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Theodore Panagiotidis[1], Paraskevi Tzika[2], and Georgios Voucharas[3]

Abstract

The housing market plays a central role in economic stability and social well-being across countries, but specifically in Greece, it has been shaped by crises, policy shifts, and external shocks over the last decades. We introduce the Greek Housing Market Uncertainty (HMU) index, a monthly newspaper-based measure designed to capture housing-specific uncertainty. Using Local Projections and their state-dependent and time-varying extensions, we examine the dynamic effects of HMU shocks on key housing market variables. The results show that house prices respond negatively to housing uncertainty shocks, albeit with a lag, while residential loan growth also declines significantly in the short run. The state-dependent analysis demonstrates that regimes matter, as adverse effects on house prices are stronger during periods of low economic growth or high foreign uncertainty. Time-varying estimations indicate heightened long-run effects during the Greek debt crisis. Regional analysis shows more severe and persistent declines in large cities compared to smaller cities, while newer dwellings are also more vulnerable to shocks. Overall, the HMU index provides a valuable tool for monitoring housing market risks, while the incorporation of state-dependent and time-varying analysis reveals the crucial role of economic regimes and evolving conditions in shaping the impact of housing uncertainty.

Keywords: *Housing Market Uncertainty, Housing Market, Greece, Local Projections, Regimes*

JEL Classification: *R30, R38, D80, C32*

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1. Introduction

According to the United Nations Sustainable Development Goals, access to adequate, safe, and affordable housing has been recognised as a fundamental objective for sustainable development, reflecting its central role in social well-being, economic stability, and poverty reduction, among others (United Nations, 2015; UN-Habitat, 2021). Despite the undeniable significance of housing, the dynamics of the housing market in many cases remain complex, unpredictable and not fully understood. This challenge is even more pressing in today's context, where the recent cost-of-living crisis has deepened the European Union's ongoing housing affordability problem. On top of that, rising construction costs and rising mortgage rates, together with declining housing supply, have made home ownership quite challenging (European Parliamentary Research Service, 2025). These developments have significantly heightened uncertainty in the housing market.

Since 2015, in the EU, inflation-adjusted house prices have increased by over 20%, real investment in residential buildings declined by 6% between 2022 and 2024, while the number of building permits for residential construction has fallen by more than 20% since 2021. Housing affordability has also become an increasingly urgent issue (European Commission, 2025). In 2023, EU households spent an average of 19.7% of their disposable income on housing. Interestingly, in Greece, this share soared to 35.2%, that is among the highest rates. In the same year, the housing cost overburden rate (i.e., the share of people spending more than 40% of their disposable income on housing) reached 10.6% in EU cities and 7.0% in rural areas. Greece recorded the highest rates, that is 31.0% in urban areas and 24.7% in rural areas, contributing to heightened uncertainty (Eurostat, 2024).

This paper focuses on Greece, a particularly complex but interesting case marked by a sequence of major shocks and events that have altered the housing landscape significantly. Over the last decades, the Greek housing market has been shaped by the financial crisis and austerity measures, which were accompanied by significant tax reforms, policy shifts, and volatile political events. More recently, the sector faced pressures from the COVID-19 pandemic, the energy crisis, as well as the effects of the Golden Visa scheme. House prices have significantly increased over the last few years, while foreign direct investments in real estate have shown signs of recovery, especially after the implementation of the Golden Visa Programme. At the same time, construction activity and the total value of mortgages remain relatively stable and low. These and more stylised facts will be presented in Section 2.

The aforementioned facts and figures have intensified concerns and heightened uncertainty. Hence, understanding the dynamic behaviour of the housing market and examining its determinants in terms of house prices and the impacts of housing uncertainty

are more profound than ever before.[4] In addressing housing uncertainty, decision-making institutions play a vital role, as they shape the socio-economic landscape through policy tools and regulatory frameworks. Yet, the question remains as to why many advanced societies, including Greece, continue to face persistent housing crises. Notably, the global financial crisis itself was triggered by distortions in the U.S. housing market. While the EU has introduced various initiatives to tackle housing challenges, national-level strategies still remain critical.[5] [6] While these actions target specific aspects of the housing challenge, a key question remains: is the persistence of housing market challenges in Greece due to a lack of targeted monitoring tools or because existing measures fail to capture the dynamics and the uncertainty of the sector? On top of that, there is an urgent need for a nationally tailored monitoring tool to capture the unique housing market volatility in Greece.

To address this issue, we introduce, for the first time, the Greek Housing Market Uncertainty (hereafter HMU) index.[7] More specifically, we propose a robust newspaper-based monthly index that captures uncertainty in the Greek housing market. To the best of our knowledge, there is no index that quantifies the Greek housing market uncertainty. In addition, we assess the impact of HMU shocks on fundamental housing market variables. To do so, we use a Local Projections framework that is a more flexible approach than conventional Vector Autoregression (hereafter, VAR) models that most of the literature employs. While the majority of the literature operates within linear frameworks, this can overshadow the true effect of uncertainty on housing market variables, since they might behave in a non-linear manner (Katrakilidis and Trachanas, 2012). For this reason, we take into account potential non-linearities and we incorporate state-dependent (regime-switching) Local Projection approaches to capture the possibility that the impact of housing market uncertainty may differ under distinct economic conditions. We further allow the impact of uncertainty to evolve over time using Time-Varying Parameter Local Projections, enabling us to track how

[4] For clarity, throughout this paper, the term "housing" refers primarily to residential housing.

[5] Recognising this, the EU has made housing a political priority. That is, in 2021, the European Parliament declared adequate housing a fundamental human right and more recently approved the creation of a special committee tasked with proposing solutions to the EU housing challenges. A list of housing-related initiatives and recent developments in the EU can be found here https://www.europarl.europa.eu/RegData/etudes/BRIE/2025/767189/EPRS_BRI(2025)767189_EN.pdf and here https://economy-finance.ec.europa.eu/system/files/2022-09/dp171_en.pdf.

[6] Recently, Greece has launched multiple measures to address housing affordability and reduce uncertainty. These include, but are not limited to, the "My Home" programme, which offers subsidised, partly interest-free mortgages, the "Upgrade My Home" programme, which provides interest-free loans for energy-efficient home renovations (Ministry of Finance, 2025), as well as the Golden Visa scheme to attract foreign investment (Ministry of Migration and Asylum, 2025). Interestingly, in a fresh initiative, Greece proposed a bill to utilise unused public land to build affordable homes for young people and vulnerable groups (To Vima, 2025).

[7] The HMU index is publicly available online here: https://sites.google.com/view/georgios-voucharas/data/housing-market-uncertainty?authuser=0, enabling other researchers and policymakers to incorporate it into further analyses of housing market dynamics and uncertainty.

the housing market's sensitivity to uncertainty has changed over time. Finally, we examine whether the effects of uncertainty differ across regions and by the type of dwelling, in order to capture heterogeneity within the housing market.[8]

By utilising quarterly data over the period 2006Q2-2023Q4, we confirm that the HMU index is a valid and robust measure of housing-specific uncertainty for Greece. While EPU reflects general macroeconomic and policy-related uncertainty, HMU offers a more targeted picture of the housing sector, making the two measures complementary tools for policymakers.

Our results indicate that house prices respond negatively to HMU shocks, though with a lag. Construction volume reacts in a less systematic manner, while residential loans exhibit an immediate and significant short-run decline. Second, when conditioning on domestic economic growth, HMU shocks generate an immediate negative impact on house prices in low-growth periods, whereas in expansionary periods the responses are initially positive. For residential loans, the tightening is more immediate under low growth, while under high growth the decline emerges with a lag. Third, when regimes are defined by foreign uncertainty, HMU shocks depress house prices more strongly during periods of high foreign uncertainty in the medium run, and the impact on construction activity is also regime dependent. The growth of residential loans contracts more strongly in periods of relatively low foreign uncertainty in the short run. With respect to the time-varying estimations, our findings demonstrate that the impact of uncertainty on housing prices is not constant over time, and more specifically, the long-run effects are particularly pronounced during the Greek debt crisis. Finally, as regards to the disaggregated analysis, we highlight evidence of regional disparities. That is, major urban centres such as Athens (the capital of Greece) and Thessaloniki (the second largest city) face more severe and persistent house price declines following uncertainty shocks, whereas smaller cities tend to experience shorter-lived effects, reinforcing the case for regionally tailored policy interventions. The results also show that the age of the dwelling plays an important role, with newer houses being slightly more vulnerable to uncertainty shocks.

To reinforce our findings, we conduct a series of robustness checks using alternative measures of uncertainty. While Greece provides an especially informative setting for studying housing market uncertainty, the methodological framework we develop--combining a newspaper-based uncertainty index with state-dependent and time-varying analysis--can be applied to other national contexts as well.

The rest of the paper is structured as follows: Section 2 provides stylised facts for the Greek housing market, and Section 3 reviews the relevant literature. Section 4 describes the methodology for constructing the HMU index, while Section 5 describes the data and

[8] Towards this direction, important contributions have shown that regional analysis cannot be ignored in the case of Greece. See for instance Kontonikas and Pyrgiotakis (2025), Karahasan and Monastiriotis (2021) and Monastiriotis (2011), among others.

presents the empirical methodology. Section 6 discusses the empirical findings and robustness tests, and Section 7 concludes the paper.

2. Stylised facts: The case of Greece

The Greek housing market has undergone profound changes over the past two decades. Since the collapse of Lehman Brothers, the subsequent global financial crisis in 2008/2009, and the Greek sovereign debt crisis, several factors and events have altered its landscape. In this section, we present key housing and macroeconomic indicators to illustrate the main trends and current state of the Greek housing market.

Figure 1 presents the inflation-adjusted residential property prices together with the year-on-year percentage (YoY) change. A downward trend in house prices is evident until 2018, the year when Greece exited the memorandum programmes. The YoY price change is negative throughout this period, and becomes positive after 2018. Thereafter, there is a gradual increase in the price level.

Figure 2 extends the analysis of the housing market to a regional level, since it illustrates house prices in Athens, Thessaloniki, other big cities, and all other cities, separately. It can be concluded that, up to 2020, the smaller cities of Greece experienced relatively higher house prices. However, following the onset of the Covid-19 pandemic, and more intensively after 2022 and the energy crisis, this trend shifted, with the country's capital emerging as the primary driver of elevated prices in the housing market.

Further insights are provided by Figure 3, which distinguishes between new and old dwellings. After the onset of the global financial crisis and until the end of the examining period, houses younger than 5 years of age appear to be more expensive than older residences. However, both newer and older dwellings follow the same pattern, with a decreasing trend in prices until 2018 and an increasing trend thereafter.

Figure 4 displays the total value of residential loans together with the respective interest rate. We observe an increase in the total value of loans at the beginning of our sample and until 2010, accompanied by an increase in the interest rates. Interest rates started falling after the global financial crisis, while loans started gradually dropping as the country was getting further in the debt crisis. We also observe a further, sharp drop in residential loans during the Covid-19 pandemic. The interest rates face a sharp increase after 2022, apparently driven by inflationary pressures and the consequential contractionary monetary policy.

Figure 5 reveals the number of building permits issued per quarter, as an indicator of the construction activity. The number of permits connects to the prices through the supply channel. Following a similar pattern to the house prices, the number of permits shows a relatively steep downward trend until about 2014 but has been very gradually increasing since 2018.

Figure 6 depicts the net Foreign Direct Investment (FDI) in real estate together with the Golden Visa approved applications since 2018. The FDI was stable and below €200 million until 2016. Then, gradually at first and more rapidly later, the FDI has an upward trend, which is being driven by the Golden Visa programme.

Figure 7 shows the standardised price-to-income ratio, which is a measure of housing affordability, as it offers an indication of how expensive houses are relative to what people of the country earn as income. The standardised version is estimated over the long-term average price-to-income ratio. Values above 100 reveal housing market pressures and housing affordability above the long-term average. The figure underscores that in 2014 the price-to-income ratio falls below 100 and remains so until 2022. This is in line with the trend of house prices, as depicted in Figure 1, since the house price index is the highest at the beginning of the examining period, and increases again towards the end, while during the Greek debt crisis the prices are declining, hence making houses more affordable.

We provide further insights in Figure 8, which depicts the home ownership percentage in Greece and the respective EU average. The percentage of home ownership in Greece is one of the highest in the EU and significantly above the EU's average, reaching 77% in 2010. Even though there has been a downward trend after the pandemic, with the level dropping to 70%, it still remains above the EU average.

Last but not least, we illustrate the real GDP growth and the unemployment rate in Figure 9 to provide a general picture of the crisis's consequences for the Greek economy. The economy was partly growing before the Greek debt crisis, but it faced a severe downturn between 2009 and 2013. The signs of recovery close to and after the end of the crisis were abruptly interrupted by the Covid-19 pandemic, accompanied by an unprecedented drop in growth. However, the economy is now back to positive growth after the end of the pandemic restrictions. Unemployment, on the other hand, reached the highest levels in 2013, right in the middle of the crisis, with unemployment rates exceeding 25%. Towards the end of the sample, the rates are almost down to the pre-crisis levels. These are important facts that one should bear in mind when examining the housing market in Greece, since they shape the dynamics and relationships in the market.

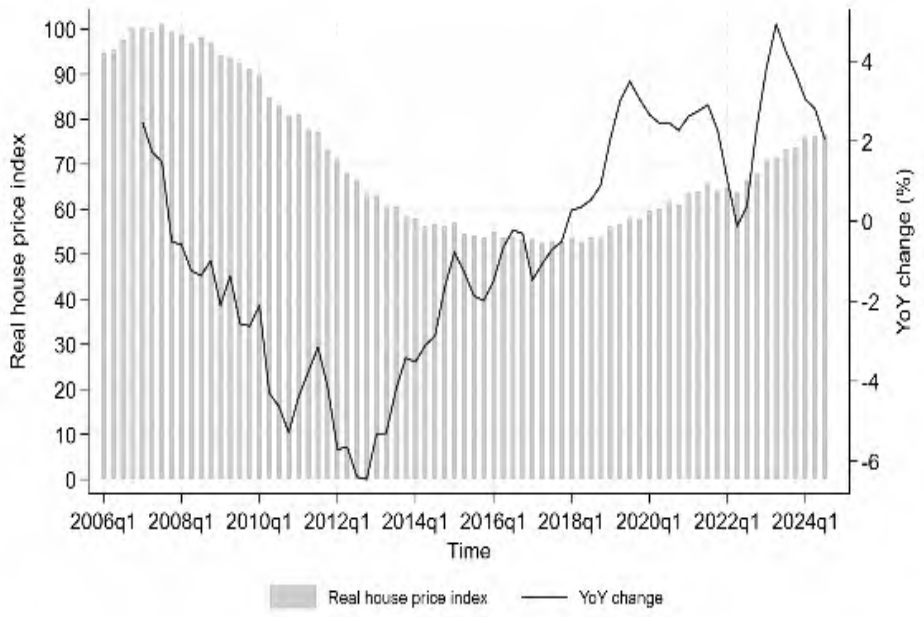


Figure 1: House prices over time.

Source: Bank of Greece, Hellenic Statistical Authority (ELSTAT)

Notes: Real house price index with base year 2007 and year-on-year percentage change.

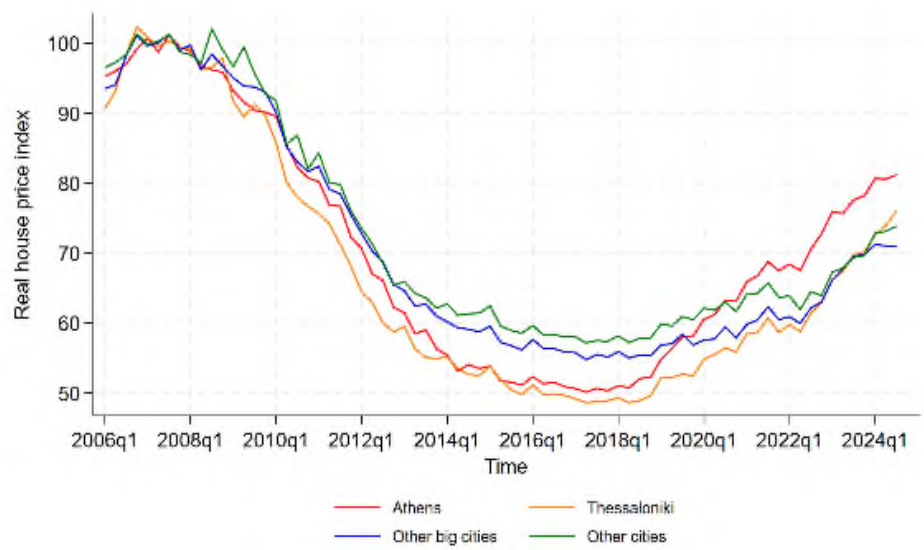


Figure 2: House prices: regional

Source: Bank of Greece, Hellenic Statistical Authority (ELSTAT)

Notes: Real house price indices, for different geographical areas, with base year 2007.

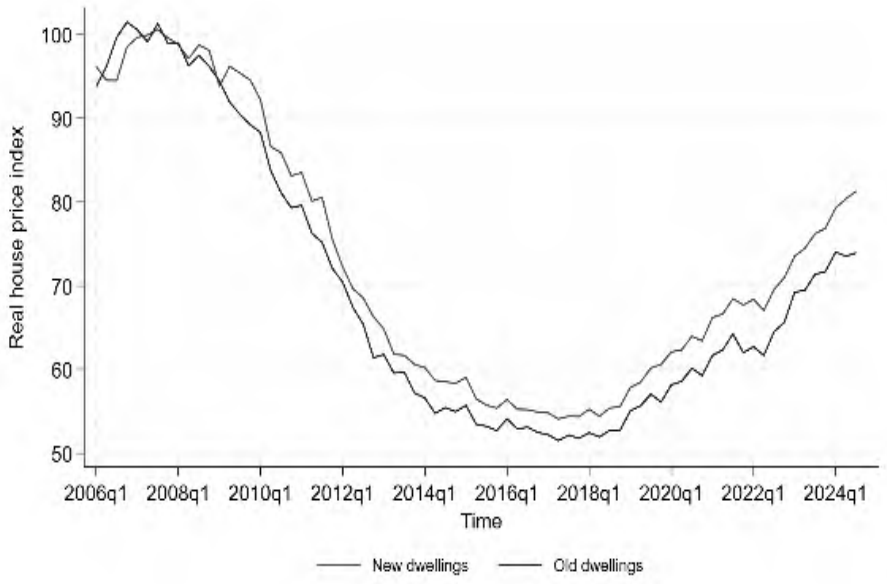


Figure 3: House prices: old and new dwellings

Source: Bank of Greece, Hellenic Statistical Authority (ELSTAT)

Notes: Real house price indices with base year 2007. New dwellings refer to dwellings of up to 5 years old. Old dwellings refer to dwellings of over 5 years old.

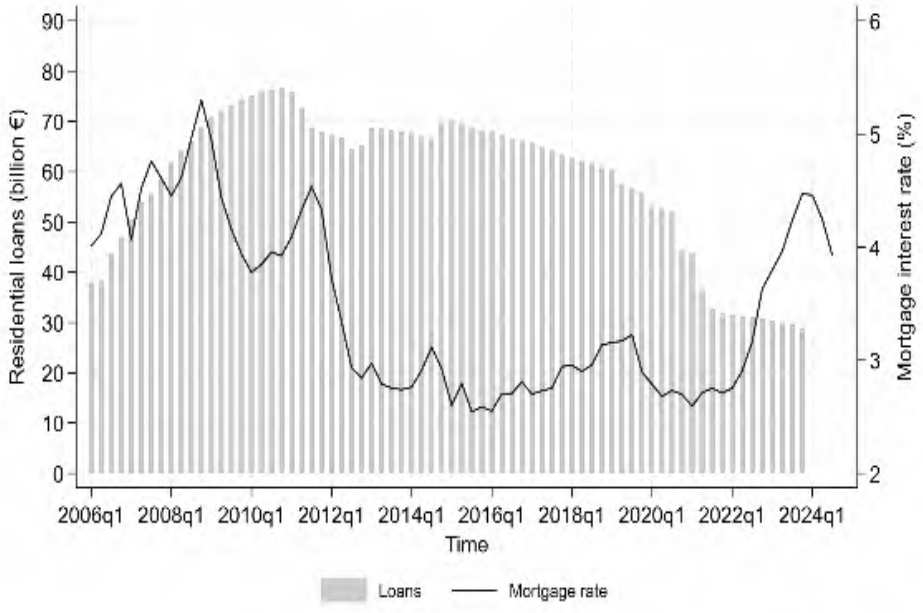


Figure 4: *Residential loans and mortgage interest rates*

Source: Bank of Greece

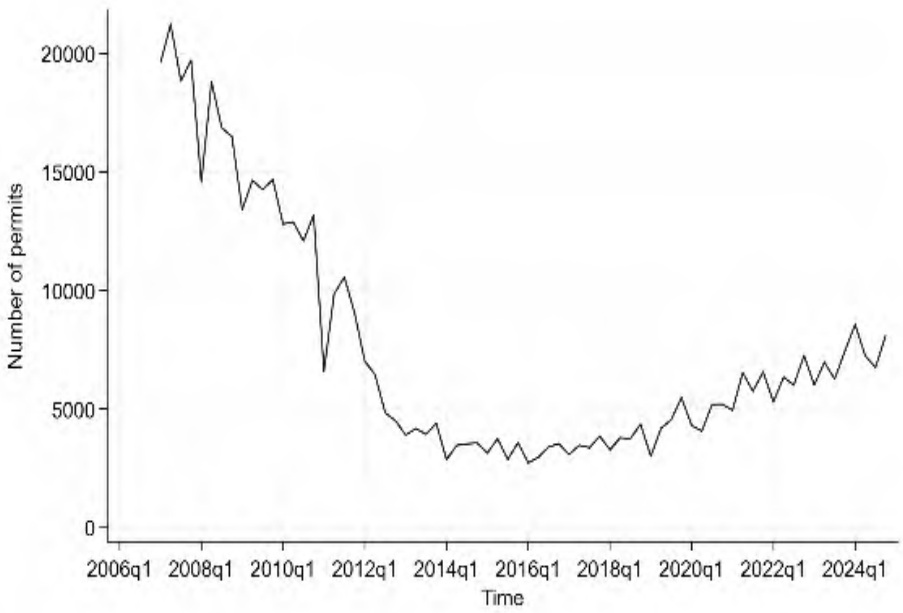


Figure 5: Number of building permits
Source: ELSTAT

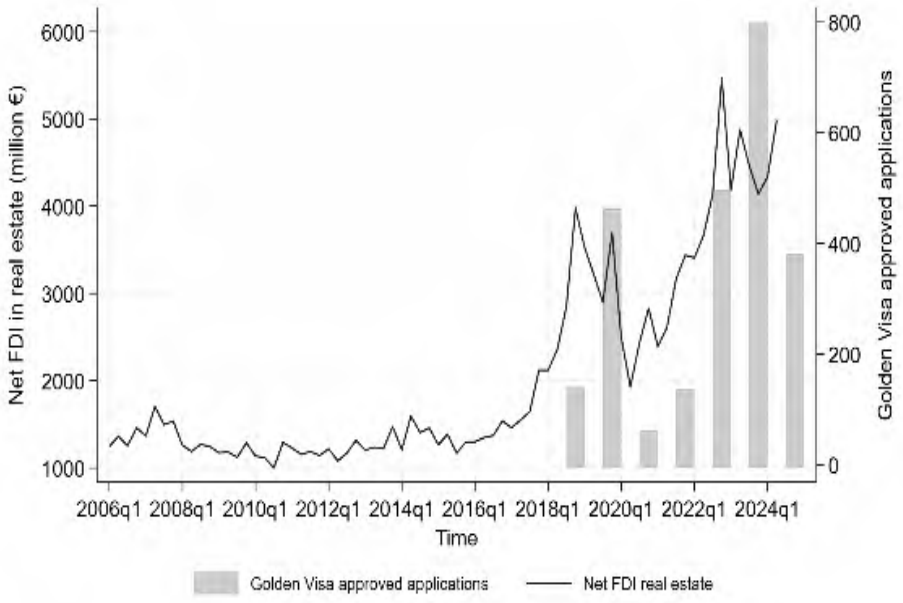


Figure 6: Net FDI and number of Golden Visa approved applications
Source: Bank of Greece (net FDI data) and Ministry of Migration and Asylum (Golden Visa data)
Notes: The number of Golden Visa approved applications is on annual frequency.

Figure 7: Price-to-income ratio
Source: Organisation for Economic Co-operation and Development (OECD)
Notes: Standardised index, over the long-term average, with 2015 base year.

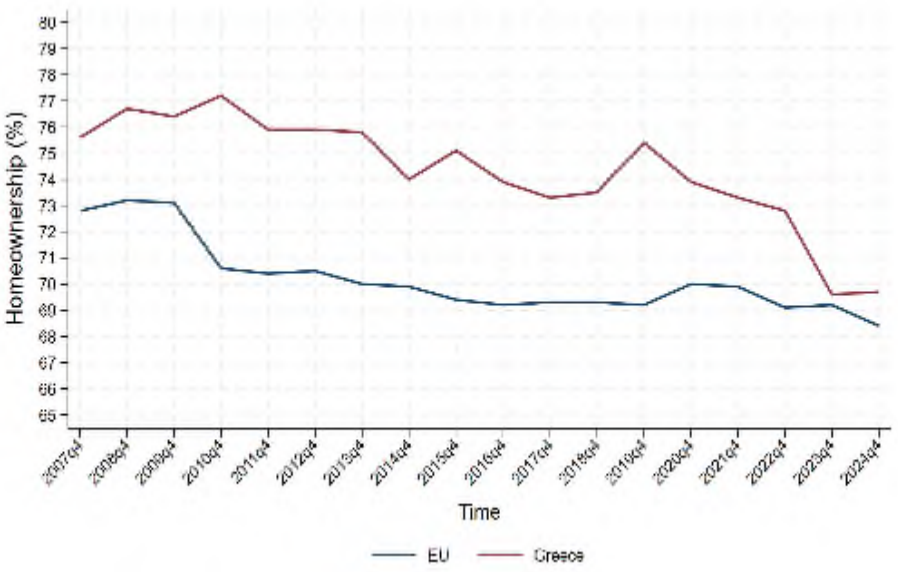


Figure 8: *Home ownership in Greece and the EU (percentage)*
Source: Eurostat

Figure 9: *GDP growth and unemployment rate*
Source: ELSTAT

3. Literature Review

3.1 Fundamental Drivers of Housing Markets

The housing market is shaped by a wide range of fundamental drivers including economic, financial, environmental, technological, social and demographic drivers, among others. To start with, increased economic activity tends to boost housing demand and increase prices, while higher construction costs restrict supply, placing upward pressure on prices (Adams and Füss, 2010). Household income is also an important determinant, as it directly affects housing affordability (Holly and Jones, 1997), while employment conditions are equally influential, with higher unemployment generally linked to downward pressure on housing prices. Monetary policy and liquidity are pivotal in shaping the likelihood of housing booms and busts (Agnello and Schuknecht, 2011). Interest rates are particularly important, since, if long-term rates rise, fixed-income assets become more attractive, reducing demand for residential property and lowering house prices (Iacoviello, 2005; Adams and Füss, 2010). Finally, credit conditions are also crucial drivers as, for instance, easier access to credit could increase house prices (Adelino et al., 2025). Interestingly, environmental factors similarly matter for housing markets, with natural disasters influencing the demand and supply of houses (Apergis, 2020), while buyer perceptions on disaster risks shape purchasing behaviour (Kiel and Matheson, 2018).

Technological advancements further contribute to housing market dynamics. On the supply side, slow technological progress can constrain construction, contributing to increases in housing prices (Iacoviello and Neri, 2010). On the demand-side, advances in digital infrastructure can make credit more accessible or house locations more attractive, thereby raising housing demand and prices (Wang et al., 2023). Tourism activity is also connected to housing markets, as tourist inflows influence house prices (Cró and Martins, 2024) and generate spillover effects (Kavarnou and Nanda, 2018). Social norms also act as important determinants of housing market behaviour (Lux et al., 2017), while demographic shifts, such as changes in fertility, life expectancy, urbanisation, and international migration, can also determine house prices (Gong and Yao, 2022). For comprehensive surveys of housing within the area of macroeconomics interested readers can refer to Leung (2004), Piazzesi and Schneider (2016), Panagiotidis and Printzis (2016) and Leung (2022), among others.

3.2 Housing Market Determinants in Greece

But what fundamental factors shape the housing market and house prices, specifically in Greece? The literature offers findings that vary depending on the econometric methodology employed and the specific period under examination. For instance, Apergis and Rezitis (2003) using an error correction vector autoregressive model show that interest rates, inflation, and employment significantly explain house price variation over the period 1981-1999. Brissimis and Vlassopoulos (2009) find evidence of a bidirectional relationship between mortgage lending and house prices in the short run over the period 1993Q4-2005Q2. Gounopoulos et al., (2012) find that greater stock market volatility increases housing demand and raises the house price index, while construction and labour costs also exert upward pressure on house prices over the period 1985Q1–2010Q4. In contrast, long-term interest rates and industrial production are shown to have negative effects. Katrakilidis and Trachanas (2012) employ a non-linear Autoregressive Distributed Lag (ARDL) model cointegration approach with data spanning from 1999M01 to 2011M05 and show that both the Consumer Price Index and the industrial production index exert asymmetric effects on house prices. Using hedonic pricing and spatial econometric models for Athens, Efthymiou and Antoniou (2013) provide evidence that proximity to transport infrastructure significantly influences house prices and rents. Panagiotidis and Printzis (2016) employ a two-stage Vector Error Correction Model (VECM) with data ranging from 1997M1 to 2013M12 and reveal that mortgage loans and retail trade have the highest impact on house price variation. In addition, Gounopoulos et al., (2019) examine the relationship between housing and stock prices and find a significant bidirectional nexus between the two markets using quarterly data over the period 1997Q1 to 2015Q2. Using a VAR framework and data over the period 2003Q1 to 2020Q3, Anastasiou and Kapopoulos (2023) find that negative financial stability shocks reduce both residential property prices and housing investment. Additionally, house prices are also determined by specific apartment characteristics. For example, Stamou et al., (2017) show that property age has a negative effect on prices, while larger surface area and better-quality features have a

positive impact. In a recent contribution, Kontonikas and Pyrgiotakis (2025) find that the Greek residential market has shifted from undervaluation toward overheating, with significant geographic heterogeneity and that government's subsidised housing loans programmes have not affected transaction values.[9]

3.3 Uncertainty and Housing Markets

Several scholars have turned their attention to the impact of uncertainty on housing activity and prices.[10] Although a large share of studies find that higher uncertainty reduces housing activity and prices, results are not unanimous and the net effect remains open to debate. This can be explained by two opposing mechanisms (see also Noh, 2020; Han, 2013 and Han, 2010). That is, on one hand, higher uncertainty reduces housing demand. When housing is seen as a consumption good, uncertainty about future income, prices, or economic conditions makes households more cautious, pushing prices downward. On the other hand, uncertainty can also stimulate demand if households view home ownership as a way to hedge against future housing costs or risks. In this perspective, housing is not only a consumption good but also an investment asset, often regarded as a durable and relatively safe store of value. On top of that, in more speculative markets, the negative effect of uncertainty on house price inflation may be weakened (Christidou and Fountas, 2018). For a comprehensive review of the transmission channels of uncertainty in house prices, interested readers can refer to Anastasiou et al. (2023).

Turning to the empirical evidence, recent studies provide important findings on the impact of uncertainty shocks on housing markets. Antonakakis et al. (2015) analyse housing market returns in the U.S. and show that their correlation with economic policy uncertainty is negative, time-varying, and becomes stronger during recessions. El-Montasser et al. (2016) investigate the causal relationship between economic policy uncertainty and house prices in a cross-country setting, while Bahmani-Oskooee and Ghodsi (2017) examine how the EPU index affects house prices across different states of the U.S. Using GARCH-based measures of uncertainty and the EPU index, Christidou and Fountas (2018) show that uncertainty raises housing investment growth but lowers house price inflation in most states of the U.S., with speculative markets offsetting the negative effects in some cases. Gholipour (2019) reports that EPU shocks decrease real estate activities in a panel of high-income and emerging economies during the period 1996-2016. Christou et al. (2019) show that uncertainty shocks mainly have a negative effect on housing variables such as prices, permits and starts, while the magnitude and the sign of the effect vary over time. Choudhry (2020) examines the effect of EPU on house prices in England and Wales, reporting a negative effect that holds in both the short and long run. In another contribution, Noh

[9] Earlier contributions of Kavarnou and Nanda (2014) and White and Papastamos (2018) use bank estimates of property values.

[10] Uncertainty has long been examined mainly for its effects on macroeconomic outcomes, among others (see also Fountas et al., 2002, Kontonikas, 2004, Baker et al., 2016, and Al-Thaqeb and Algharabali, 2019).

(2020) employs a Markov-switching VAR model and shows that house price uncertainty shocks in expansionary regimes increase residential investment, housing prices, and mortgage debt, while they have the opposite effects in recessionary regimes. Focusing on China, Li and Wu (2020) find that EPU has a negative effect on real estate development investment. Balcilar et al. (2021) follow a panel vector autoregressive framework and show that positive EPU shocks decrease house prices in 16 countries. Anastasiou et al. (2023) provide evidence that sentiment-driven shocks can significantly affect house price dynamics in the Eurozone. Fan et al. (2023) focus on G7 countries and find that EPU and house price volatility are positively linked. Nguyen and Vergara-Alert (2023) show that political uncertainty reduces house price growth and housing transactions, while increasing building permits, with effects stronger during high-uncertainty election years. Using the UK House Price Uncertainty index constructed by Yusupova et al. (2020), Balcilar et al. (2023) show that the impact of uncertainty on real house prices is negative and time-varying. Drawing on the same index, Cepni et al. (2025) find that uncertainty shocks reduce the synchronisation of regional house prices in the UK, with house price uncertainty having a stronger and more persistent effect than broader economic uncertainty. Kafka (2024) shows that EPU proxied by Hardouvelis et al. (2018) has a negative impact on the gross added value of the real estate sector. Baek et al. (2024) examine the non-linear effects of real estate uncertainty proxied by Nguyen et al. (2020) on the U.S. housing market and find that uncertainty shocks reduce house prices, housing starts, and construction employment, with effects being stronger and more persistent during recessions. Recently, Durmaz and Sun (2025) show that EPU has significant effects on housing markets across the Asia-Pacific region, with positive impacts in most countries, but negative effects in New Zealand and short-term declines in Australia.

4. The Construction of the HMU Index

One of the main objectives of this research is to develop a robust indicator designed to quantify uncertainty in the Greek housing market. To this end, this section presents the construction of the HMU index, which is proposed as a valuable tool for more effectively monitoring housing market dynamics in Greece.

The literature has developed several ways to quantify uncertainty, yet these measures do not all capture the same underlying concept. For instance, some measures focus on financial uncertainty, often proxied by stock or financial market volatility (e.g., Bloom, 2009), while others capture macroeconomic uncertainty (e.g., the forecast-error–based approach of Jurado et al., 2015). A large strand of the related literature measures economic policy uncertainty using text-based indices constructed from newspaper coverage (e.g., Baker et al., 2016). More recently, researchers have developed survey-based measures that employ subjective probability distributions (Altig et al., 2022). Notably, sector-specific indices have also emerged, including measures of housing market uncertainty, such as the Real Estate

Uncertainty index for the U.S. (Nguyen et al., 2020) and the House Price Uncertainty index for the U.K. (Yusupova et al., 2020).

To the best of our knowledge, no newspaper-coverage-frequency based uncertainty measure exists specifically for the Greek housing market. Instead, the literature so far has relied on broader measures, such as the Greek EPU index, to proxy uncertainty.[11]

In what follows, we build upon the newspaper textual analysis and coverage-frequency approach proposed by the seminal work of Baker et al. (2016). More specifically, we utilise the digitised archives of the printed version of the daily newspaper *Kathimerini* to identify relevant articles that respond to the appropriate query.[12] More specifically, we count the total number of articles that include at least one word for each of the three categories: (a) uncertainty, (b) housing market, and (c) policy. Table 1 includes the full set of words in each one of the aforementioned categories; the first column presents the words in Greek and the second column their respective English translation.[13] In order for an article to be eligible, it must contain words in all three categories. We also count the total number of articles published every month by the newspaper. Then, we scale the number of the HMU-eligible articles over the total number of articles.[14] This scaling is vital, since the volume of articles published by a newspaper changes over the years. Following this, we apply a standardisation to a mean 100 for the period until the beginning of the Greek debt crisis, following Fountas et al. (2018). The corresponding index covers monthly data starting from 2005M4 up to the time of writing.[15]

While relying on a single newspaper could be considered a limitation, this choice was dictated by the availability and accessibility of digitised archives for the printed versions. It is important to note that the selected newspaper is a nationwide, high-circulation daily newspaper in Greece, which enhances the credibility of the data source. Moreover, the EPU index for several countries has been constructed using a single leading newspaper, with strong support in the literature; see China and Russia by Baker et al. (2016), Ireland by Zalla (2017), Greece by Fountas et al. (2018). This further suggests that such indices can be robust even when based on one newspaper. The index shows clear peaks and troughs that align with significant economic events and housing policy interventions. In developing the index,

[11] In another contribution, Vasileiou et al. (2024) construct a sentiment index for the Greek housing market using internet search data from Google Trends.

[12] Kathimerini is a nationwide newspaper with long-standing coverage of economic and housing issues, and hence we believe that it acts as a suitable and representative source for capturing uncertainty-related keywords and articles.

[13] The search has been conducted in Greek.

[14] Since 2005, more than 7500 articles have been marked as eligible for our textual analysis.

[15] The index undergoes regular updates, ensuring that researchers can rely on the most up-to-date data for empirical analysis.

we calibrated our keyword selection through extensive testing, checking its sensitivity to alternative word choices, to ensure that the resulting measure is both robust and reliable.

We shed light on the behaviour of the HMU index in Figure 10. Higher index values indicate higher levels of uncertainty in the housing market. As shown, uncertainty tends to peak during periods of economic distress or following the introduction of new property-related taxes. In particular, the HMU index shows elevated and volatile values leading up to and during the early stages of the global financial crisis, consistent with findings in prior literature (Balcilar et al., 2023; Yusupova et al., 2017). A pronounced peak is observed in 2012, coinciding with a period of significant political instability. Further increases in HMU are associated with the implementation of new property taxes such as *charatsi*, introduced in September 2011, and *ENFIA*, announced in July 2013 and applied in January 2014, both of which correspond with sharp rises in market uncertainty. Between 2013 and 2018, the HMU evolves in a more stable manner, exhibiting lower volatility despite a period marked by high political uncertainty, including multiple national elections, a referendum, and the imposition of capital controls. Finally, the HMU index peaks during the COVID-19 pandemic and the energy crisis triggered by the onset of the Russia–Ukraine war.

To allow for a direct comparison between the economic policy-related uncertainty and the housing-specific uncertainty index, we present Figure 11. While the two measures broadly move together during certain episodes of increased uncertainty (such as around the beginning of the sovereign debt crisis period and the COVID-19 pandemic), they also exhibit notable differences. Notably, while the EPU index reflects substantial volatility during 2013-2019, the HMU index does not follow a similar pattern. This divergence aligns with the relatively low house price trends observed between 2013 and 2019. Overall, the EPU is more volatile, while the HMU is smoother and more persistent. The correlation coefficient between the HMU and EPU is approximately 0.44, indicating a relatively strong and positive correlation. Nonetheless, the correlation is not so high as to suggest redundancy or perfect overlap. This implies that while the two indices share common elements, they also capture distinct aspects of economic uncertainty, and thus underscoring the need for a categorical housing uncertainty index to better capture the dynamics of the housing market.

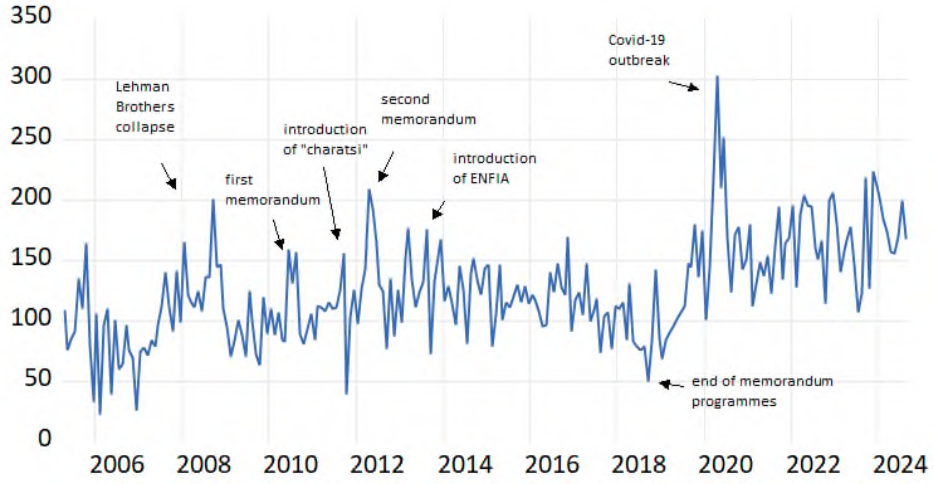


Figure 10: *The Housing Market Uncertainty Index*
Notes: Authors' own calculations, monthly frequency.

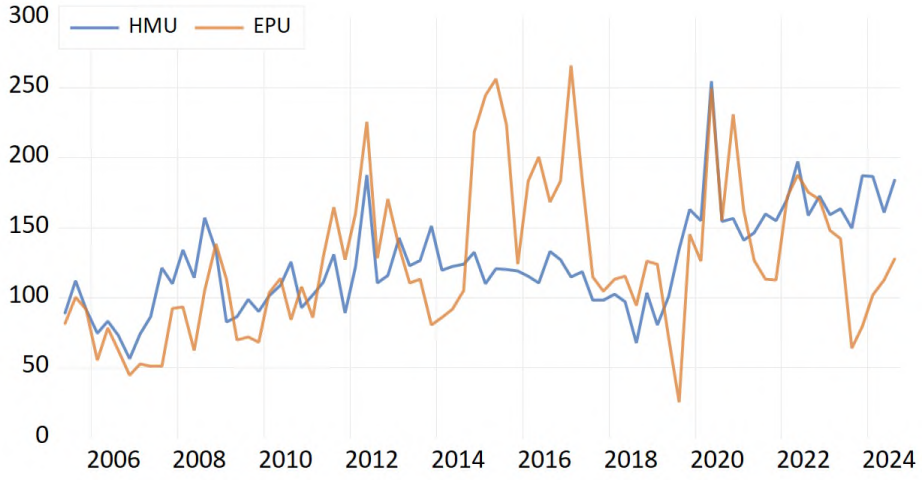


Figure 11: Comparison of the Housing Market Uncertainty index and the Economic Policy Uncertainty
Notes: Authors' own calculations, quarterly frequency. Data for the EPU index sourced from Fountas et al., 2018.

Table 1: Set of keywords

Keywords in Greek	English translation
- αβεβαιότητα, ανησυχία, αμφιβολία	- uncertainty, anxiety, doubt
- σπίτι, οικία, κατοικία, ακίνητο, μεσίτης	- home, house, residence, property, real estate agent
- πολιτική, μεταρρύθμιση, ΤτΕ, Τράπεζα της Ελλάδος, φόρος, επιτόκιο, χαράτσι, στεγαστικό δάνειο	- policy, reform, BoG, Bank of Greece, tax, interest rate, charatsi, residential loan

Notes: Any derivative of these Greek words is also included in the query.

5. Methodology

5.1 Data

We utilise quarterly data for the Greek economy over the period 2006Q2 to 2023Q4 from several sources.[16] Specifically, we capture housing uncertainty in Greece with the HMU index, broader economic policy uncertainty with the Greek EPU index (Fountas et al., 2018), and foreign policy uncertainty with the U.S. EPU (Baker et al., 2016). As far as house prices are concerned, we use residential house price indices data from the Bank of Greece and deflate them into real values using the Consumer Price Index (CPI) from the Hellenic Statistical Authority (ELSTAT). We collect data on overall prices, prices for old and new dwellings, as well as price data for specific geographical areas, including Athens, Thessaloniki, major urban areas, and other cities. Regarding the age distinction, new dwellings refer to dwellings of up to 5 years old, while old dwellings refer to those older than 5 years. In addition, we collect data for residential loans from the Bank of Greece, the volume of construction from the Federal Reserve Economic Data (FRED), the unemployment rate and GDP from ELSTAT and M1 as an indicator of money supply from the Bank of Greece.[17] Table 2 reports descriptive statistics.

[16] The first observation appears in 2006Q1, as no quarterly house price data are available prior to that date. However, since we take growth rates for some variables, the first effective observation is 2006Q2.

[17] In the empirical analysis, the variables of interest are expressed in logs. In addition, we construct the growth rates of residential loans, construction volume, GDP, and M1 by taking log differences. The quarterly frequency is derived by averaging the monthly observations for the HMU and the EPU indices, the unemployment rate and money supply.

Table 2: Descriptive Statistics

Variable	Observations	Mean	Std. dev.	Min	Max
HMU Greece	71	124.867	33.972	56.619	254.809
EPU Greece	71	129.479	55.651	25.404	265.753
EPU U.S.	71	150.138	59.573	52.089	401.716
House Prices, Total	71	70.219	16.405	52.505	101.137
House Prices, Athens	71	69.832	16.934	50.103	101.137
House Prices, Thessaloniki	71	66.528	17.712	48.59	102.329
House Prices, Big cities	71	70.460	16.151	54.73	101.238
House Prices, Other cities	71	72.322	15.627	57.133	102.037
House Prices, New Dwellings	71	72.005	15.883	54.107	100.635
House Prices, Old Dwellings	71	69.094	16.755	51.526	101.516
Loans (Growth)	71	-0.004	0.044	-0.18	0.137
Construction Volume (Growth)	71	-0.017	0.114	-0.307	0.321
Unemployment (Growth)	71	0.002	0.052	-0.136	0.140
Money Supply M1 (Growth)	71	0.008	0.030	-0.056	0.099
GDP (Growth)	71	-0.003	0.026	-0.148	0.056

Notes: Sample: 2006Q2 - 2023Q4. Growth rates of the variables Loans, Construction Volume, Unemployment, Money Supply M1, and GDP are computed as log differences.

5.2 Linear model

To examine the effect of housing uncertainty shocks on housing market variables, we employ a linear Local Projections (LP) specification and the corresponding Impulse Response Functions (IRFs), as introduced by Jordà (2005). While a large body of the literature relies on VAR frameworks to study the effects of exogenous shocks, more recent contributions highlight that these models may impose relatively strong dynamic structure, which can be restrictive in some applications. LPs provide a complementary approach that is more flexible and robust to model specification, making them particularly well-suited for our analysis.[18]

[18] For a review of the topic, interested readers can refer to Plagborg-Møller and Wolf (2021), Jordà and Taylor (2025) and Montiel Olea et al. (2025), among others.

More specifically, at time *t* and horizon *h*, the linear model is given as follows:

$$Y_{t+h} = \alpha_h + \beta_h y_t + \gamma_h X'_t + \delta_h Z'_t + \epsilon_{t+h}$$

where Y_{t+h} is the outcome variable of interest (in our case, house prices), y_t is the shock variable (in our case, the HMU index), X_t is a vector of endogenous variables, other than the shock variable (e.g., housing market related variables, in our case, the growth rates of residential loans and construction volume), and Z_t is a vector of exogenous variables (e.g., a set of exogenous macroeconomic variables, in our case, the growth rates of unemployment and money supply). α_h is the vector of constants, and the IRFs for the LP model are estimated as a sequence of β_h, which have been individually estimated using Ordinary Least Squares (OLS) for each horizon h.

5.3 State-dependent model

To deepen our analysis of the role of housing uncertainty shocks, we extend the baseline linear specification by employing a non-linear, state-dependent LP framework (Auerbach and Gorodnichenko, 2012; Jordà, 2005). In particular, this approach allows impulse responses to vary across regimes and thus enables us to capture potential asymmetries in the relation of interest. In our case, regime switches are determined by a smooth transition function (see also Adämmer, 2019 and Auerbach and Gorodnichenko, 2012).[19] The *state-dependent* LP model is described as follows:

$$Y_{t+h} = (1 - F(z_{t-1}))(\alpha_h^1 + \beta_h^1 y_t + \gamma'^1_h X_t + \delta'^1_h Z_t) + F(z_{t-1})(\alpha_h^2 + \beta_h^2 y_t + \gamma'^2_h X_t + \delta_h^2 Z_t) + \epsilon_{t+h}$$

where the smooth transition function $F(z_t) = exp(-\gamma z_t)/(1 + exp(-\gamma z_t)), \gamma > 0$ and z_t is the switching variable. $F(z_t)$, takes values between 0 and 1 and can be interpreted as the probability of being in a specific regime. For instance, when it approaches 1, the system is more likely to be in one regime, whereas values close to 0 indicate a higher probability of the alternative regime. In our case, we consider two types of regime switches, one based on the state of the economic cycle using GDP growth as the regime variable, and another one based on foreign uncertainty, captured by the U.S. EPU index.

5.4 Time-varying model

Following the linear and state-dependent LP specifications, we further investigate the housing market dynamics by applying a Time-Varying Parameter Local Projections (TVP-LP) methodology, aiming to shed further light on the time-varying dynamic nature of the impact of uncertainty on Greek house prices. Inoue et al. (2024) proposed the TVP-LP framework

[19] Regime switches can also be determined by a dummy variable specification. Our findings are robust to the choice of regime-switching specification.

to account for broader sources of instability, assuming that the parameters of the model change over time (t) independently of any macroeconomic variables, in a deterministic way.

The TVP-LP model is then given by the following equations:

$$Y_{t+h} = \alpha_{t+h} + \beta_{h,t+h} y_t + \sum_{j=1}^{m} \gamma'_{j,t+h} z_{t-j} + v_{t+h}$$

$$IRF(h) = \beta_{h,t+h}$$

where y_t denotes shock variable (in our case, the HMU index) Y_{t+h} the outcome variable (in our case, house prices), $h = 0,1,2,\ldots$ is the horizon, m is the number of lags of the control variables, and z_{t-j} is the vector of control variables (in our case, the growth rates of residential loans, construction volume, unemployment and money supply). The time-varying impulse response $\beta_{h,t+h}$ is the parameter of interest, and α_{t+h} denotes the constant term.

6. Findings

6.1 Linear analysis

We begin our analysis with respect to the Linear LP model[20]. Figure 12 presents the respective LP IRFs of the variables of interest following a one-standard-deviation shock in HMU (see panels a, b, and c) and the responses of house prices to one-standard-deviation shocks of other endogenous variables (see panels d and e). [21] [22]

Starting with panel (a), the response of house prices to an HMU shock is positive and close to zero for the first few horizons after the shock, however, not statistically significant. After horizon 7, the response becomes negative, but remains insignificant until horizon 15, thereafter it becomes significant. The effect grows stronger over time, reaching a trough of about –2% after 4.5 to 5 years (18–20 quarters). Overall, housing uncertainty shocks affect prices with a lag, with the negative response being persistent and economically meaningful, in the medium- to long-horizon. As previous literature suggests, there are different channels through which a positive uncertainty shock affects house prices. For instance, if housing is considered as a durable consumption good then prices will fall, while in cases when housing is perceived as a safe-haven investment asset prices will increase (Christidou and Fountas, 2018; Anastasiou et al., 2023).

[20] A summary of the results can be found in Table A1 of the Appendix.

[21] Confidence intervals for all IRFs in the analysis correspond to the 68% confidence level. Responses are statistically significant when their corresponding confidence intervals do not include zero.

[22] The lag length was set to 1, based on standard information criteria.

Moving on to panel (b), the responses of the growth rate of construction volume fluctuate highly, revolve around zero and change signs. Overall, the evidence suggests that housing uncertainty shocks do not have a systematic or persistent effect on construction activity in the linear analysis. While the point estimates imply some short-lived positive responses followed by negative swings, the lack of significance in some horizons implies that these movements should be interpreted with caution.

Focusing on panel (c), the results imply that housing uncertainty shocks generate an immediate reduction in the growth rate of residential loans and the initial tightening seems to be corrected over the medium run. Specifically, in the short horizon (up to 3 quarters), the responses are negative and significant, meaning that the growth rate of residential lending decreases. In the quarters that follow, the response fluctuates around zero and is mainly not statistically significant, with the exception of quarters 8-10 when there is a short-lived positive response.

Panel (d) of the figure illustrates how house prices respond to a shock in the growth rate of construction volume. Even though the first reaction of house prices in this case is slightly positive, this response is not statistically significant. From the third quarter onward, the effect turns and remains negative, and is actually significant for most of the horizons (quarters 8 to 18), before fading out in the final horizons. This figure implies that an increase in construction volume growth, exerts downward pressure on house prices.

Panel (e) of the figure displays the response of house prices after a positive shock in the growth rate of residential loans. In the short run greater residential lending slightly increases house prices, followed by a statistically significant decline at longer horizons.

To explore whether uncertainty shocks affect house prices heterogeneously across geographical areas or by dwelling age, we replicate the aforementioned analysis using different types of house price indices. In the first case, we replace the aggregate house price index with a regional price index that controls for prices in Athens, Thessaloniki, major cities, and other areas, while in the second, we replace it with the price index for new and old dwellings, and run the estimations separately. For comparison, we present the responses of regional prices to a one-standard-deviation HMU shock together in panel (a) of Figure 13, and the corresponding responses for new and old dwellings in panel (b) of the same figure.

Although the findings broadly follow the patterns observed when the total price index was taken into account, the responses reveal substantial geographical heterogeneity. In the medium and long run, the decline is most pronounced in Athens, where a one-standard-deviation shock to housing market uncertainty reduces prices by 2.5% after 20 quarters, followed by Thessaloniki, where the decline is slightly smaller. In contrast, the response is more moderate in other big cities and in smaller cities where the decline is around 1.5% after 20 quarters.

Focusing on the comparison between new and older dwellings, the IRFs exhibit similar dynamics which are in line with the aggregate results, while at the same time provide further insights. Both categories of dwellings experience little to no reaction in the short run, exhibiting an initial response close to zero, which temporarily and slightly becomes positive between quarters 4 and 7. From quarter 8 onward, however, the response becomes negative, and house prices for both new and old dwellings begin to decline sharply after quarter 16. Interestingly, the responses of new dwellings become more pronounced, indicating that house prices for properties built within the last five years are more vulnerable to housing uncertainty shocks in the longer horizon compared to the prices of older dwellings.

6.2 State-dependent analysis

Since our linear model findings provide an average response that smooths over different conditions, this could potentially underestimate the real impact of a housing uncertainty shock. For this reason, we allow IRFs to vary depending on a regime variable. Starting with the real GDP growth as the switching variable, we present the corresponding IRFs in Figure 14. The blue responses correspond to the low regime (in this case, a recession or a period of relatively low level of economic growth), while the red responses refer to the high regime (in this case, an expansion or a period of relatively high level of economic growth). Consistent with the linear presentation of the results, panels (a), (b) and (c) provide the IRFs of the variables of interest to a one-standard-deviation shock of the HMU index, while panels (d) and (e) illustrate the IRFs of house prices to a construction volume or a residential loan shock of one standard deviation, respectively.

Starting with panel (a), during periods of relatively low economic growth, a positive housing uncertainty innovation generates an immediate negative impact on house prices. This impact reflects the role of housing as a consumption good: when uncertainty rises, households increase precautionary savings and reduce spending on housing, which lowers housing demand and house prices. In contrast, during expansionary periods, house prices respond positively. This may reflect housing's role as a relatively safe investment, encouraging portfolio shifts toward real estate. However, stronger incomes, easier credit, greater risk tolerance, and optimistic price expectations may also contribute to the increase. Considering panel (b), the responses of the growth rate of construction volume to HMU shocks fluctuate without clear patterns in both regimes. On average, however, the responses are smaller in magnitude in the low-growth regime compared to the high-growth one. Turning to residential loans, in panel (c), HMU shocks generate negative responses in both regimes in the short run. The decline is stronger and more immediate in the low-growth regime in the first 2 quarters, highlighting tighter credit conditions in recessions. In contrast, during expansionary periods, the initial decline is milder in the first two horizons but becomes more pronounced at later horizons, suggesting a delayed tightening effect in residential loans. With regard to panel (d), house prices respond positively to a construction volume shock during expansionary periods. In contrast, during recessions the response is

negative, suggesting that additional supply exerts downward pressure on house prices. Examining panel (e), house prices respond positively to shocks in the growth rate of residential loans during expansionary periods, reflecting that stronger credit growth fuels housing demand, which in turn increases prices. In contrast, in the low-growth regime the response is negative, suggesting that increases in loan growth during recessions reflect a downward pressure on house prices.

We now turn our attention to the role of the external environment, specifically, foreign uncertainty, in shaping housing dynamics in Greece. Previously, the regimes were defined by the domestic GDP growth, which reflects the state of the business cycle the local economy is in. Now, the level of foreign uncertainty, proxied by the U.S. EPU, determines the regime, instead. Figure 15 reports the corresponding IRFs, where the blue lines correspond to periods of low U.S. uncertainty and the red lines correspond to periods of high U.S. uncertainty. Several important findings emerge.

First, HMU shocks depress house prices more strongly when foreign uncertainty is relatively high, with a lag of approximately 8 quarters (panel a). Second, HMU shocks appear to affect the growth rate of construction activity more strongly in the low regime, where responses fluctuate with larger magnitude, while in the high regime the effects remain smaller and turn negative in the medium run (panel b). Third, HMU shocks reduce residential loan growth more strongly when U.S. uncertainty is relatively low (panel c). Fourth, a shock to construction volume growth lowers house prices under relatively low foreign uncertainty, but raises them under the high regime (panel d). Finally, a residential loan growth shock increases house prices in the high-uncertainty regime but decreases them in the low-uncertainty regime (panel e).

We now turn our attention to the regional dimension and the distinction between old and new dwellings. As before, we take into account two different regime specifications. In the first case presented, in Figure 16, the regime is determined based on the GDP growth of Greece, while Figure 17 illustrates the U.S. EPU regime specification. The dashed lines correspond to the LP IRFs under the high regime, while the solid lines represent the low regime.

The results broadly mirror the findings with respect to the aggregate price indices under their respective regime specifications, confirming the robustness of the patterns observed at the national level. Importantly, regional and dwelling-type heterogeneity is clearly evident. The magnitude of the responses differs across the two regime specifications, but the key message remains that metropolitan areas are more vulnerable to uncertainty shocks. In particular, Athens and Thessaloniki once again exhibit the largest and most persistent declines.

6.3 Time-varying analysis

In this subsection, we turn to the time-varying analysis, to provide further insights into the dynamic impact of housing uncertainty on house prices over time. We provide the corresponding time-varying LP IRFs of house prices following a one-unit shock in HMU in the following figures.[23] In Figure 18, the multiple-coloured lines represent the responses at different horizons (up to 20 quarters) ahead, with each colour representing one specific horizon.[24] We directly observe that the responses vary significantly over time, both in terms of magnitude and sign. The response of house prices is closer to zero, either positive or negative, until 2010, it becomes negative during the sovereign debt crisis, and turns positive during the recovery period and the Covid-19 pandemic. Connecting the above to the findings in Figure 14, during the debt crisis, when the economy was facing low growth levels, rising uncertainty contributed to the downward pressure on house prices. This effect reflects reduced housing demand, consistent with the interpretation of housing as a durable consumption good.

Figure 19 illustrates the response of house prices after a one-unit shock in HMU at selected horizons; that is, panel (a) for horizon 1, panel (b) for horizon 10, panel (c) for horizon 15, and panel (d) for horizon 20. The solid lines represent the responses, the dashed lines depict the lower and upper bounds, and the bar chart in the background reports the value of the HMU index.

Specifically, in the short- and medium-term horizons (horizon 1 and horizon 10, respectively), we observe significant time variation of the responses only at the beginning of the sample and in early 2020. However, in the 15-quarter horizon, the responses to HMU shocks are time-varying and significantly negative during the Greek debt crisis, specifically between 2011 and 2014. For instance, a one-unit HMU shock in 2013Q1 will affect prices by approximately 2%, 15 horizons after the shock. This response persists and increases until the 20th horizon, as panel (d) shows, where the highest negative values are identified in 2012 and 2018. In the 20-quarter horizon, we identify the longer periods of significant time variation of the responses, since after 2011 and until the end of the examined period, the zero line is outside the bounds. We can thus conclude that the time variation of the responses of house prices to HMU shocks is more intense in longer horizons rather than in shorter ones. Remarkably, the effect of HMU on house prices is time-varying and more profound during the Greek debt crisis period with the effect taking place in longer horizons.

[23] These graphs were replicated in STATA following Saadaoui et al. (2025), utilising the code provided in www.jamelsaadaoui.com.

[24] The responses at horizons after the shock refer to quarters ahead of each point in time within our sample. This explains why some response lines end before the end of our sample.

6.4 Robustness checks

Having established significant patterns in housing market dynamics and the transmission of housing uncertainty shocks to housing-related variables, we now provide further robustness checks to reinforce our analysis.

To start with, we first replicate the analysis using a broader measure of uncertainty, the EPU index, instead of the HMU index. As far as the linear estimation is concerned, EPU shocks reduce house prices more persistently, but with a lower magnitude (Figure 20). It is worth noting that when we allow for state-dependence in our model, the evidence for differences across regimes is rather limited. As presented in Figure 21 in panel (a), we find that EPU shocks exert significant negative effects on house prices, although the significance varies across horizons. In the low-growth regime, the responses are significant only in the medium term (horizons 11–14), while in the high-growth regime they are significant in the early horizons. When we define regimes based on the U.S. EPU in Figure 22 in panel (a), the responses to EPU shocks are mainly significant and negative during the high foreign uncertainty regime in the medium and long run.

Bearing in mind these differences, we consider it important to examine the HMU cleared from any EPU components. We thus regress the HMU index on the EPU index and use the residuals (that is, the component of HMU not explained by general policy uncertainty, hereafter referred to as net HMU) as an alternative measure of housing uncertainty. Re-estimating our models with this residual-based index yields qualitatively similar results in the linear case (panel (b) in Figure 20), offering further credibility to our baseline findings. When it comes to the regime specifications though, we see clear support in favour of the HMU index against the EPU index, since the net HMU leads to clearer evidence of regime dependence. Panels (b) in Figure 21 and Figure 22 demonstrate that in both regime specifications, the impact of clear housing market uncertainty on house prices exhibits strict regime dependence, further supporting the robustness of our baseline model.

Finally, with respect to the time-varying analysis in the cases of EPU and net HMU, evidence shows that the impact of uncertainty on house prices varies over time, with the sovereign debt crisis and the COVID-19 pandemic periods being the main drivers--similar to the HMU results. These robustness findings further strengthen the interpretation of our main findings.[25]

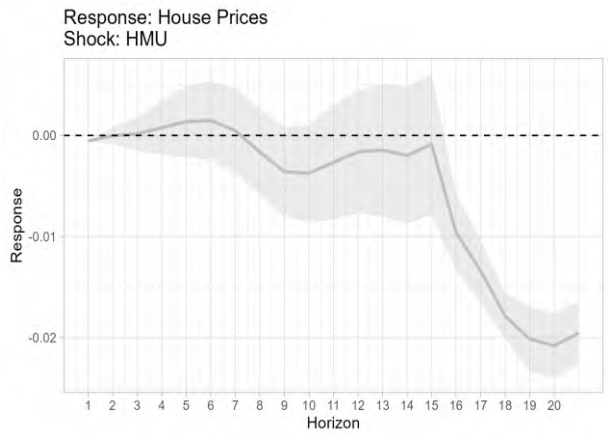
6.5 Comparison with other housing uncertainty indices

Even though the existing housing-market-specific uncertainty indices are limited to the Housing Price Uncertainty (HPU) index for the UK (Yusupova et al., 2020) and the Real Estate Uncertainty (REU) index for the U.S. (Nguyen et al., 2020), comparing our results to these

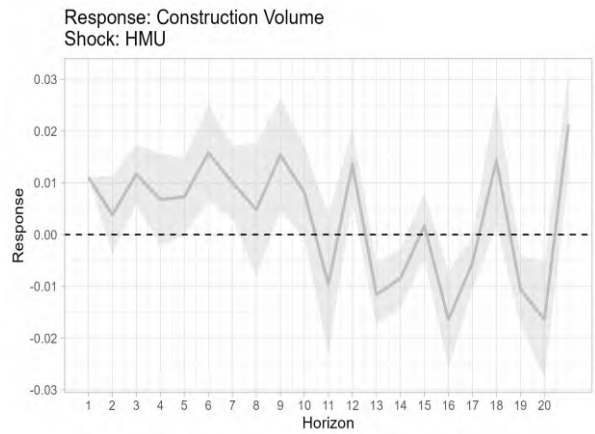
[25] These findings are available upon request.

cases provides significant insights and situates the HMU better in the global housing market landscape. To begin with, the HPU for the UK is a newspaper-frequency-based housing uncertainty index, similar in construction to the HMU, which demonstrates significant rises prior to recessionary periods in the country. Yusupova et al. (2020) identify a few triggers of housing uncertainty, like domestic political situations, negotiations with the EU and the Brexit, which resonates with the Greek case, where the HMU index peaks during political events or at the beginning of the GFC, even though the levels are more moderate later during the Greek debt crisis. Balcilar et al. (2023) examine the impact of HPU and EPU on real house prices in the UK. Applying a time-varying framework, they find a negative impact in both cases, highlighting, however, the importance of the HPU index in the framework. This finding is in line with the negative sign of the impulse responses of real house prices to HMU shocks in Greece in most of the cases that we examine. They also find evidence of time-varying nature of the causality that they examine, corroborating the time-varying nature of our impulse responses.

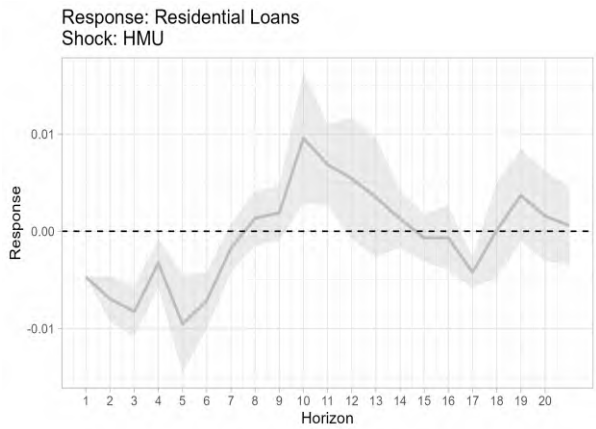
Building more on the global comparison framework, the Real Estate Uncertainty (REU) index for the U.S. (Nguyen et al., 2020), developed using the methodological framework of Jurado et al. (2015), indicates significant elevation in housing uncertainty levels at the onset of crises, and in particular of the Great Recession. These elevated levels persist in the post-crisis period, a finding that makes sense in the U.S. context, given that a housing market bubble was a principal trigger of the crisis, which was not the case for the Greek debt crisis, during which the HMU levels remain relatively stable. Nguyen et al. (2020) examine the impact of the REU on house prices and housing starts in the US, using impulse responses, and they find a negative impact in both cases. In fact, the duration of this impact is long-lasting (60 and 36 months respectively). Our findings similarly reveal negative long-run responses of house prices to housing uncertainty shocks; however the response is not significant in the short run for the case of Greece. Regarding the housing starts, however, in contrast to the U.S. case, Greek construction volume does not show a clear pattern. However, when the U.S. EPU is high (Figure 15) the construction sector in Greece responds clearly negatively to HMU shocks, a pattern that may relate to the dynamics connected to Nguyen et al. (2020).



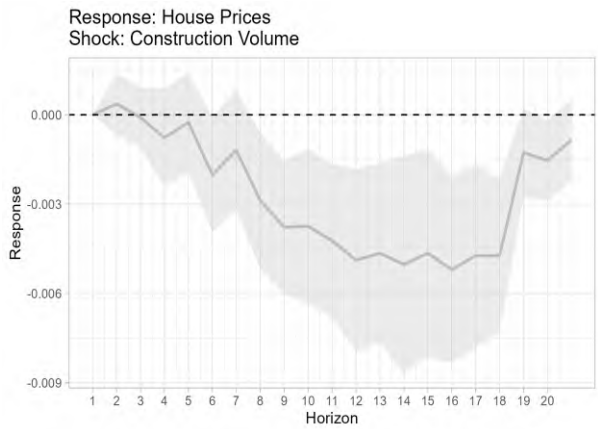
(a)



(b)



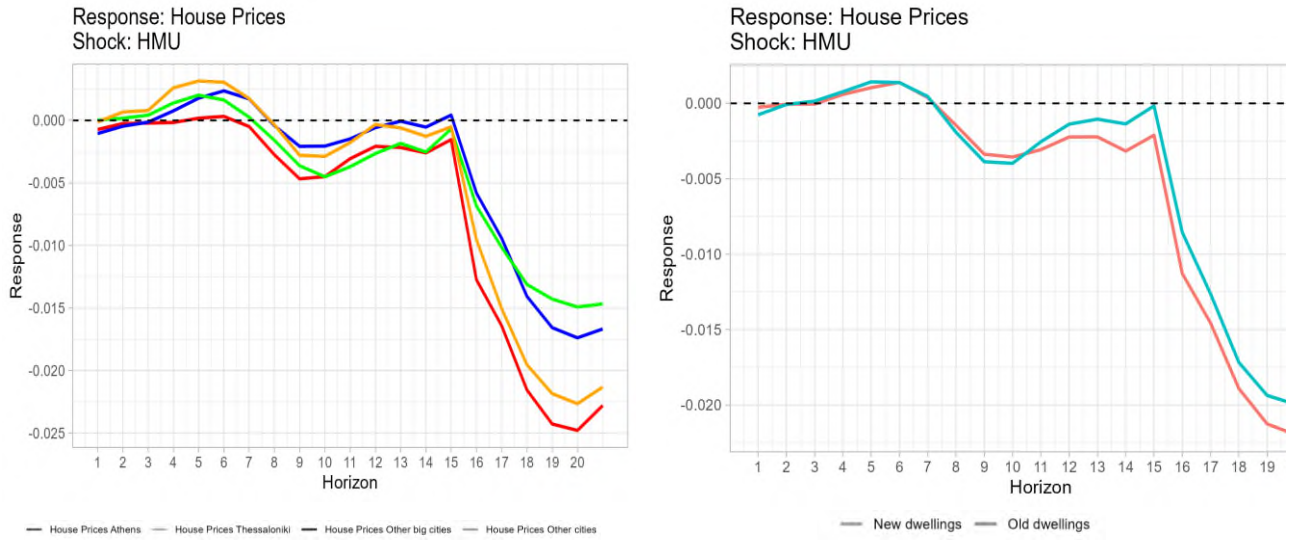
(c)



(d)

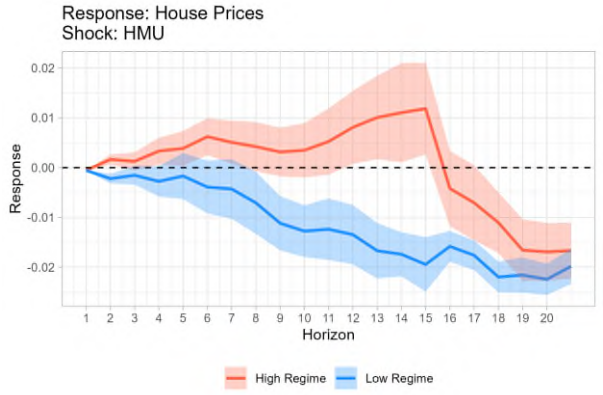
(e)

Figure 12*:* Linear LP IRFs

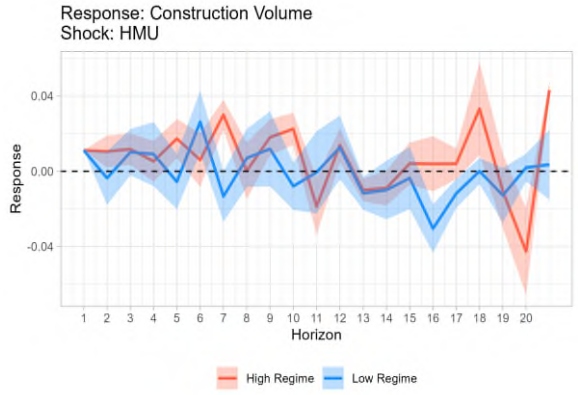


(a) **(b)**

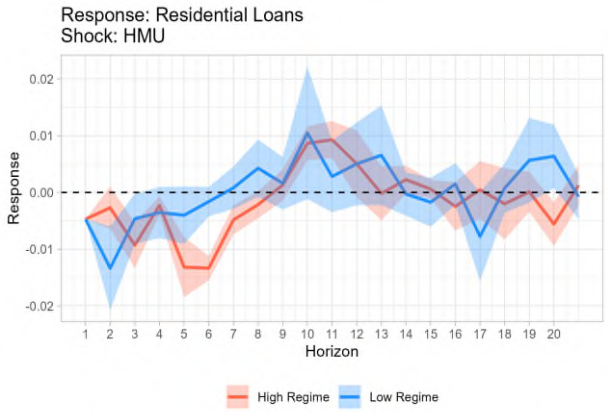
Figure 13*:* Linear LP IRFs by region and dwelling type



(a)



(b)



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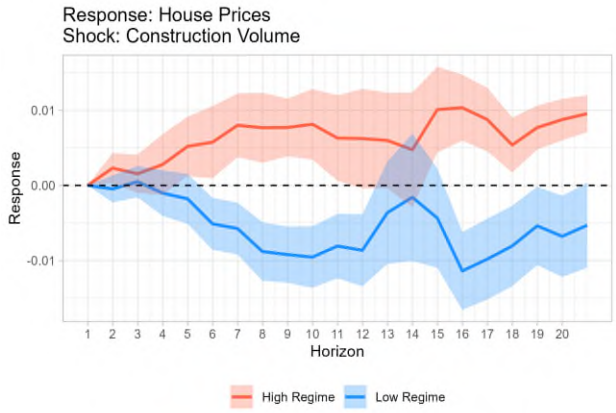

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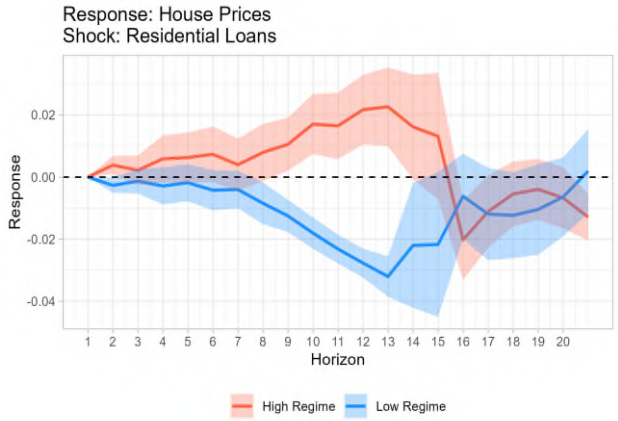
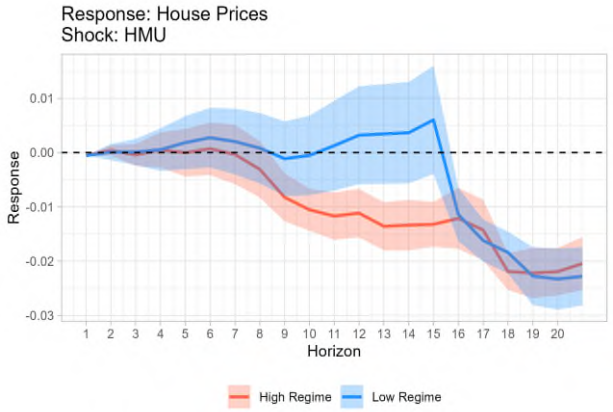
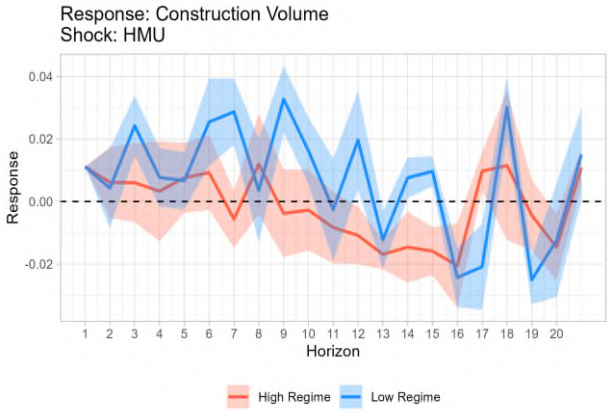


(e)

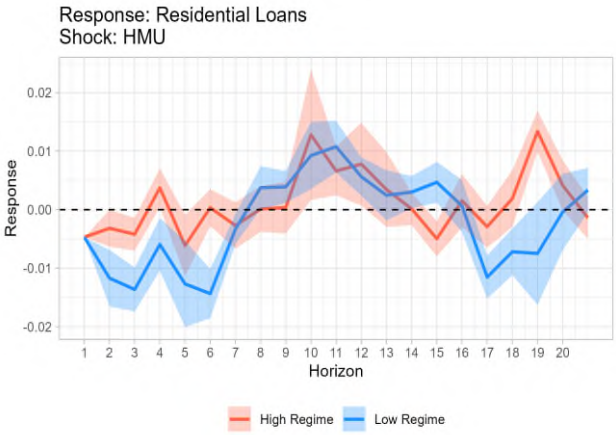
Figure 14*:* State-dependent LP IRFs with regimes defined by GDP growth



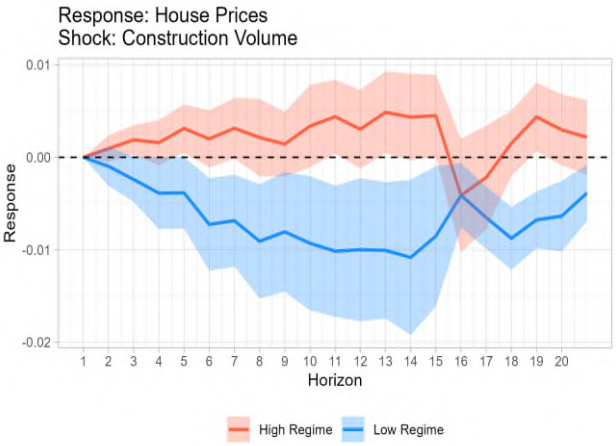
(a)



(b)



(c)



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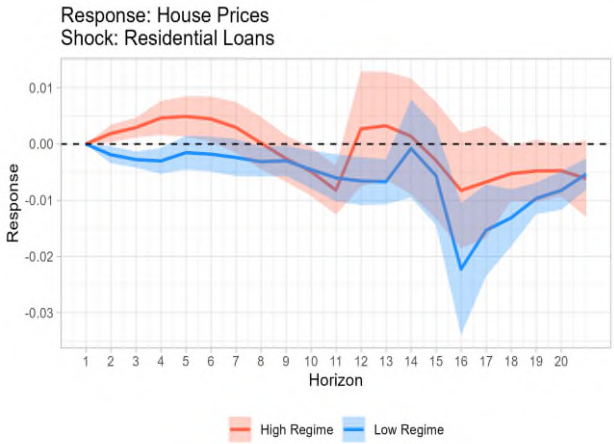
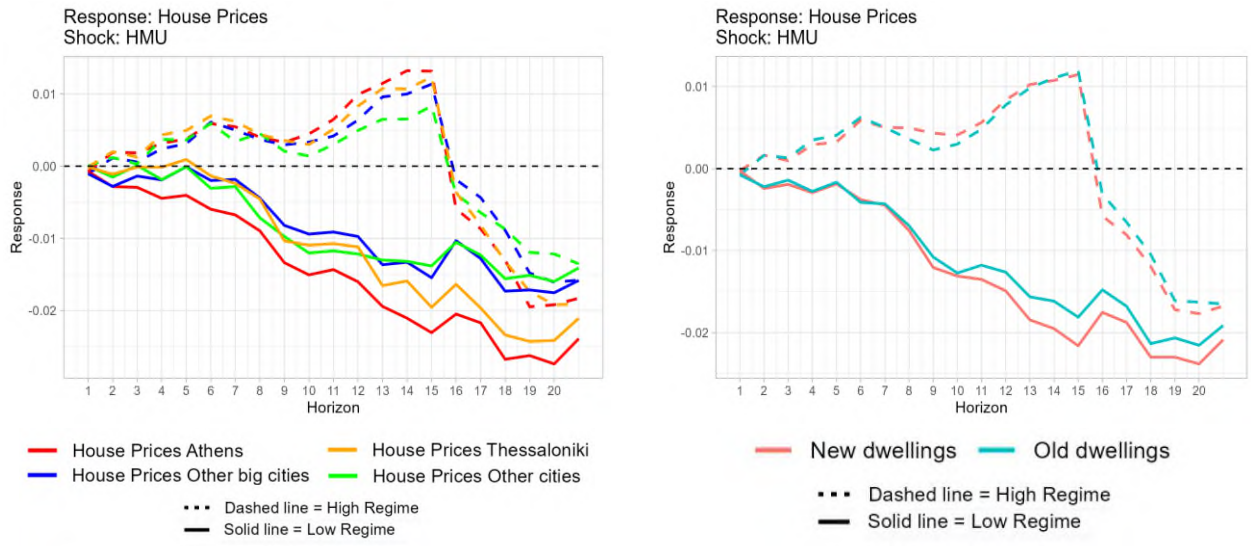


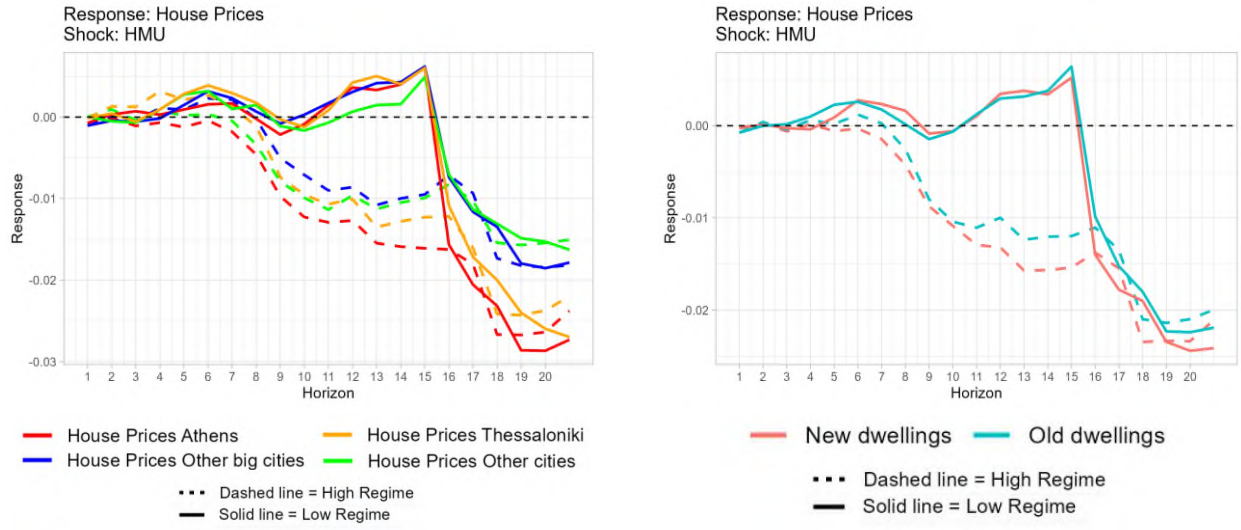
(e)

Figure 15*:* State-dependent LP IRFs with regimes defined by U.S. EPU



(a) **(b)**

Figure 16: State-dependent LP IRFs by region and dwelling type with regimes defined by GDP growth



(a) **(b)**

Figure 17*:* State-dependent LP IRFs by region and dwelling type with regimes defined by U.S. EPU

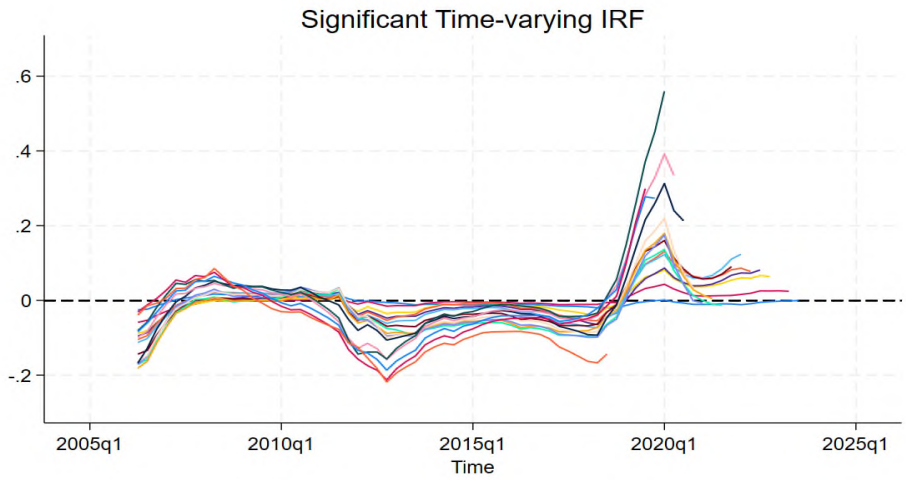


Figure 18*:* Time-Varying LP IRFs

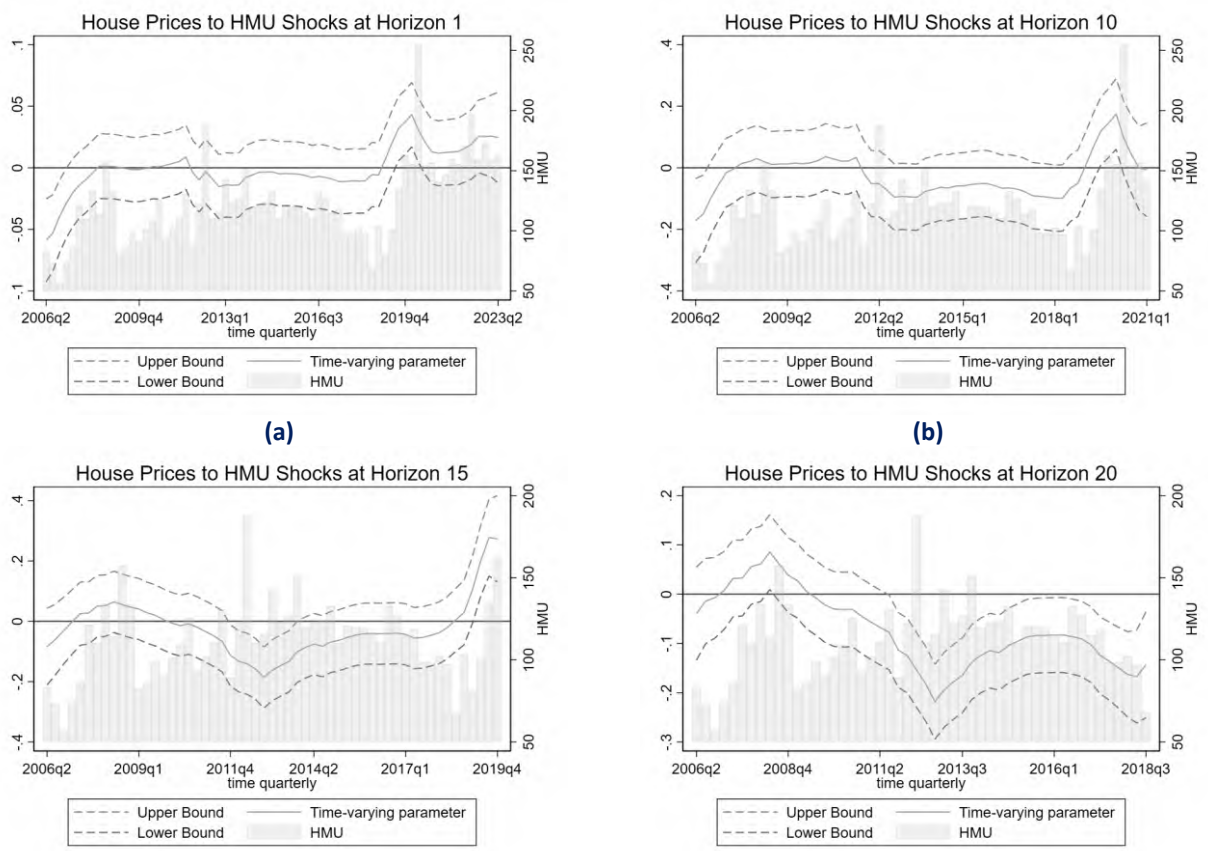
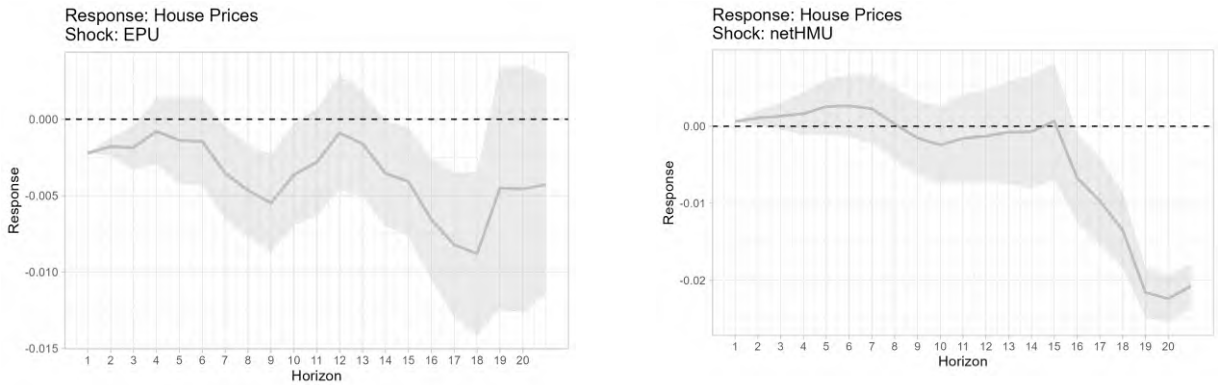


Figure 19: Time-Varying LP IRFs, selected horizons

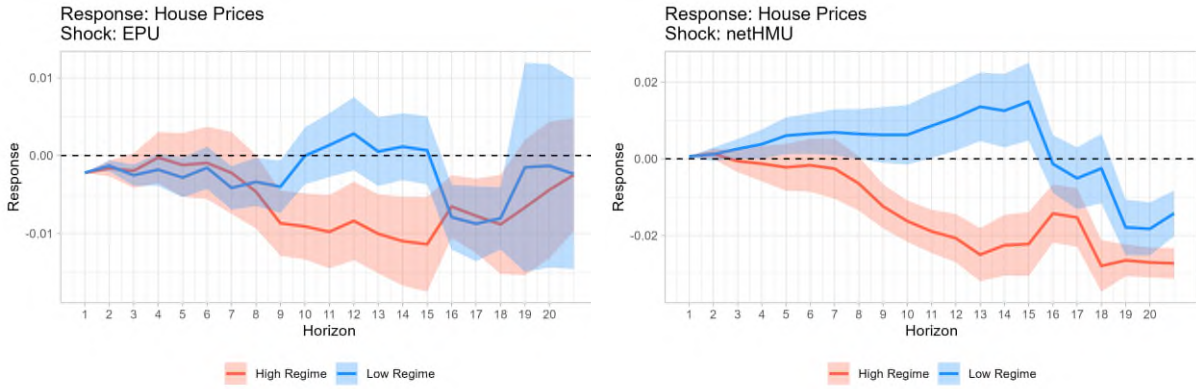


(a) EPU shock **(b) Net HMU shock**

Figure 20: Linear LP IRFs, EPU and net HMU

(a) EPU shock **(b) net HMU shock**

Figure 21: State-dependent LP IRFs with regimes defined by GDP growth



(a) EPU shock **(b) net HMU shock**

Figure 22*:* State-dependent LP IRFs with regimes defined by U.S. EPU

7. Conclusions

The importance of housing for social well-being and economic development is well established, yet its underlying dynamics and sources of uncertainty remain under investigation for both researchers and policymakers. The case of Greece is particularly interesting but also complex, as decades of crises, austerity, policy reforms, and external shocks have shaped the housing market, creating strong needs for policy action.

In this paper, we contribute to this direction by constructing, for the first time, the Greek Housing Market Uncertainty index, a newspaper-based monthly measure that captures uncertainty specific to the housing market. Although the index is based on a single nationwide newspaper due to archive availability, extensive keyword testing and robustness checks ensure that the measure remains credible and informative. The index, together with alternative measures of uncertainty (such as the EPU index by Fountas et al., 2018) and existing monitoring tools, provides a valuable instrument for policymakers and researchers to better monitor risks and dynamics in the Greek housing market.

Our analysis provides additional important contributions. First, we show that house prices respond negatively to HMU shocks, albeit with a lag, with the effect becoming significant after 15 quarters. Our findings are consistent with studies showing the effect of uncertainty on housing activity and prices is mainly negative (e.g., Cepni, et al., 2025; Balcilar et al., 2021; Choudhry, 2020). Construction volume reacts in a less systematic way, while residential loans show an immediate and significant reduction in the short run. The latter is consistent with studies showing that higher uncertainty reduces the probability of new loans (e.g., Kara and Yook, 2023; Alessandri and Bottero, 2020).

Second, we highlight that the role of regimes is of vital importance. We account for two types of regimes: one based on the domestic state of the economy and one based on foreign uncertainty. The results show that regimes matter significantly. During periods of low economic growth, HMU shocks generate an immediate negative impact on house prices, while during expansionary periods the response is initially positive. For residential loans, the tightening is more immediate in the low-growth regime, while during high-growth regimes the decline appears with a lag. When regimes are defined by foreign uncertainty, HMU shocks depress house prices more strongly when U.S. uncertainty is high while the effects on construction activity are higher in magnitude and more volatile under the low foreign uncertainty regime. HMU shocks decrease residential loan growth more in periods of relatively low foreign uncertainty. These findings provide important insights for the Greek housing market and are in line with earlier contributions (e.g., Baek et al., 2024; Noh, 2020), which also emphasise that uncertainty shocks in the U.S. affect housing dynamics heterogeneously across regimes.

Third, recognising geographical or property-type heterogeneity is equally important, since the Greek housing market does not respond uniformly across regions or dwelling types. Our

results show that Athens and Thessaloniki face stronger and more persistent declines compared to smaller cities, while newer dwellings appear more vulnerable to uncertainty shocks compared to older ones. This suggests that one-size-fits-all housing policies may not be appropriate in the Greek case. Our findings are consistent with recent contributions which underscore the importance of taking into account geographical heterogeneity in housing market studies in Greece (e.g. Kontonikas and Pyrgiotakis, 2025; Doumpos et al., 2021), as well as with studies showing that the behaviour of house prices and related variables is sensitive to regional differences in other countries such as the U.S. (e.g. Baffoe-Bonnie, 1998).

Fourth, capturing the time-varying nature of uncertainty effects is crucial, as the sensitivity of house prices changes significantly across different periods. Our findings show that the effect of HMU shocks on house prices is not constant but time-varying, with the long-run negative effects being particularly pronounced during the Greek debt crisis. This underlines the importance of accounting for the evolving nature of uncertainty, consistent with related contributions which show that uncertainty does not affect housing markets in a stable way over time (e.g., Christou et al., 2019; Antonakakis et al., 2015).

When comparing HMU with EPU, we find that EPU shocks reduce house prices more persistently, but with a smaller magnitude. This weaker effect is consistent with Cepni et al. (2025) in the UK context. At the same time, once state dependence is introduced into the model, the differences between regimes appear limited. The latter highlights the greater relevance of housing-specific uncertainty as a policy tool and as a more precise indicator of housing-market dynamics.

The results of this project point to several important policy implications. Policymakers should integrate housing-specific uncertainty into their monitoring frameworks, as the HMU index captures sector-specific risks that broader uncertainty measures overlook. The evidence also highlights the need for regime-sensitive policy interventions: uncertainty has stronger negative effects on house prices when economic growth is weak or foreign uncertainty is high, whereas prices tend to rise under stronger growth and lower external uncertainty. Moreover, the impact of housing uncertainty is time-varying, with negative effects strengthening at longer horizons and during turbulent periods, underscoring the need for vigilance and policy adjustment over time. Finally, policymakers must account for geographical and dwelling-type heterogeneity, as uncertainty effects are more pronounced in major urban areas and for new dwellings compared with older ones, making targeted measures preferable to one-size-fits-all approaches. While Greece provides an especially informative setting for studying housing market uncertainty, this paper offers a flexible framework that can be adapted to housing markets in other countries.

Taken together, continuous monitoring of the housing market uncertainty is of vital importance. Future work could expand the index using additional textual sources and explore its predictive power relative to other uncertainty measures, or extend the analysis

to a multi-country or regional panel to capture broader spillovers. Such directions would further deepen our understanding of the housing markets dynamics towards a more effective policy design.

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Appendix

Table A1: Summary of impulse responses on house prices to an HMU shock

	Linear	High growth	Low growth	High foreign uncertainty	Low foreign uncertainty
Whole country	Close to zero initially; becomes negative after approximately 7-8 quarters and increasingly negative at longer horizons.	Positive initially; turns negative at approximately horizon 16.	Negative from the initial horizons, with the decline generally intensifying over time.	Close to zero initially; becomes increasingly negative from approximately horizon 8.	Close to zero or mildly negative initially; becomes more strongly negative from approximately horizon 16.
Athens	Small and mixed initially; becomes persistently negative from approximately horizons 7-8 and records the largest long-run decline among the regions.	Positive initially; turns negative from approximately horizon 16 and records the largest response range among the regions.	Negative from the initial horizons, with the largest negative responses among the regions.	Close to zero initially; becomes increasingly negative and records the largest long-run decline among the regions	Mixed through the medium horizon; becomes positive around horizons 11-15 and sharply negative from approximately horizon 16, recording the largest long-run regional decline.
Thessaloniki	Slightly positive initially; becomes negative after approximately 8-9 quarters.	Positive initially; turns negative from approximately horizon 16.	Close to zero initially; becomes increasingly negative over subsequent horizons.	Positive initially; turns negative after several quarters and becomes increasingly negative.	Mixed initially; becomes positive around horizons 11-15 and sharply negative from approximately horizon 16. The long-run decline is generally the second-largest after Athens.
Other big cities	Slightly positive initially; becomes negative after approximately 8-9 quarters.	Positive initially; turns negative from approximately horizon 16.	Close to zero initially; becomes increasingly negative over subsequent horizons.	Positive initially; turns negative after several quarters and becomes increasingly negative.	Mixed initially; becomes positive around horizons 11-15 and sharply negative from approximately horizon 16.
Other cities	Slightly positive initially; becomes negative after approximately 8–9 quarters.	Positive initially; turns negative from approximately horizon 16.	Close to zero initially; becomes increasingly negative over subsequent horizons.	Close to zero initially; becomes negative and the decline gradually intensifies.	Mixed through the medium horizon; becomes positive around horizons 11-15 and sharply negative from approximately horizon 16. The long-run decline is generally smaller than in the metropolitan regions.
New dwellings	Close to zero initially; slightly positive around horizons 4-7; becomes negative from approximately horizon 8 and declines sharply after horizon 16.	Positive initially; turns negative at approximately horizons 16-17.	Negative from the initial horizons, with the decline generally intensifying over time.	Close to zero initially; becomes increasingly negative from approximately horizons 7–8.	Mixed and close to zero initially; negative around horizons 8–10, positive around horizons 11-15, and sharply negative from approximately horizon 16.
Old dwellings	Close to zero initially; slightly positive around horizons 4-7; becomes negative from approximately horizon 8 and declines sharply after horizon 16. The long-run decline is smaller than for new dwellings.	Positive initially; turns negative at approximately horizons 16-17.	Negative from the initial horizons, with the decline generally intensifying over time.	Close to zero initially; becomes increasingly negative from approximately horizons 7–8.	Mixed and close to zero initially; negative around horizons 8-10, positive around horizons 11-15, and sharply negative from approximately horizon 16. The long-run decline is generally smaller than for new dwellings.

Notes: The table summarises the direction and overall pattern of the estimated impulse responses. Statistical significance should be evaluated using the confidence intervals reported in the corresponding figures.

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