nature should address concerns about the possibility of inconsistent parameter estimation due to endogenous regressors. The challenge is to find a robust time-varying IV, which needs to be correlated with a country's economic growth, but have no contemporaneous direct effect on real house prices. Accordingly, we adopt the IV quantile regression framework (Chernozhukov and Hansen, 2008) and instrument a country's real GDP growth with the trade-weighted average real GDP growth of its trading partners as in Cevik (2018). This approach builds on the assumption that trading

partners' real GDP growth is plausibly exogenous to changes in contemporaneous real house prices.⁴ The IV quantile regression results, presented in Appendix Table A5 and A6, confirm our baseline findings that income growth and interest rates are the most significant factors in determining the trajectory of real house prices in emerging European countries. In particular, with the IV quantile regression model, the coefficient on income growth declines only slightly in magnitude for each quantile, but remains statistically significant, which supports the plausible exogeneity of our IV.

V. CONCLUSION

The global economy is in the midst of sweeping realignments that have a significant bearing on all asset prices, including the most important of all—housing. The sudden and widespread surge in consumer prices after decades of low and stable inflation has forced central banks to tighten monetary policy even against the rising risk of recession. Higher interest rates and greater uncertainty have raised the cost of capital and put downward pressure on housing prices that have experienced an uninterrupted boom across the world in the aftermath of the GFC. In view of significant downside risks to the global economy and financial markets, it is critical to understand the main determinants of housing prices and potential impact of a slowdown in income growth and a sustained increase in interest rates. This study therefore contributes to the debate by providing a granular and high-frequency analysis of house price developments in ten developing countries in Europe.

The quantile regression analysis presented in this paper reveals the varying effects across the distribution of real house prices. First, we find that economic, financial and demographic factors explain the changes in real house prices in emerging European markets, with income growth having the most significant impact. This result is consistent with income convergence towards the rest of Europe. While a rise in real GDP growth is associated with an increase in housing prices, this effect is not homogenous across the conditional distribution of real house prices. The coefficient on real GDP growth for the 25th percentile is smaller than the income elasticity of house prices in the 75th percentile. This difference becomes even more apparent when we focus on the bottom 5th percentile and the top 95th percentile. These quantile regression estimations show that income growth matters more for higher housing prices than those at the lower quantiles of the property market. Second, we find that interest rates are also an important factor for the housing market in emerging Europe. An increase in short-term or long-term interest rates have a price-dampening impact, indicating that a higher cost of borrowing is associated with lower real house prices. However, this effect does not appear to be statistically significant at all points of the distribution of real house prices. Furthermore, the interest rate elasticity of house prices becomes more significant across the distribution of residential property prices when we estimate the model using long-term interest rates. Robustness checks along several dimensions, including a granular analysis with household real disposable income and household debt-to-income ratio and an alternative estimation using the

⁴ We check for the strength of the IV used in our analysis and find that the trade-weighted average real GDP growth of trading partners is an appropriate instrument for a country's own real GDP growth.

IV quantile regression framework, confirm the baseline results that income growth and interest rates are the most significant factors in determining the trajectory of real house prices.

The house price cycle has already turned down in emerging Europe, which could deepen with the looming economic recession and soaring interest rates. Although housing prices in our European sample remained buoyant as of the first half of 2022, high-frequency data already shows growth deceleration in some countries. The empirical analysis presented in this paper indicates that monetary policy shocks and slower income growth could lead to a major correction in real housing prices, especially in countries with greater share of variable-rate mortgages and higher household debt-to-income ratios. In particular, our findings based on the quantile regression approach suggest that the lower quantiles of the real estate market in emerging European countries are significantly more vulnerable to the end of cheap borrowing and a slowdown in economic activity. In turn, large house price adjustments can have adverse effects on economic performance and financial stability, as experienced during the GFC and other episodes in history. What can policymakers do at the current juncture? Macroprudential measures should help build additional buffers in the banking system, increase resilience of borrowers to asset price or income shocks, and thereby minimize downside risks to financial stability. Before the onset of a housing market correction, the authorities should conduct stress tests for banks and other non-bank financial institutions that have high exposures to real estate, and possibly require higher provisioning for mortgage loans for those that are found to be vulnerable based on the stress tests. During a significant downturn in the housing market, sectoral macroprudential measures, such as capital requirements and limits on loan-to-value and debt service-to-income ratios, can be relaxed to contain the procyclical feedback loop between lower credit and house prices. Furthermore, real estate taxes can also be used as a countercyclical tool to have a stabilizing effect on house prices over the economic cycle, at least in countries with a well-developed system of recurrent property taxation.

REFERENCES

- Adams, Z., and R. Füss (2010). "Macroeconomic Determinants of International Housing Markets," *Journal of Housing Economics*, Vol. 19, pp. 38–50.
- Agnello, L., and L. Schuknecht (2011). "Booms and Busts in Housing Markets: Determinants and Implications," *Journal of Housing Economics*, Vol. 20, pp. 171–190.
- Burnside, C., M. Eichenbaum, and S. Rebelo (2011). "Understanding Booms and Busts in Housing Markets," NBER Working Paper No. 16734 (Cambridge, MA: National Bureau of Economic Research).
- Cerutti, E., J. Dagher, and G. Dell'Ariccia (2015). "Housing Finance and Real-Estate Booms: A Cross Country Perspective," IMF Discussion Note No. 15/12 (Washington, DC: International Monetary Fund).
- Cevik, S. (2018). "Unlocking Pakistan's Revenue Potential," *South Asian Journal of Macroeconomics and Public Finance*, Vol. 7, pp. 17–36.
- Chernozhukov, V., and C. Hansen (2008). "Instrumental Variable Quantile Regression: A Robust Inference Approach," *Journal of Econometrics*, Vol. 142, pp. 379–398.
- Davis, P., and H. Zhu (2011). "Bank Lending and Commercial Property Cycles: Some Cross-Country Evidence," *Journal of International Money and Finance*, Vol. 30, pp. 1–21.
- Duca, J., J. Muellbauer, and A. Murphy (2021). "What Drives House Price Cycles? International Experience and Policy Issues," *Journal of Economic Literature*, Vol. 59, pp. 773–864.
- Égert, B., and D. Mihaljek (2007). "Determinants of House Prices in Central and Eastern Europe," *Comparative Economic Studies*, Vol. 49, pp. 367–388.
- Eurostat (2013). "Handbook on Residential Property Prices Indices (RPPIs)," Eurostat Methodologies and Working Papers No. 18/164 (Luxembourg: Eurostat).
- Geng, N., (2018). "Fundamental Drivers of House Prices in Advanced Economies," IMF Working Paper No. 18/164 (Washington, DC: International Monetary Fund).
- Girouard, N., M. Kennedy, P. van den Noord, and C. Andre (2006). "Recent House Price Developments: The Role of Fundamentals," OECD Economics Department Working Paper No. 475 (Paris: Organization for Economic Co-operation and Development).
- Goodhart, C., and B. Hofmann (2008). "House Prices, Money, Credit and the Macroeconomy," *Oxford Review of Economic Policy*, Vol. 24, pp. 180–205.
- Guo, J., and H. Long (2013). "Investigation of the Linkage Among China's Macroeconomy, Stock Market and Real Estate Market," *International Journal of Finance and Banking Studies*, Vol. 2, pp. 1–7.
- Holly, S., H. Pesaran, and T. Yamagata (2010). "A Spatio-Temporal Model of House Prices in the USA," *Journal of Econometrics*, Vol. 158, pp. 160–173.
- Huynh-Olesen, D., K. Steiner, A. Hildebrandt, and K. Wagner (2013). "Residential Property Prices in Central, Eastern and Southeastern European Countries," *Focus on European Economic Integration*, Vol. 2, pp. 52–76.

- Im, K., M. Pesaran, and Y. Shin, 2003, "Testing for Unit Roots in Heterogeneous Panels," *Journal of Econometrics*, Vol. 115, pp. 53–74.
- Koenker, R., and G. Bassett (1978). "Regression Quantiles," *Econometrica*, Vol. 46, pp. 33–50.
- Kohlscheen, E., A. Mehrotra, and D. Mihaljek (2020). "Residential Investment and Economic Activity: Evidence from the Past Five Decades," *International Journal of Central Banking*, Vol. 16, pp. 287–329.
- Kulikaukas, D. (2016). "Fundamental Housing Prices in the Baltic States: Empirical Approach," *Baltic Journal of Economics*, Vol. 16, pp. 53–80.
- Machado, J., and J. Santos Silva (2019). "Quantiles via Moments," *Journal of Econometrics*, Vol. 213, pp. 145–173.
- Mian, A., K. Rao, and A. Sufi (2013). "Household Balance Sheets, Consumption, and the Economic Slump," *Quarterly Journal of Economics*, Vol. 128, pp. 1687–1726.
- Stepanyan, V., T. Poghosyan, and A. Bibolov (2010). "House Price Determinants in Selected Countries of the Former Soviet Union," IMF Working Paper No. 10/104 (Washington, DC: International Monetary Fund).
- Sutton, G. (2002). "Explaining Changes in House Prices," *BIS Quarterly Review*, September (Basel: Bank for International Settlements).
- Terrones, M., and C. Otrok (2004). "The Global House Price Boom," *World Economic Outlook*, September, pp.71–89.
- Tsatsaronis, K., and H. Zhu (2004). "What Drives Housing Price Dynamics: Cross-Country Evidence," *BIS Quarterly Review*, March (Basel: Bank for International Settlements).
- Ucal, M., and G. Gökkent (2009). "Macroeconomic Factors Affecting Real Estate Markets in Turkey: A VAR Analysis Approach," *Briefing Notes in Economics*, Vol. 80, pp. 1–13.

Appendix Table A1. Determinants of Housing Prices—Pre-GFC: Short-Term Interest Rates

VARIABLES	(1) OLS FE	(2) 5th Percentile	(3) 25th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real GDP Growth	1.764** (0.588)	1.873*** (0.518)	1.841*** (0.420)	1.756*** (0.667)	1.681** (0.728)	1.595 (1.142)
Short-Term Interest Rate	-0.062 (1.290)	-1.217 (1.333)	-0.880 (1.077)	0.026 (1.725)	0.826 (1.865)	1.746 (3.158)
Unemployment Rate	-1.674 (1.969)	-0.538 (1.489)	-0.870 (1.205)	-1.761 (1.923)	-2.547 (2.087)	-3.452 (3.446)
Population Growth	8.505 (6.862)	9.702 (7.742)	9.352 (6.286)	8.413 (9.979)	7.584 (10.893)	6.631 (17.046)
Inflation	-1.854 (1.639)	-0.796 (1.202)	-1.105 (0.971)	-1.935 (1.552)	-2.668 (1.682)	-3.510 (2.809)
Real Stock Market Return	0.018 (0.071)	0.014 (0.073)	0.015 (0.059)	0.018 (0.094)	0.021 (0.103)	0.024 (0.161)
REER	-0.248 (0.428)	-0.271 (0.409)	-0.264 (0.332)	-0.246 (0.527)	-0.230 (0.575)	-0.212 (0.899)
Observations	101	101	101	101	101	101
Countries	8	8	8	8	8	8
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.897					

Note: The dependent variable is the year-on-year change in real house prices. Robust standard errors are clustered at the country level and reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table A2. Determinants of Housing Prices—Post-GFC: Short-Term Interest Rate

VARIABLES	(1) OLS FE	(2) 5th Percentile	(3) 25th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real GDP Growth	1.156*** (0.207)	0.946* (0.485)	1.069*** (0.280)	1.157*** (0.178)	1.239*** (0.193)	1.370*** (0.382)
Short-Term Interest Rate	-0.383 (0.278)	-1.180* (0.691)	-0.714* (0.398)	-0.379 (0.256)	-0.069 (0.277)	0.431 (0.547)
Unemployment Rate	-0.823** (0.265)	-0.431 (0.645)	-0.660* (0.372)	-0.825*** (0.237)	-0.977*** (0.257)	-1.223** (0.509)
Population Growth	-1.782 (1.286)	-0.322 (3.105)	-1.176 (1.791)	-1.790 (1.139)	-2.357* (1.239)	-3.274 (2.451)
Inflation	-0.074 (0.354)	0.046 (0.763)	-0.024 (0.440)	-0.075 (0.279)	-0.121 (0.304)	-0.197 (0.602)
Real Stock Market Return	0.026 (0.026)	0.009 (0.065)	0.019 (0.037)	0.026 (0.024)	0.032 (0.026)	0.042 (0.051)
REER	-0.063 (0.059)	-0.094 (0.186)	-0.076 (0.107)	-0.063 (0.068)	-0.051 (0.074)	-0.032 (0.147)
Observations	498	498	498	498	498	498
Countries	10	10	10	10	10	10
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.672					

Note: The dependent variable is the year-on-year change in real house prices. Robust standard errors are clustered at the country level and reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table A3. Determinants of Housing Prices—Pre-GFC: Long-Term Interest Rates

VARIABLES	(1) OLS FE	(2) 5th Percentile	(3) 25th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real GDP Growth	1.781** (0.561)	1.841** (0.784)	1.810*** (0.450)	1.788*** (0.360)	1.751*** (0.564)	1.727** (0.739)
Long-Term Interest Rate	-0.119 (1.402)	1.036 (2.015)	0.445 (1.153)	0.016 (0.939)	-0.703 (1.451)	-1.154 (1.931)
Unemployment Rate	-1.648 (0.871)	-1.863 (2.153)	-1.753 (1.235)	-1.673* (0.989)	-1.539 (1.548)	-1.455 (2.031)
Population Growth	8.179 (7.860)	13.181 (10.814)	10.623* (6.193)	8.764* (5.011)	5.650 (7.780)	3.696 (10.305)
Inflation	-1.918 (1.088)	-1.809 (1.923)	-1.865* (1.103)	-1.906** (0.882)	-1.973 (1.382)	-2.016 (1.813)
Real Stock Market Return	0.021 (0.081)	0.035 (0.101)	0.028 (0.058)	0.023 (0.046)	0.014 (0.073)	0.009 (0.096)
REER	-0.317 (0.428)	-0.290 (0.551)	-0.304 (0.316)	-0.314 (0.253)	-0.331 (0.396)	-0.341 (0.520)
Observations	102	102	102	102	102	102
Countries	8	8	8	8	8	8
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.896					

Note: The dependent variable is the year-on-year change in real house prices. Robust standard errors are clustered at the country level and reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table A4. Determinants of Housing Prices—Post-GFC: Long-Term Interest Rates

VARIABLES	(1) OLS FE	(2) 5th Percentile	(3) 25th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real GDP Growth	1.100*** (0.236)	1.174 (1.174)	1.128* (0.644)	1.100*** (0.360)	1.075*** (0.260)	1.038* (0.563)
Long-Term Interest Rate	-0.310 (0.305)	0.343 (1.771)	-0.064 (0.972)	-0.311 (0.543)	-0.541 (0.394)	-0.866 (0.851)
Unemployment Rate	-0.866** (0.306)	-1.214 (1.416)	-0.997 (0.777)	-0.865** (0.434)	-0.742** (0.314)	-0.569 (0.679)
Population Growth	-1.781 (1.234)	0.447 (6.354)	-0.939 (3.485)	-1.782 (1.948)	-2.568* (1.412)	-3.676 (3.052)
Inflation	-0.318 (0.250)	-0.632 (1.363)	-0.437 (0.748)	-0.318 (0.418)	-0.207 (0.303)	-0.050 (0.654)
Real Stock Market Return	0.027 (0.029)	0.039 (0.124)	0.032 (0.068)	0.027 (0.038)	0.023 (0.027)	0.017 (0.059)
REER	-0.133 (0.075)	-0.196 (0.394)	-0.157 (0.216)	-0.133 (0.121)	-0.111 (0.087)	-0.079 (0.189)
Observations	500	500	500	500	500	500
Countries	10	10	10	10	10	10
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.671					

Note: The dependent variable is the year-on-year change in real house prices. Robust standard errors are clustered at the country level and reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

**Appendix Table A5. Determinants of Housing Prices—IV Quantile Regressions:
Short-Term Interest Rates**

VARIABLES	(1) IV FE	(2) 5th Percentile	(3) 5th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real GDP Growth	3.766*** (0.454)	1.568*** (0.217)	1.216*** (0.179)	1.034*** (0.175)	0.780*** (0.183)	0.263 (0.246)
Short-Term Interest Rates	-0.266 (0.185)	-0.661*** (0.180)	-0.287** (0.112)	-0.093 (0.091)	0.177** (0.089)	0.726*** (0.168)
Unemployment Rate	0.160 (0.249)	-0.891*** (0.159)	-0.969*** (0.104)	-1.010*** (0.100)	-1.066*** (0.128)	-1.181*** (0.237)
Population Growth	-3.189** (1.327)	0.477 (0.982)	-0.771 (0.611)	-1.418*** (0.522)	-2.319*** (0.595)	-4.150*** (1.154)
Inflation	0.407* (0.230)	-0.236 (0.244)	-0.143 (0.168)	-0.094 (0.141)	-0.027 (0.132)	0.111 (0.213)
Stock Market Returns	-0.020 (0.025)	0.017 (0.026)	0.052*** (0.016)	0.070*** (0.018)	0.096*** (0.026)	0.147*** (0.051)
REER	0.061 (0.061)	-0.061 (0.104)	-0.183*** (0.069)	-0.246*** (0.056)	-0.334*** (0.052)	-0.513*** (0.090)
Observations	599	599	599	599	599	599
Countries	10	10	10	10	10	10

Note: The dependent variable is the year-on-year change in real house prices. A country's real GDP growth is instrumented by the trade-weighted average real GDP growth of its trading. Standard errors are reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

**Appendix Table A6. Determinants of Housing Prices—IV Quantile Regression:
Long-Term Interest Rates**

VARIABLES	(1) IV FE	(2) 5th Percentile	(3) 5th Percentile	(4) 50th Percentile	(5) 75th Percentile	(6) 95th Percentile
Real GDP Growth	3.914*** (0.509)	1.499*** (0.209)	1.231*** (0.172)	1.097*** (0.167)	0.896*** (0.174)	0.516** (0.228)
Long-Term Interest Rate	0.663** (0.328)	-1.003*** (0.318)	-0.657*** (0.185)	-0.484*** (0.152)	-0.225 (0.178)	0.266 (0.364)
Unemployment Rate	-0.115 (0.242)	-0.733*** (0.186)	-0.822*** (0.119)	-0.866*** (0.111)	-0.933*** (0.142)	-1.059*** (0.264)
Population Growth	-2.811** (1.326)	0.991 (1.003)	-0.387 (0.626)	-1.076* (0.551)	-2.112*** (0.643)	-4.067*** (1.206)
Inflation	0.219 (0.233)	-0.410 (0.263)	-0.127 (0.158)	0.015 (0.137)	0.227 (0.164)	0.629** (0.319)
Stock Market Returns	-0.007 (0.025)	0.024 (0.023)	0.053*** (0.014)	0.067*** (0.017)	0.088*** (0.026)	0.129*** (0.049)
REER	0.106 (0.078)	-0.262*** (0.080)	-0.274*** (0.057)	-0.280*** (0.049)	-0.290*** (0.044)	-0.307*** (0.061)
Observations	602	602	602	602	602	602
Countries	10	10	10	10	10	10

Note: The dependent variable is the year-on-year change in real house prices. A country's real GDP growth is instrumented by the trade-weighted average real GDP growth of its trading. Standard errors are reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.