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House Price Determinants in the European Union: The Role of Macroprudential Policy

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Abstract. *The study examines key factors influencing residential real estate markets across EU countries using fixed effects panel estimation on EU countries from 2011Q1 to 2024Q3. Housing markets vulnerabilities were one of the main factors behind the Great Financial Crisis, urging policy makers to design dedicated macroprudential instruments in order to decrease RRE risks. Current literature highlights GDP growth, unemployment, interest rates, and construction output as main potential drivers of house price growth. The research methodology involves establishing the determinants of house prices and investigating the direct and indirect effects of macroprudential policies on housing markets, particularly through the credit channel. Key findings confirm the results in the literature regarding house price drivers and reveal that capital buffers have a minor impact on house prices and mortgage credit, while borrower-based instruments significantly affect credit markets but not directly housing markets. The study contributes to the field by providing empirical evidence on the nuanced effects of macroprudential policies, offering insights for policymakers aiming to stabilize housing markets.*

Keywords: real estate, housing market, macroprudential policy, financial stability, capital buffers, borrower-based measures.

Introduction

Housing is a central topic to economic policy making. For most households, real estate holdings represent their main assets and are the principal source of their wealth. Households finance their residential real estate acquisition through long term mortgage debt, which is usually issued by credit institutions. Typically, households pledge their acquired houses in order to contract a mortgage. This makes banks' exposure to real estate consistent.

The extent to which a real estate shock can be detrimental to the financial stability was seen multiple times during history, but was more prominent during the Great Financial Crisis (GFC). Then, the bursting of a credit fueled real estate bubble led to one of the deepest economic depressions ever recorded. In order to prevent such an episode from occurring again, world regulators put in place new financial stabilization instruments. The new instruments involve either higher capital requirements for banks, or direct limits to the amount that borrowers can access credit.

European countries have gathered important experience in using these instruments for financial stability purposes. Every country in the European Union (EU) has activated at least one macroprudential policy tool in order to build resilience and stop dangerous developments. Most of these tools are tailored to counter risks in the residential real estate markets.

The fact that no major financial crisis has happened since their use has become widespread serves as possible evidence to their effectiveness. However, risks in the real estate sector have

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persisted. Between 2016 and 2022, the European Systemic Risk Board (ESRB), a body specialized on financial stability considerations, issued 18 warnings and 8 recommendations towards EU countries signaling the presence of an elevated level of risks in the residential real estate markets and urging countries to improve their macroprudential policy mix to tackle these vulnerabilities.

After the GFC and the sovereign debt crisis in 2011, housing markets entered into a period of continuous expansion, on the back of very favorable financing macroeconomic and financing conditions. The pandemic created a massive shift in house preference due to the widespread working from home policies. This led to the forming of a bubble in many EU countries. The short-lived overexpansion busted in 2023. For a third of EU countries, real estate prices started to drop. In other countries, the bursting was less acute, and brought just a slowdown in the price growth. However, home prices rebounded in 2024, and the short-lived contraction has been overcome.

Undoubtedly, there are multiple factors that played a role in the evolution of house prices since the GFC. This conference paper aims to uncover the fundamentals of house price determinants in the EU. Additionally, we would test the direct and indirect contribution of macroprudential policy instruments on house prices, adding to the literature on their effectiveness.

Literature review

House price determinants is a topic well studied in the economic literature. Three approaches can be distinguished as regards to determining the fundamentals price of a house. Firstly, there is an asset pricing approach in which real estate prices are computed from discounted earnings derived from real estate, mainly through rents and user costs. Applications in this regard are Hott and Monnin (2008) and Himmelberg et al. (2005). The second approach in the literature is using a hedonic price modelling of granular data of house specific or neighborhood specific characteristics. Established examples of papers using this approach are Li and Brown (1980) and Can (1990) that prove a relationship between price and house endowments and neighborhood quality. More recently, Dickes and Crouch (2015) show an effect of environmental variables on house prices.

The present paper relates to a third strand of literature that relies on aggregate variables and national or local level real estate prices. Typically, authors include a combination of demand-side factors and supply-side factors. A part of the literature focuses on country specific-case studies, either at regional or national level. Belke and Keil (2018) use a panel analysis on house prices in nearly 100 German cities and find an influence of construction activity and housing stock, as well as apartment rents, market size, local infrastructure. Eichholtz et al. (2015) analyses 350 years of Amsterdam house prices, finding that expectations shift between fundamental factors during slowdowns and momentum during booms.

Another part of this literature focuses on estimation methods across multiple countries. On a worldwide level, Adam and Fuss (2010) find that house prices increase by 0.6% for a 1% rise in economic activity, with construction costs and interest rates having smaller impacts, and suggesting a slower adjustment to equilibrium than previously thought. Hirata et al. (2013) examine house price fluctuations in advanced countries over four decades, identifying global interest rate shocks as significant drivers of house prices, but finding that monetary policy, productivity, and credit shocks have limited impact. With an European focus, Mainou et al. (2021) finds no overall convergence in house prices, identifying five distinct market clubs driven mainly by fiscal factors and unemployment, with no specific Eurozone club. Melecky and Paksi (2024) study a panel of European countries and find a strong contribution of demand-side determinants and a significant effect of financial development on house prices.

There is a growing literature that studies the effects of macroprudential policy on house prices. Galati and Moessner (2018) provides an early overview of this literature. Araujo et al. (2024) conduct a meta-analysis, compiling data from 58 studies on macroprudential policy, finding significant effects on credit with varied impacts across instruments, weaker effects on house prices, stronger impacts in emerging markets, and evidence of leakages and spillovers.

Methodology

The methodology chosen is a two-way fixed effects panel regression on country-level variables. Commonly used in the literature, this methodology allows to control for unobserved heterogeneity that is constant over time but varies across entities, thus accounting for state specific characteristics of the housing markets. Additionally, we include time fixed effects control for factors that affect all entities in a given time period, such as macroeconomic shocks or policy changes. In this way, one can control for a significant exogenous shock, such as the COVID-19 pandemic. The fixed effects model can be specified as in equation (1), (Hansen 2022):

$$Y_{it} = X_{it}\,\beta + \gamma_t + u_i + \varepsilon_{it} \quad (1)$$

where Y_{it} is the dependent variable for entity i at time t, u_i represents the entity-specific intercept (fixed effect), γ_t represents a time fixed effect in the form of a dummy value taking value 1 in a specific year, X_{it} is a vector of independent variables, β is a vector of coefficients, and ε_{it} is the error term.

The choice of a fixed effect estimator is prevalent in the literature over the random effects model which assumes that the entity-specific effects are random and uncorrelated with the independent variables. This assumption is less credible when dealing with country specific factors. However, as a robustness check we estimate also the same equations using a random effects model instead of a fixed effect one.

We exploit a dataset of 26 EU countries in the timespan of 2011Q1:2024Q3. The only country missing is Greece, which does not report official house price data on Eurostat. All variables are taken from official EU sources of data, which means that there is a certain degree of homogeneity in regards to the data collection and definitions used. This constitutes an advantage compared with other studies that perform global estimations using data that may differ in terms of coverage and definitions. The variables used and their characteristics are summarized in Table 1.

A general principle followed in this paper is that we analyse variables expressed in real terms and in annual growth terms. The usage of real variable is a choice commonly found in the literature meant to capture the variance of variables that is not due to a general price increase. Using annual growth of variables reduces cointegration and makes sure the variables don't have unit roots.

As dependent variable we use house price growth. For demand side determinants of house prices the following variables are used: (i) GDP growth as a measure of overall economic activity, (ii) unemployment rate as a measure of labour market activity, (iii) wage growth as a measure directly affecting households capacity to afford housing, (iv) housing credit growth in order to capture a major channel through which households acquire housing, (v) population growth a measure that can capture the rise in demand due to population changes. Supply side determinants used are (i) construction output growth as a measure of total housing units constructed, although it also captures civil engineering, (ii) production price of new housing units. We also use two all encompassing variables: (i) long term interest rates which can affect both demand, as households can adjust their preferences for buying houses compared with other financial investments return, while also affecting supply, as construction companies are typically highly financially leveraged enterprises that rely on loans to finance their projects (ESRB 2023), (ii) rent prices as these can induce either a substitution effect, in

which households prefer acquiring housing if rent costs are too high and vice versa, or can incentivize the acquisition of housing for investment purposes when rents are high.

To test macroprudential instruments effectiveness we employ two different methodological setups: one with housing credit growth as dependent variable and one with house price growth as endogenous variable. For macroprudential instruments we use capital-based instruments in the form of (i) a binary variable for instances when the Countercyclical Capital Buffer (CCyB) rate was positive and (ii) a variable representing the amount of capital held for macroprudential buffers expressed as percent of Risk Weighted Assets (RWA). We also include the use of borrower-based measures (BBMs), in the form of binary variables that mark the existence of limits of (i) Loan-to-Value of mortgages, (ii) debt limits using either a Debt (Loan)-to-Income or Debt-Service-to-Income instrument. In practice, these instruments are rarely used as stand alone, but often times in certain combinations. Counting the all the combinations between LTV and debt limits within the sample, we maintain only the ones that cover at least 10% of the total sample. These are a stand-alone LTV limit and combination of LTV and a debt limit, thus we don't include stand-alone debt limits as these are very rare. Additionally, when we explain the evolution of real housing loans we use a more focused measure of interest rate, more specifically the average cost of borrowing in national currency for domestic housing loans. This accounts for a shorter-term measure of interest rates, which has nevertheless a high correlation with the long-term interest rate (72.6%).

Regarding the lag structure used in the estimation, we employ and approach in which demand driven factors, interest rates and rents affect dependent variables with a lag of 2 quarters, while supply driven factors and population growth have a larger lag of 4 quarters. Moreover, given that macroprudential policy instruments are usually phased-in over a relatively large period of time, we assume that financial agents are forward-looking and adapt to the announced changes beforehand. Thus, in out regressions, macroprudential factors affect housing credit contemporaneously, and house prices with a lag of 2 quarters, similar to other demand factors.

Results and discussions

House price determinants

In our first setting we employ the estimation of real house prices using only classical determinants that are widespread across the literature. Our results confirm some of the finding across different studies (Table 2). GDP growth has a positive effect of prices, however it has a rather small magnitude, around 0.08 p.p. and it's statistical significance decreases with adding other variables. Unemployment is expressed in levels, and has a relatively negative large effect, of -0.4 pp in full specification, and retains a high degree of significance. The highest negative effect on prices can be found in the long-term interest rate, around -0.7 p.p. The recent dynamics in which the monetary policy tightening cycle led to a decrease in house price growth rates across EU confirm this result (ESRB 2024). Construction growth is another factor that is statistically significant when regards to house prices increases, but the effects are rather small, less than 0.1 p.p. This implies that households react by demanding more housing when construction is increasing. Housing credit growth is another factor that increases prices, but the effect is small, around 0.1 p.p. and it is on the borderline of being statistically significant. The inclusion of both long-term interest rate and credit appears to cause confounding variables, as credit losses significance when paired with the interest rate. Wage increase is another factor that seems to have small and not statistically significant effect. Rent increase causes a small and statistically insignificant increase in house prices. Construction price increases don't cause a statistically significant effect in house prices. The result is most likely due to the fact that this factor explains the

growth of prices mostly for new buildings, not for existing buildings. Finally, population growth is not a statistically significant factor, with a negative coefficient that is poorly identified given the large standard error. Overall population growth may be a too slow-moving factor in order to explain the rapid dynamics of house prices. Additionally, the population distribution also matters, as people might be moving from smaller cities towards big metropoles.

Macroprudential policy effects on the full sample of countries

Macroprudential policy transmits to asset price either through the credit channel or through the expectation channel (ESRB 2014). Unlike monetary policy, macroprudential instruments "do not get in all the cracks", but must mainly rely on financial institutions reactions. Higher macroprudential capital buffers might create additional costs for banks that can discourage banks to expand their assets, thus limiting credit supply, or can increase the cost of loans which limits credit demand. Borrower-based instruments act directly on households' capacity to contract mortgages. LTV limits caps the amount of loan that households can take in relation to the value of the property. DTI, LTI or DSTI limits the amount of debt a household can borrower compared with their income. Thus, given that both types of instruments limit mortgage credit, we will first test their effects towards credit growth. Then, in a second setting, we introduce the instruments directly to explain house price growth, cutting the middle term which is mortgage credit.

In the first specification of determinants of housing credit growth, we include two basic variables, borrowing costs and wage increases (Table 3). Both factors play a significant role in the evolution of housing credit. As expected, borrowing costs have a large and negative relationship with credit growth, depressing it by -1.7p.p. The increase in wage has a smaller positive effect of around 0.2 p.p. Introducing a CCyB does not have a statistically significant relationship on credit growth. Although in its inception it was specifically designed to cool the credit cycle, the instrument has not proven a great efficiency towards influencing the financial cycle. Still, increasing capital buffers can have a positive effect on the banking sector resilience. Countries have started to switch towards an early activation of this instrument, thus preferring to have more space for releases in case capital is needed to absorb shocks (ESRB 2025). When it comes to the efficiency of borrower-based measures the results are mixed. On one hand, introducing a LTV limit on its own has a large and significant effect, managing to reduce credit growth by -2.4 p.p. On the other hand, the combinations of LTV and debt limits lead to effects twice as small and close to being statistically significant at 10% confidence level.

In a second specification we check whether macroprudential instruments have a direct effect on house prices (Table 4). Keeping four core variables that were the determinants with the highest degree of significance, we add the variable for CCyB, LTV and LTV-income limit combination. The macroprudential policy variables do not exhibit statistically significant direct effects. But, as seen previously, acting through capping credit growth the instruments can derive indirect effects on house prices. For example, taking coefficients previously reported, introducing an LTV can lead to a reduction of -0.24 p.p. of house prices.

Macroprudential policy effects under a smaller sample of countries

In the previous subsection we showed that a variable that indicates when a country has a CCyB activated has a negative effect on credit growth, but the effect is not well identified and is not statistically significant. In the current subsection we will introduce another variable that measures the macroprudential buffer in a continuous manner, not as a binary variable. In this way, we can distinguish between countries that are active with other capital buffers, such as Systemic Risk

Buffer or Global/Other Significant Institutions Buffer. Furthermore, we can distinguish countries that impose higher level of buffers for those that activate instruments at lower levels. The new variable is defined using the Consolidated Banking Data (CBD2) made publicly available by the ECB. However, the dataset suffers from data quality issues. Thus, we will proceed to estimate only on a smaller sample of 17 countries that have reported a good data quality for this variable. To our knowledge, the present study marks the first time that this dataset was used for this purpose.

Performing a similar exercise as in the previous subsection, we regress housing credit on borrowing costs, wage growth and macroprudential instruments (Table 5). The new macroprudential buffer variable is now having a much smaller effect, of just -0.01 p.p. but is now better identified and statistically significant at 10% level. This result confirms the one obtained for just one buffer, indicating that all macroprudential policy instruments have shown little efficiency in influencing the credit cycle. A possible explanation is that banks have not suffered increased costs due to additional buffer increases, as the good profitability shown in recent years have permitted them to grow their capital at small costs. The coefficient of both borrower-based instruments increases by approximately 0.3 p.p. The LTV and debt limit combination becomes statistically significant at 10% level, indicating that under a different sample it could be better identified.

Finally, regressing directly the macroprudential instruments along the main determinants of house price growth we obtain that the macroprudential buffer has a small but statistically significant negative effect of -0.01 p.p (Table 6). The presence of a direct effect of macroprudential buffers bypasses the credit channel. One possible explanation is that households perceive the increase of capital buffers as warnings that there are risks at present in the banking sector. Under a risky environment, they adapt their behaviour and consume less housing. Borrower-based measures continue to be only affecting house prices through the indirect channel of credit, both variables remaining statistically insignificant, although they report much higher coefficients in this setting.

Robustness checks

Complementing our analysis, we ran a series of robustness checks. First of all, we replicated each setting with a random effects estimator, instead of a fixed effects one, keeping time fixed effects in place. We found no significant change in our results.

Another robustness check concerns the number of lags of the variables. In our analysis we followed an approach in which some determinants have a half-year pass through, while some variables transmit in one year. Changing these lag levels does not cause issues regarding the statistical significance of most variables, with two exceptions. Firstly, we noticed a sensibility of the effect of long-term interest rates on house prices with a lag larger than 2. The impact of this variable becomes less pronounced after 3 quarters, signalling a potential rapid impact of changes in monetary policy conditions. Secondly, the effects of the macroprudential buffer variable become statistically insignificant with a lag larger than 2. However, as explained in the methodology section, the macroprudential variables are not expected to have such long lasting impacts, given also the ample phase-in time that banks can use to adjust.

In the previous subsection we switched from a sample of 26 countries to one with only 17 countries. This change brought some important changes in coefficients. The most revealing example is the fact that under the smaller sample, GDP growth is not a statistically significant determinant of house prices anymore. Furthermore, F statistics under the smaller sample have become enlarged up to the point of the software reaching an error in computing them. This raises concerns about overfitting and sample representativeness, as the smaller sample does not have enough degrees of freedom to produce robust results.

Conclusion

The study analysed the contribution of various determinants to residential real estate markets in a fixed effects panel estimation on EU countries. The results confirm the main findings found in the literature that the principal variables that drive house price growth are GDP growth, unemployment, long term interest rates and construction output, with evidence of effects also from mortgage credit growth. In the second part of the study, we looked into the effects of macroprudential policy on housing markets, taking into account both direct effects and indirect effects that are transmitted through the credit channel.

Capital based macroprudential policy was introduced in a binary form for countries that have activated a CCyB, and in a level form, adding the capital that banks hold for macroprudential requirements. While the first setting did not produce statistically significant results, the second one showed that capital buffers have a small direct effect on house prices and a small indirect effect on housing credit.

Furthermore, we studied the effects of introducing borrower-based measures in the form of LTV limits and a combination of LTV and a debt limit. The stand-alone LTV limit was showed to have a large significant effect on mortgage credit growth, but did not have a direct impact on house prices. The combination of LTV and debt caps provided statistically weaker results on housing credit, and no direct effect on the housing market.

We have also noticed that using a smaller sample can affect the coefficients obtained. Given that macroprudential policy have started to become used on a wider scale starting from 2015, the time sample could still be too small in order to identify macro level effects in a panel analysis. Moreover, grouping countries in different ways might show contrasting results. Finding out the extent of this phenomenon can be a future avenue of research.

The present study used macroprudential policy mostly through variables expressed in a binary way. While working this way captures the effect of introducing the measure, it cannot distinguish the impact of the difference in the degree of the calibration stringency. Introducing a level-based variable for the macroprudential buffer showed promising results and is a first step towards such an analysis, but further studies can expand this approach to borrower-based tools.

Figures and tables

Table 1. Data series description

Variable	Definition	Form	Source	Time	Number of observations	Average	Standard Deviation
Real house price	Nominal house price deflated by private final consumption expenditure of households	Quarterly year-on-year growth	Eurostat	2011Q1-2024Q3	1430	1.617762	5.767315
Real GDP	Gross Domestic Product at 2021 prices	Quarterly year-on-year growth	Eurostat	2011Q1-2024Q3	1430	2.297552	4.085664
Unemployment	Unemployment of persons aged 14-74	Level	Eurostat	2011Q1-2024Q3	1430	3.628945	16.6956
Long term interest rate	Maastricht criteria interest rates	Level	Eurostat	2011Q1-2024Q3	1393	2.320811	2.050075

Variable	Definition	Form	Source	Time	Number of observations	Average	Standard Deviation
Real housing credit	Nominal housing credit of domestic households deflated by private final consumption expenditure of households	Quarterly year-on-year growth	ECB, authors` calculation	2011Q1-2024Q3	1430	1.435734	5.550966
Construction output	Changes in the value of construction output	Quarterly year-on-year growth	Eurostat	2011Q1-2024Q3	1415	1.969965	10.28724
Real wages	Nominal wages and salaries deflated by private final consumption expenditure of households	Quarterly year-on-year growth	Eurostat, authors` calculation	2011Q1-2024Q3	1430	1.679391	4.530477
Rent	Rent price subcategory of the HICP	Quarterly year-on-year growth	Eurostat	2011Q1-2024Q3	1430	3.004755	3.980821
Population	Number of people living in a country	Quarterly year-on-year growth	Eurostat	2011Q1-2024Q3	1430	0.3101399	0.9540687
Construction price	Producer price index for construction	Quarterly year-on-year growth	Eurostat	2011Q1-2024Q3	1427	3.721934	5.643911
Cost of borrowing	Cost of borrowing for housing loans taken by households in national currency	Level	ECB	2011Q1-2024Q3	1335	3.14236	1.638912
LTV	Existence of Lo an-to-Value limit for mortgages	Binary	ESRB	2011Q1-2024Q3	1430	0.5412587	0.4984691
Debt limit	Existence of Debt(Loan)-to-Income or Debt (Loan)-Service-to-Income limit for mortgages	Binary	ESRB	2011Q1-2024Q3	1430	0.3153846	0.4648314
CCyB	Existence of Countercyclical Capital Buffer at a positive level	Binary	ESRB	2011Q1-2024Q3	1430	0.148951	0.3561648
Macroprudential buffer	Capital required for macroprudential buffers[1] as share of Risk Weighted Assets	Level	ECB CBD2	2011Q1-2024Q3	1115	1.167434	7.545028

Source: Authors' own contribution.

[1] Comprised of Countercyclical Capital Buffer, Systemic Risk Buffer, Global/Other Systemically Important Institution Buffer. Excluding Conservation Capital Buffer.

Table 2. Estimation Results of Determinants for House Price Growth, Full Sample

	(1) House price	(2) House price	(3) House price	(4) House price
GDP (lag 2)	0.083**	0.100**	0.082*	0.081*
	(0.040)	(0.040)	(0.045)	(0.044)
Unemployment (lag 2)	-0.469***	-0.608***	-0.439**	-0.431**
	(0.162)	(0.139)	(0.178)	(0.176)
Construction (lag 4)	0.054**	0.067***	0.054***	0.053***
	(0.020)	(0.021)	(0.017)	(0.018)
Long term interest rate (lag 2)	-0.866***		-0.851***	-0.732**
	(0.270)		(0.293)	(0.293)
Housing credit (lag 2)		0.146**		0.114
		(0.055)		(0.067)
Wage (lag 2)			0.090	0.064
			(0.061)	(0.065)
Rent (lag 2)			0.046	0.066
			(0.102)	(0.101)
Population (lag 4)			-0.574	-0.613
			(0.444)	(0.441)
Construction price (lag 4)			0.067	0.057
			(0.060)	(0.059)
Constant	7.324***	5.267***	6.484***	6.336***
	(1.468)	(1.310)	(1.500)	(1.505)
Observations	1280	1315	1264	1264
Groups	26	26	26	26
R^2	0.500	0.475	0.509	0.514
F	97.210	45.441	76.875	70.791

Robust country-clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' own research results.

Table 3. Estimation Results of Macorprudential Policy Effects on Housing Credit Growth, Full Sample

	(1) Housing Credit	(2) Housing Credit	(3) Housing Credit	(4) Housing Credit
Borrowing cost (lag 2)	-1.652***	-1.678***	-1.648***	-1.668***
	(0.554)	(0.551)	(0.541)	(0.539)
Wage (lag 2)	0.182***	0.183***	0.192***	0.193***
	(0.029)	(0.030)	(0.030)	(0.031)
CCyB		-0.662		-0.518
		(1.239)		(1.254)
LTV limit only			-2.403**	-2.353**
			(1.018)	(1.053)
LTV and debt limit			-1.230	-1.232
			(0.865)	(0.863)
Constant	7.237**	7.791**	8.282**	8.709***
	(3.039)	(2.883)	(2.986)	(2.872)
Observations	1273	1273	1273	1273
Groups	26	26	26	26
R^2	0.430	0.431	0.442	0.443
F	117.620	106.395	131.249	144.272

Robust country-clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' own research results.

Table 4. Estimation Results of Macroprudential Policy Effects on House Price Growth, Full Sample

	(1) House price	(2) House price	(3) House price
GDP (lag 2)	0.084**	0.085**	0.085**
	(0.040)	(0.041)	(0.041)
Unemployment (lag 2)	-0.483***	-0.458**	-0.475**
	(0.167)	(0.170)	(0.176)
Construction (lag 4)	0.053**	0.054**	0.053**
	(0.020)	(0.021)	(0.021)
Long term interest rate (lag 2)	-0.815***	-0.875***	-0.823***
	(0.283)	(0.277)	(0.292)
CCyB (lag 2)	-1.291		-1.269
	(0.954)		(0.978)
LTV limit only (lag 2)		-0.399	-0.301
		(1.078)	(1.017)
LTV and debt limit (lag 2)		0.036	0.030
		(1.045)	(1.035)
Constant	7.939***	7.336***	7.935***
	(1.689)	(1.471)	(1.680)
Observations	1280	1280	1280
Groups	26	26	26
R^2	0.503	0.500	0.504
F	109.582	126.844	150.737

Robust country-clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' own research results.

Table 5. Estimation Results of Macroprudential Policy Effects for Housing Credit Growth, CBD2 Sample

	(1) Housing Credit	(2) Housing Credit	(3) Housing Credit	(4) Housing Credit
Borrowing cost (lag 2)	-1.021***	-0.996**	-0.984***	-0.963**
	(0.329)	(0.349)	(0.336)	(0.356)
Wage (lag 2)	0.217***	0.208***	0.245***	0.237***
	(0.051)	(0.052)	(0.058)	(0.059)
Macroprudential Buffer		-0.017*		-0.018*
		(0.009)		(0.009)
LTV limit only			-2.758***	-2.644**
			(0.927)	(0.961)
LTV and debt limit			-1.582*	-1.519
			(0.917)	(0.917)
Constant	2.688	2.445	3.912*	3.635
	(1.903)	(2.006)	(2.106)	(2.229)
Observations	839	821	839	821
Groups	17	17	17	17
R^2	0.445	0.449	0.466	0.468
F	562.812	1353.999	.	.

Robust country-clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' own research results.

Table 6. Estimation Results of Macroprudential Policy Effects for House Price Growth, CBD2 Sample

	(1) House price	(2) House price	(3) House price	(4) House price
GDP (lag 2)	0.052	0.054	0.052	0.054
	(0.040)	(0.040)	(0.039)	(0.039)
Unemployment (lag 2)	-0.529***	-0.526***	-0.507**	-0.503**
	(0.171)	(0.170)	(0.187)	(0.185)
Construction (lag 4)	0.073**	0.071**	0.073**	0.072**
	(0.028)	(0.028)	(0.029)	(0.029)
Long term interest rate (lag 2)	-0.761**	-0.772**	-0.806**	-0.819**
	(0.355)	(0.354)	(0.377)	(0.377)
Macroprudential buffer (lag 2)		-0.016**		-0.016*
		(0.008)		(0.008)
LTV limit only (lag 2)			-1.365	-1.380
			(1.546)	(1.550)
LTV and debt limit (lag 2)			-0.971	-1.007
			(1.303)	(1.306)
Constant	6.835***	6.892***	7.690***	7.765***
	(1.684)	(1.689)	(1.628)	(1.626)
Observations	856	848	856	848
Groups	17	17	17	17
R^2	0.509	0.509	0.512	0.512
F	28941.524	.	.	.

Robust country-clustered standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' own research results.

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