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The Impact of the 2008 Financial Crisis on Lisbon's Housing Prices

João Fragoso Januário and Carlos Oliveira Cruz *

CERIS, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1049-001 Lisbon, Portugal
* Correspondence: oliveira.cruz@tecnico.ulisboa.pt

Abstract: Real estate markets are frequently affected by growth and contraction cycles. Given the social and economic impacts of changes on real estate prices, the understanding of these cycles is crucial from a socio-economic perspective, but also, and more importantly, from a public policy view. The literature has provided several contributions focusing on the deconstruction of the main determinants of housing prices. This research focuses on the analysis of housing prices variation with a particular emphasis on the analysis of the impacts of the 2008 financial crisis. Within the existing body of knowledge, few studies have focused on this particular issue, and even fewer have focused on countries where the financial crisis led to an external bailout, as was the case in Portugal. The analysis confirmed that the 2008 financial crisis had a negative impact on real estate prices, and the ex-post growth in GDP and low interest rates had a positive impact. The paper also provides a long-term analysis of housing price trends over the last decades.

Keywords: economic cycles; financial crisis; housing; real estate

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1. Introduction

The real estate market has traditionally been subject to cycles of boom and bust, led by speculative behavior, construction booms, financial crisis or external economic events (Shiller 2007). Over recent decades, several authors have studied the main determinants of real estate prices, motivated by the fundamental importance of understanding real estate prices, their dynamics and driving factors. The vulnerability of the real estate market to economic cycles assumes a significant relevance, given the social and economic impacts of real estate prices on both corporate firms and individuals. In fact, in most countries, real estate is the most important source of financial saving, and its (in)stability is critical for the financial balance of households.

The 2007–2008 subprime crisis, which started in the US, resulted from an excessive purchase of real estate properties by individuals led by easy access to credit and leveraged by high levels of debt. The willingness to buy property, not just for a housing function, but also as a way to make a quick profit, led to a peak in property prices. In total, in the years prior to the crisis, over a trillion dollars was channeled into the US subprime mortgage market. The crash of the housing bubble that followed had worldwide global consequences, impacting real estate markets across the globe. The lack of quality in the Mortgage-Backed Securities (MBS) products held by financial institutions, and their overall exposure to the real estate market, led to a financial crisis spreading all across the globe (Reinhart and Rogoff 2008; Valadez 2011). As discussed in this paper, the financial crisis severely affected the fragile Portuguese economy, and, particularly, public finances, leading the Government to require external financial assistance.

What was the impact of the financial crisis on real estate prices in Lisbon? This is the starting point for this research. Building upon existing literature, presented in detail in the next section, the authors expected to find a negative impact, i.e., the occurrence of the crisis would have led, directly and indirectly, to a decrease of prices. The paper also provides

a historical overview on the variations of real estate prices in Lisbon, providing some economic and social contexts to help read the data and trends identified by the authors.

Furthermore, the authors also controlled for other economic, demographic and social variables, to grasp the main determinants of real estate prices so as to conclude on how the determinants (and the corresponding impacts) compared with the existing body of knowledge.

As expected, the research concluded that it was possible to find a correlation between GDP growth in the ex-post period of the crisis, and an increase in real estate prices. Low interest rates also seemed to play a role in the increase of real estate prices. On the other hand, the number of overnights, used as a proxy for touristic volumes, had a negative impact. The paper provides a detailed discussion of these effects.

This paper is organized as follows: after this introduction, the authors present an extensive literature review focusing on the main determinants of housing prices, with a particular emphasis on economic determinants, and the main findings provided by the literature; Section 3 presents some contextual background on the dynamics of the market; Section 4 contains the data and methodology; Section 5 presents the results and discussion; and, finally, Section 6 presents the main conclusions.

2. Literature Review

Several papers identified macroeconomic variables as determinants of housing prices, such as the following: population and household income (Duca et al. 2010; Xu 2017), housing supply (Glaeser et al. 2008; Grimes and Aitken 2010; Caldera and Johansson 2013; Glaeser and Gyourko 2018), GDP (Rodrigues and Lourenço 2017; Ismail and Nayan 2019), unemployment rates (Ismail and Nayan 2019), interest rates (Goodhart and Hofmann 2008; Duca et al. 2010; Xu 2017; Ismail and Nayan 2019; Afxentiou et al. 2022) and tourism (Garcia-López et al. 2020; Cocola-Gant and Gago 2021; Yang et al. 2023). Nevertheless, it is noteworthy that, despite some commonalities, their effects on the prices of residential real estate differed depending on the observed environment. In fact, the full list of economic variables impacting housing prices may be hard to find, given the complexity of the economy, as stated by Grum and Govekar (2016). In the next subsection, the authors provide a detailed discussion of the contributions found in the literature regarding each main determinant.

2.1. Population and Household Income

Leamer (2007) stated that the housing market is a result of a consumer cycle, not of a business cycle. Hence, the consumer plays a significant role in housing dynamics. The study of the population and its financial context is, therefore, crucial in understanding the market cycles.

The importance of household income in the real estate market has justified numerous studies of price-to-income ratios as proxies for the affordability and overall market "health" (Leamer 2007; Mostafa et al. 2006; Yates 2008; Meen 2018). Sharp increases in median price-to-income ratios usually signal an unsupported increase in valuations, lacking the fundamentals, and, thus, creating conditions for a higher probability of housing bubbles.

Duca et al. (2010) pointed out that, in Spain, housing prices during the 2000s were strongly propelled by household income growth. Xu (2017) studied the Chinese housing market and concluded that increases in household income would lead to an increase in demand for housing and, thus, to an increase in housing prices. Additionally, the author argues that this increase in prices would promote speculative behavior, increasing the risk of a housing bubble, and causing a vicious circle.

A higher household' income can also have secondary effects on valuation. As shown by DiPasquale (1999), higher-income homeowners are more likely to improve their property, which further increases their property's price and future sale value. Nevertheless, the author also noted that, as income rises, homeowners were more likely to move to a new house than to improve their current unit.

It is possible to argue that there is more to population and household income than what is suggested by the traditional economic theory, based on the rational "homo economicus". For example, Shiller (2007) pointed out that people's vague expectations for the future, which are constantly changing based on their experience and as new information is provided, may largely influence their long-term decisions, like buying a house. Fears of war or terrorism, for instance, may influence their buying decisions and, thus, housing prices. Additionally, if people perceive prices to continue to go up this may lead to a "*psychological expectations coordination*" further pushing the momentum of increases in home prices. Only a housing supply response tends to bring prices down. However, one should note the existing lag between the increase in demand and the response on the supply side. This may lead to a prolonged period of increasing prices. Furthermore, the distribution of housing shocks may be unevenly distributed across the territory. For example, Li and Wei (2020) found that the value of housing enjoying proximity to green spaces, jobs and good public schools was more resilient compared with a market lacking these amenities. Therefore, the market's volatility may be amplified, due to uneven spatial distribution of physical and service amenities or residential segregation.

The current economic conditions, which have resulted from the COVID-19 pandemic and war in Ukraine, have also increased the financial stress on household incomes. The increasing costs of energy add to the rest of the inflating costs (e.g., food, transportation), leaving households with tighter budgets and fewer chances to increase their consumption in the housing market (Cermáková and Hromada 2022). Furthermore, the recent interest rate hike has also decreased accessibility to the housing market (Venhoda 2022). This is especially concerning for single-parent and younger households, considering that, in many cities across Europe, these groups have already been priced out of most real estate markets due to soaring housing prices in recent years (McKee 2012; Hromada and Cermakova 2021).

2.2. Housing Supply

The housing market, as with any other market, follows the laws of supply and demand. Therefore, housing supply is of utmost important for price determination. For a given constant demand, the lower the volume of supply, the higher the price one could expect for a given property. The inverse relationship also holds true: the higher the supply available in the market, the lower the price of each individual unit. According to Glaeser et al. (2008), the responsiveness of the market to housing price changes also influences future prices. In supply-constrained markets, the adjustment occurs primarily in the price of housing rather than in expanding housing supply, while markets with a higher supply responsiveness tend to have smaller price rises following demand shocks and are less prone to "bubbles" in housing prices. In summary, the more inelastic the supply side, the more susceptible the market is to price increases and housing "bubbles". Nevertheless, the authors warn that the oversupply of housing could also be a problem, leading to larger welfare losses at the end of boom–bust cycles.

Grimes and Aitken (2010) also noted that increases in housing supply, relative to population, reduce the long-run impact of upward shifts in demand. However, the authors added a land value dimension to their analysis, concluding that the responsiveness of housing supply is closely linked to land elasticity. Shortage of available land for construction leads to higher prices and lower elasticity in housing supply. This is especially the case where land values immediately reflect increases in prior housing prices, leading to diminishing developers' returns and less supply of new housing.

Caldera and Johansson (2013) studied the responsiveness of housing supply to price changes in 21 OECD countries and concluded that the market response varied substantially across countries, depending on national geographical and urban characteristics, land use policies and planning regulations. The authors claimed that North America and some Nordic countries had higher supply elasticity than countries like Switzerland, the Netherlands and Austria. This meant that the former countries were less susceptible to the creation of housing "bubbles" on a supply–demand basis, as housing investment adjusted

more rapidly to significant changes in demand. However, this rapid adaptation led to more cyclical swings in economic growth derived from the housing market. According to the authors, the elasticity of a market could be addressed through policy reforms, notably in the areas of housing regulations and taxation. Efficient licensing processes were also considered crucial to address housing supply responsiveness issues.

According to Glaeser and Gyourko (2018), housing supply even impacted population growth with lower housing supply levels leading to higher prices and less population growth relative to demand.

Despite the proven relationship between housing supply and demand, we can argue that there is more to it than just matching numbers of overall supply and demand. The quality of supply and the housing features demanded are also at play. Thus, an overall large number of available houses does not necessarily mean that the overall market reflects this in the pricing of all properties, given that vacant properties may not be the ones desired to meet demand.

2.3. Gross Domestic Product (GDP)

The relationship between housing prices and GDP growth has long been studied by scholars (Quigley 1999; Case et al. 2005; Leamer 2007; Valadez 2011; San Ong 2013; Jaeho and Joohyung 2014; Xu 2017). Leamer (2007) even considered residential investment offers as "*by far the best early warning sign of an oncoming recession*". Vigna and Ferrara (2009) also found a strong correlation between housing prices and GDP in France, suggesting housing values were an important factor when forecasting GDP growth and business cycles, strengthening the empirical evidence on the strong relationship between housing and GDP. Xu (2017) found that GDP growth influenced building values and, thus, housing prices. Ismail and Nayan (2019) studied the interaction between housing prices and macroeconomic variables in East Asian countries[1] and found GDP, interest rates, unemployment rate and stock price indices to be among the most significant determinants. Jaeho and Joohyung (2014) studied the housing markets in G7 countries (U.S., U.K., Canada, Germany, France, Italy, and Japan) and found a procyclical relationship between housing prices and real growth of output (GDP), even during shock periods and in post-shock periods, such as the oil shocks during the 70s, 80s and 90s.

Memisevic and Jalloul (2022) studied the impacts of the 2008 and Covid crisis on the Swedish housing market and found that the real GDP and unemployment were both significant and affected housing prices in the short run.

2.4. Unemployment Rate

The unemployment rate also plays a significant role in housing prices. Grum and Govekar (2016) studied real estate markets in Slovenia, Greece, France, Poland and Norway and found statistically significant impacts of unemployment on housing prices. Agnew and Lyons (2018) analyzed the impact of employment on housing prices in Ireland and concluded that job creation (or destruction) was associated with increase (decrease) in rent and sale prices, though the effects varied by economic sector. According to their findings, 1–2 years after the creation of 1000 jobs, nearby house rents had risen by 0.5–1%, while sale prices rose by at least 2%. However, it should be noted that there was a negative relationship between the distance to employment centers and housing prices, with the latter decreasing as distance to firms increased. The authors also concluded that, while rental prices reacted to any employment activity, sale prices reacted only to employment changes in the presence of medium or large start-ups and shutdowns.

Much of this relationship can be explained by the increase/decrease in household income relatively to the proximity/distance to productivity hubs. As explained by the Phillips curve (Phillips 1958; Phelps 1967), there is a strong negative relationship between the money wage rates, the level of unemployment and the rate of change of unemployment. This means that a lower level of unemployment leads to higher wage inflation and, consequentially, to overall inflation in the economy. We can argue that this phenomenon

affects the market in two ways: (1) the overall inflation affects labor and material costs for construction, naturally leading to higher valuation of newly developed properties and, therefore, of overall properties; (2) wage increase resulting from a higher employment rate leads to an increase in demand for property, further increasing valuations.

2.5. Interest Rates

Interest rates are also considered to play a significant role in setting housing prices. Seyfried (2010) studied the relationship between interest rates (through Taylor's rule (Taylor 1993)) and housing prices in countries that experienced housing bubbles, such as Ireland, Spain, the United Kingdom and the United States. The author concluded that a loose monetary policy by Central Banks, which translated to lower interest rates, had a significant impact on housing bubbles. According to his results, a tighter monetary policy by Central Banks, following Taylor's rule, would have reduced the growth rate of housing prices by 38% in Spain, 50% in the United States and 57% in Ireland. Goodhart and Hofmann (2008) studied the markets of 17 industrialized countries, from 1970 to 2006, and found a "*significant multidirectional link between house prices, broad money, private credit and the macroeconomy*". They also pointed out that the relationship between these variables appeared to be stronger in recent years, possibly as a consequence of the liberalization of financial markets during the 1970s and 1980s, highlighting the importance of monetary policy in the stability of housing markets. Some authors even argue that a weakening of credit standards, which allows one per cent more of the population to have access to credit, would boost the demand for housing by 20% (Duca et al. 2010). However, this may induce over-optimism about the downside risks of nonprime loans, as was the case in the US housing bubble.

Xu (2017) found that interest rates affected both supply and demand for houses. Real estate market booms were usually followed by an increase in interest rates, which reduced investment in real estate to a certain extent, due to an increase in investment costs.

2.6. Tourism

The relationship between tourism and housing prices was subjected to analysis by several scholars in recent years (Füller and Michel 2014; Schäfer and Braun 2016; Blanco-Romero et al. 2018; Garcia-López et al. 2020; Cocola-Gant and Gago 2021; Yang et al. 2023). Several capital cities have been flooded by tourism leading to a rapid increase in short-term rentals, especially in city center areas, driving up affordability issues for local populations (Schäfer and Braun 2016; Mikulić et al. 2021). Wu et al. (2021) stated that there were two possible arguments for tourism driving up housing prices: (1) lack of accommodation facilities for the number of tourists may increase the demand for limited accommodation, increasing housing prices; consequently, the higher demand further increases pressure in the market, and (2) some wealthy tourists may try to purchase their own houses in their preferred destination city or country, therefore increasing prices.

Biagi et al. (2015) analyzed the Italian case, from 1996 to 2007, across 103 cities, and concluded that although tourism presents an opportunity for local economies to grow, it also drives housing prices up, leading to serious social effects in terms of affordability, displacement, and gentrification, though the effects varied across locations. It was also noteworthy that a composite tourism index, accounting for the number of tourism accommodations, number of second homes, museums' revenues and total nights of stay of tourists, was found to be more significant to the model of housing prices than each of its individual components.

Mikulić et al. (2021) studied the influence of tourism in various Croatian municipalities and found lower affordability to be associated with a higher share of rental housing within the total housing stock, in addition to higher tourist concentrations and vulnerability to tourism. Cities with a higher percentage of private rentals also had more inelastic supply prices than those holding more collective accommodation facilities. Furthermore, the authors found that it was not the locational concentration of tourism but its seasonality

which primarily drive housing prices up leading to affordability issues for local inhabitants. This happened due to the inelastic supply of housing, leading the market to be leveled by peak summer month prices. High levels of seasonality[2] were also detrimental to housing affordability, due to employment rates and economic fluctuations.

Yang et al. (2023) analyzed the housing market in G7 countries and found that the relationship between tourism and housing prices was nonlinear and dependent on the environment. The author also concluded that the impact depended on the economic development phase of the country and that. in certain conditions, it might even have a negative contribution to housing prices.

In the next section, we analyze the case of the city of Lisbon under the recent historical context of the previous five components identified as significantly impactful in housing prices.

3. Lisbon's Case

3.1. The Years Prior to the Crisis

Before addressing the impacts of the 2008 crisis, it is important to understand the context in which it arrived. The Portuguese reality has been characterized, especially during the last century, by a high preference for home ownership over private rentals, due to cultural factors and public policies incentivizing the former (Braga 2013; Azevedo 2020). The rent cap[3] in the cities of Lisbon and Porto imposed by Law 2030 of 1948, discouraged investors in the rental market in the two largest cities in the country leading to an overall degradation of its building stock (particularly in the city's center) and to a decrease in the private rental market. In 1984, Portugal started the liberalization of its financial system, allowing the creation of new private banks (Santos et al. 2014). Until this point, and since the 1974 revolution, most banks were nationalized, offering interest rates fixed by the government, with strict policies on access to the credit market. In 1986, Portugal acceded to the European Economic Community and, in the years that followed, expanded its financial system. Access to the EEC's funds and the lessened restrictions on credit allowed many families to fulfil their long-awaited wishes of buying a property, which, over the years, became synonymous with adulthood and success. The creation of subsidized special credit conditions for young adults[4], and the high inflation felt in the country during the 70s and 80s[5], also increased demand for home ownership. For example, in 1981, 82% of Lisbon's inhabitants were renters, while in 2001 that number had decreased to 52% (Câmara Municipal de Lisboa (CML) 2022). This increase in demand led to an increase in new construction all over Lisbon's Metropolitan Area (LMA), reinforcing the trend started in the 1970s, as shown in Figure 1. This trend adopted an upward slope until the country was hit by the financial crisis.

However, it is interesting to note that, after the 2000s, this trend was mainly driven by Lisbon's neighboring municipalities, as the tendency in the city of Lisbon saw a sharp decline in total number of yearly concluded new dwellings in the 2000s, reaching its peak in 2003 (2870 new dwellings) and plummeting by 98% to only 37 new dwellings in 2006 (Figure 2). This may have come about, in part, as the consequence of the cessation of public fund grants to house purchasing in 2002 (Santos et al. 2014).

The decrease in the total number of households living in the city of Lisbon (Figure 1) illustrated this dynamic, with many families opting to live in the nearby municipalities, with newer and more affordable properties. This was also justified by the macroeconomic context. After the 2000s, the Portuguese economy entered a period of lower growth in real GDP, creating additional difficulties for families to cope with housing costs (Figure 3). However, the willingness to acquire property had not vanished. Since the early 1990s real estate developers and brokers started to price properties based on the indebtedness capacity of Portuguese families, which fueled valuation increases (Braga 2013). This was well represented by the mean value of traded real estate in Lisbon, which rose from 137,755€ per property in the year 2000 to 321,697€ in 2007, a 133.52% increase in just seven years. The indebtedness levels rose accordingly: in 1995, household debt represented 35% of income

reaching a peak of 130% in 2009[6]. According to Santos et al. (2014) this rise in indebtedness was easily explained by the increase in home loan values.

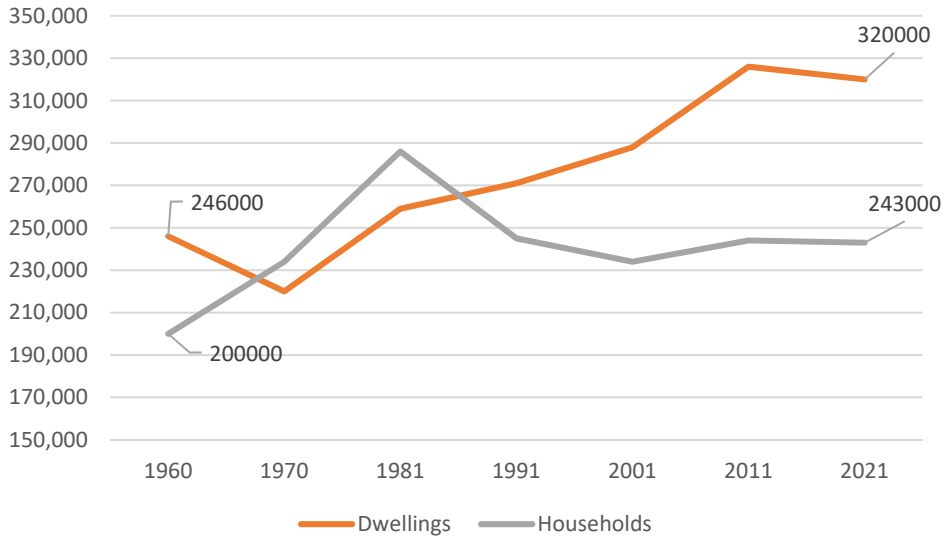

Figure 1. Number of dwellings and households in the city of Lisbon. Source (Câmara Municipal de Lisboa (CML) 2022).

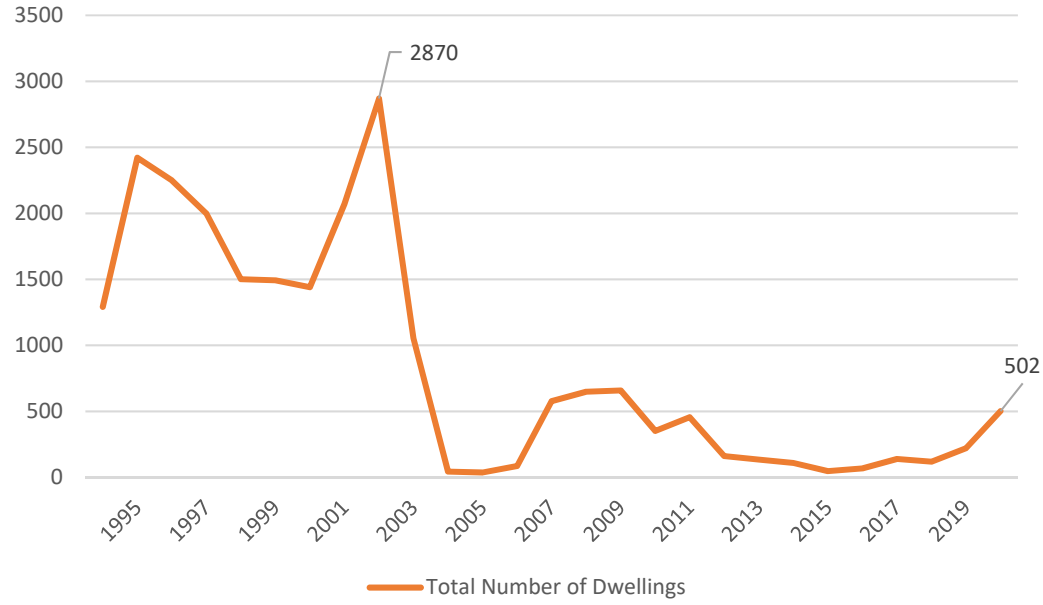

Figure 2. Total number of completed dwellings in new constructions for family housing in Lisbon. Source: INE.

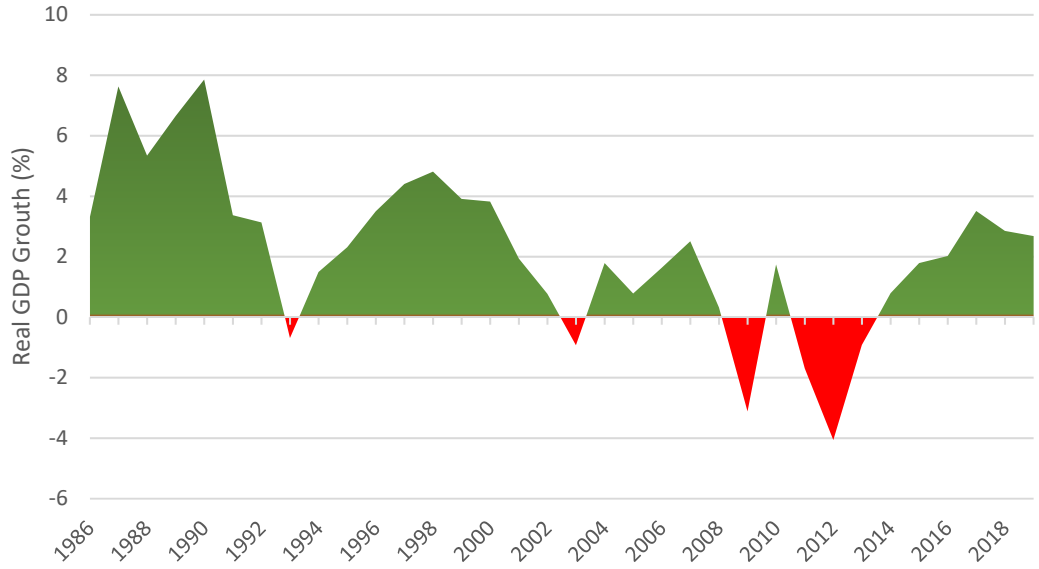

Figure 3. Real GDP growth in Portugal (1986–2018). Source: INE.

In 2008 Lisbon was a city experiencing a decrease in households and total number of inhabitants, which, due to a stagnant economy in the 2000s and the ever-increasing prices of real estate properties in the city, were moving out to nearby municipalities, offering newly built dwellings with better conditions at much lower prices. However, the levels of indebtedness were also increasing, leaving households in much harder financial positions than in the 1990s. The rental market was also stagnant, due to the government's rent freeze policies, leaving Lisbon with an old and unappealing city center.

3.2. The 2008–2013 Crisis

The economic crisis trigged by the US subprime crisis of 2007–2008 had started to be slowly felt in the country by 2008. From 2008 to 2013, the annual GDP growth was negative, reaching a minimum of −4.1% in 2012. The country experienced a large decrease in investments and companies presented higher mortality than birth rates (Carreira et al. 2021). This led to significant increases in job losses. The unemployment rate almost doubled over five years, from its December 2007 value of 9.4% to18.4% by December 2012. The country's economic outlook led to the intervention of the "troika"[7] in 2011. The discussions between the "troika" and the Portuguese government led to a *memorandum of understanding* between the two parties, on 17 May 2011 (Rodrigues 2011). This *memorandum* provided the adoption of some legislative measures affecting the housing market. It started by defining *"measures to amend the New Urban Lease Law, Law n.º 6/2006*[8]*, in order to guarantee balanced obligations and rights of landlords and tenants, taking into account the most vulnerable groups"*. This led to approval of Law nº31/2012[9] which came into effect on 12 November, 2012. It is important to note that, due to political unrest, although the first discussions with troika were taken under a socialist prime-minister, he presented his resignation in March 2011, leading to the election of social-democrat prime-minister, Pedro Passos Coelho, who was in charge of the political enforcement of the memorandum. The center-right government implemented strict financial austerity measures and put tourism and foreign investment as the cornerstones to the country's economic recovery. As part of this strategy, a Residence Permit for Investment Activity (ARI) program was created, commonly known as the Golden Visa Program. This allowed foreign nationals to obtain a temporary residence permit for investment activity with the exemption of a residence visa to enter national territory, providing free access to travel in 26 countries of the Schengen area. The program also entitled beneficiaries of the ARI/Golden Visa to apply for permanent residence or even for Portuguese citizenship[10]. As part of the criteria to be accepted into this program, applicants should fulfill certain requirements. Among the options, one could:

(1) purchase real estate property with a value equal to, or above, 500 thousand Euros;
(2) purchase real estate property, with construction dating back more than 30 years or located in urban regeneration areas, for refurbishing, for a total value equal to, or above, 350 thousand Euros.

From 2012 to 2022, the Golden Visa Program raised over 6 billion euros, from over ten thousand investors, with a strong share of Chinese and Brazilian nationals. A total of 90.3% of this investment was made through real estate[11] purchases. This had a significant impact on the Portuguese real estate market, particularly in the luxury property sectors of Lisbon and Porto. The influx of capital then trickled down to the rest of the housing market, due to demand displacement and equity effects (Gordon 2020).

The creation of short-rental platforms, such as AirBnB in 2008, also led to deep transformations in the housing supply, especially in the capital city's center (see, for example, Cocola-Gant and Gago 2021). During this period, the lower ECB rates stimulated the economy, with Euribor 3-month rates lowering from 4.68% in 2007 to 0.29% in 2013.

This economic context lay the foundations for the years that followed in the Portuguese real estate market.

3.3. The Years That Followed

The year 2014 was a turning point in the Portuguese economy. Despite a slow start, the country's GDP returned to a growth rate of over 2% in 2017 (Carreira et al. 2021). This economic recovery was recognized in the median banking valuations for properties in the Lisbon municipality (Figure 4):

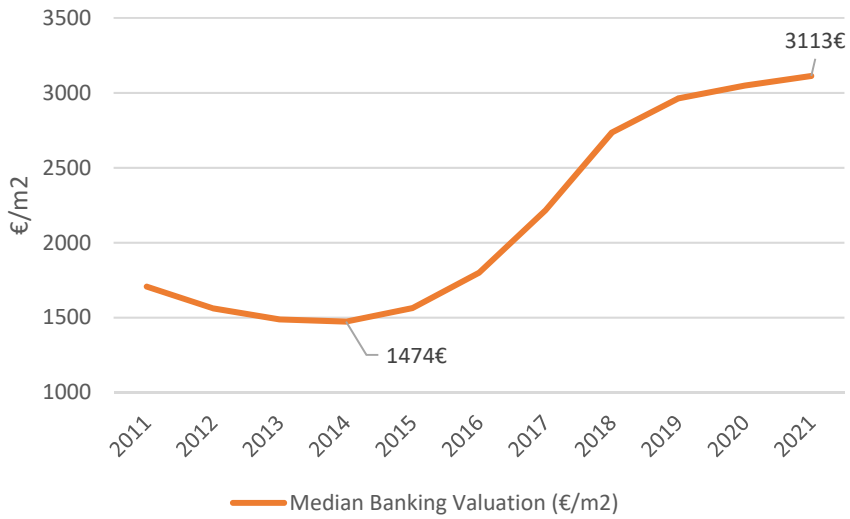

Figure 4. Median banking valuation (€/m^2) of properties in Lisbon Municipality, from 2011 to 2021. Source: INE.

From 2014 to 2019, the median banking valuation of properties in Lisbon municipality doubled from 1474 €/m^2 to 2963 €/m^2 in 2019, over a period of five years. Despite the COVID-19 pandemic, and against the initial expectations of a decrease in housing values, valuations rose another 5% from 2019 to 2021. As of August 2022, banking valuations in the city reached 3471 €/m^2. So, could this significant growth be solely attributed to GDP growth? In fact, data shows there were a lot of factors contributing to the rise in valuations. However, some of the fundamentals seem not to have been supporting this upward slope. For instance, analyzing the average monthly earnings of employees in Lisbon, it was possible to observe a loss in purchasing power since 2010. Figure 5 shows the growth of earnings and compares it with the Consumer Price Index (CPI) from 2009 to 2018. We see that, despite an increase in average monthly earnings, these were not on a par with inflation, which rose 7% during this period, contrasting with a 12% increase in inflation.

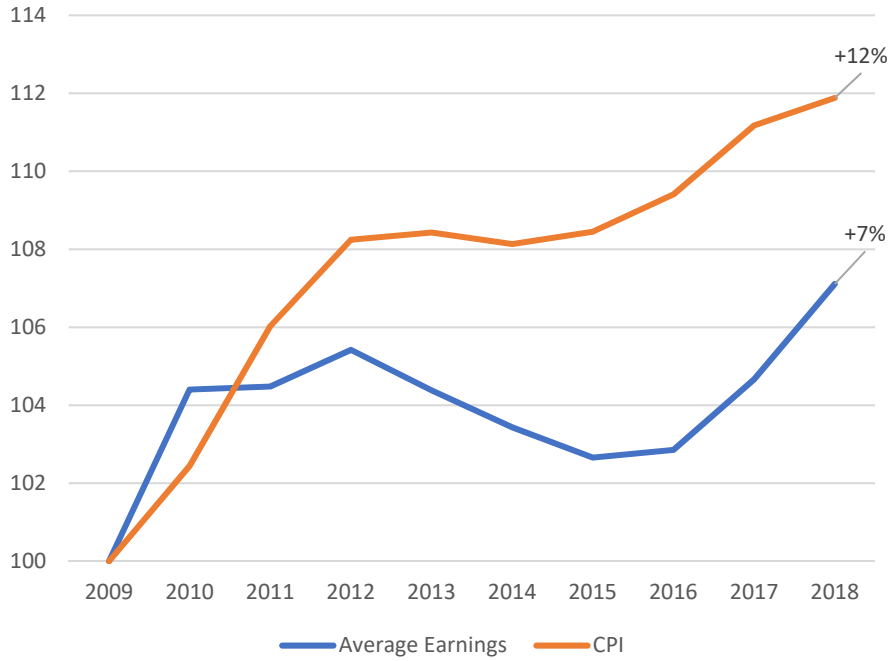

Figure 5. Average earnings per employee in Lisbon and Consumer Price Index (CPI). Base = 100 (2009). For CPI, we used the 12-month average as of 31 December. Source: PORDATA, INE.

As previously mentioned, scholars have often identified a positive correlation between household income and housing prices, concluding that higher levels of income lead to higher levels of housing consumption. However, despite the GDP increase, there was a decrease in the purchasing power, which, assuming a positive correlation, would lead to a decrease in housing values.

The housing supply had not significantly changed, with few new dwellings being built, as seen in Figure 2. In fact, the number of total dwellings decreased by approximately 2% from 2011 to 2021 (see Figure 1), compared with a decrease in the number of households of less than 1%. From a purely statistical point of view, there were far more dwellings than families (an excess of 77,000 dwellings, as per Figure 1). However, looking at housing prices, there were no signs of oversupply of housing. Rather, the opposite was visible in the data, suggesting a mismatch between the living requirements of the Lisbon households and the offers existing in the market, which was in in line with previous study findings (see, for reference, Garha and Azevedo 2021).

Euribor 3-month rates continued their downward trend, lowering from 0.29% in 2013 to −0.55% in 2020. This decrease in financing costs might have contributed to an increase in housing valuations, offering better loan conditions to creditworthy homebuyers. In addition, low interest rates may even have encouraged speculative behavior, as history shows us that several central banks used increases of interest rates as a way to deter both inflation and speculation (Drazen 2003). It is noteworthy that, due to rising inflation mainly derived from the energy crisis and the war in Ukraine, central banks have been rapidly increasing interest rates. However, the effects on the real estate market are still to be seen.

Unemployment rate also decreased from a peak of 18.6% in January and February 2013, to as low as 5.6% in July 2022. This fact also increased pressure on the housing market, allowing more households to consider increasing their housing consumption (e.g., moving to a larger unit or to a better location).

One of the factors commonly debated, both by scholars (Mendes 2011, 2017; Franco and Santos 2021; Cocola-Gant and Gago 2021; Cunha and Lobão 2022) and in the public arena (see, for reference, Pereira 2022), was the effects of tourism on Lisbon's housing market.

In the wake of the financial crisis, the country has seen, and relied on, a large economic recovery based on tourism (Figure 6).

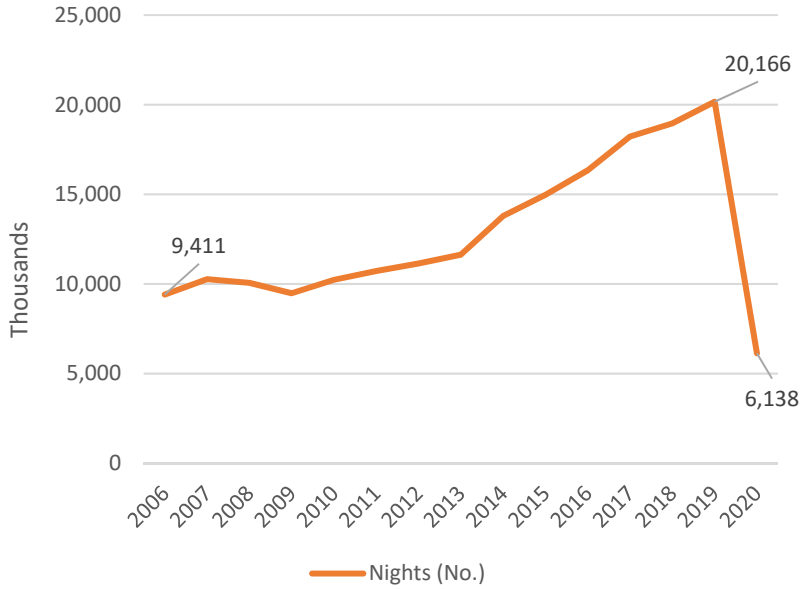

Figure 6. Nights (No.) in collective tourist accommodations in Lisbon's Metropolitan Area. Source: INE.

The growth in tourism was so significant that it made Portugal the EU country with the highest increase in tourist arrivals between 2010 and 2018[12] (UNTWO 2019). This was reflected in the country's economy. In 2011, only 4.8% of the total Gross Fixed Capital Formation (GFCF) was due to accommodation and food service activities, but by 2019 the sector already accounted for 8.6%.

While studying the Portuguese reality, Franco and Santos (2021) found that each one percent increase in the share of Airbnb properties translated into a 4.5% increase in house prices and a 2.26% increase in rent values.

Cunha and Lobão (2022) also found a significant impact of short-term rental (STR) activities on housing prices, leading to price increases, especially in municipalities where a higher percentage of housing was transferred to tourism. The shock of tourism was adjusted in the market by increasing house prices and not by increasing supply quantities. The authors found that each percentage point increase in the share of STR resulted in an increase of 27.4% and 16.1% in housing prices of the Lisbon and Porto metropolitan areas, in the upper quartile of tourism STR, respectively.

Nevertheless, it is important to note that this influx of tourists and increase in housing prices also created incentives for the rehabilitation and renovation of Lisbon and Porto's historical city centers (Franco and Santos 2021).

Since 2016, the municipalities of Porto and Lisbon have taken some containment measures to mitigate the effects of tourism, such as the introduction of tourism taxes and the suspension of new STR accommodations in certain zones of the city. Rodrigues et al. (2022) studied the impact of this measures and concluded that restricted areas saw a decrease of 20% in sales and a decrease of 9% in prices, indicating a strong impact of STR on housing. The issuance of Golden Visas was also suspended in the two largest metropolitan areas in an effort to prevent further significant increases.

4. Data and Methods

The main focus of this section is understanding the impact of the economic crisis on the real estate market, measured through property sale prices. The data was collected from the National Statistics Institute (INE) and a public statistics database called PORDATA[13],

with a total of 44 quarterly observations, ranging from the first quarter of 2008 to the fourth of 2018. The price variables were collected from a Lisbon City Council (CML) database, containing over 8000 property sales between 2008 and 2018, aggregated into quarters. All property values were standardized, based on the 2008 mean value. It is noteworthy that the standardization of property values has often been used in hedonic price modeling (see, for reference, Quigley 1999). We did not include the unemployment rate in our models, given the strong correlation with household income, as previously mentioned. The basic variables are shown in Table 1.

Table 1. Base variables.

Variable	Description	Units	Mean	SD	Min	Max
POP	Resident population	individuals	525,119.16	18,988.17	504,471.00	550,934.00
NIGHTS	Overnight stays (No.) in hotel establishments	—	2,710,980.57	855,250.91	1,410,553.00	4,472,052.00
GDP	Gross Domestic Product	million €	45,106.35	2488.13	41,690.80	50,908.10
RATE	Euribor 3-months	%	2.05	1.31	1.01	5.29
EARNINGS	Average monthly earnings	€	1559.20	29.35	1508.80	1616.10
CRISIS	*Period under crisis*	*dummy*	0.55	0.50	0.00	1.00
PRICE	Sale price of properties	normalized values	0.96	0.16	0.74	1.45

Note that the *crisis* dummy variable allowed us to identify events which occurred in the 2008–2013 crisis period. The definition of the "crisis" period was based on the work of Carreira et al. (2021).

We then adjusted the values of GDP, earnings and price for inflation, based on the fourth quarter of 2008, and implemented a Multiple Linear Regression (MLR) model, as follows:

$$\Delta PRICE_t = \beta_O + \Delta\beta_1 POP_{t-1} + \Delta\beta_2 NIGHTS_{t-1} + \Delta\beta_3 GDP_{t-1} + \Delta\beta_4 RATE_{t-1} + \Delta\beta_5 EARNINGS_{t-1} + \beta_6 CRISIS_{t-1} + \varepsilon_t$$

All the variables are defined in Table 1. Notably, β_i are the regression coefficients, Δ is the usual first difference operator and ε_t is the error term. This allowed us to analyze the relationship between the set of explanatory, or independent, variables, and the dependent variable (PRICE) (Grum and Govekar 2016). However, we should note that this method only captured linear relationships between variables.

We followed the most recent literature and implemented a Feasible Generalized Least Squares (FGLS) technique to estimate the regression coefficients (see, for reference, Cunha and Lobão 2022). In this work, we used a Feasible Generalized Least Squares python implementation with autoregressive covariance. This method, we felt, might offer efficiency gains over Ordinary Least Squares (OLS), especially in the presence of heteroskedastic errors, over large samples, as it is asymptotically unbiased. However, it could also be biased for small samples, thus not BLUE[14], and the efficiency gains were limited to the type of heteroskedastic errors derived from variables explicitly recognized by the model or derived from unknown variables (Miller and Startz 2018). Additionally, one should note that the OLS model assumes that errors are homoscedastic and uncorrelated which, in most practical applications, is not true. If errors do not meet these criteria, the estimated variance of estimated coefficients might be incorrect (implying incorrect standard errors and confidence intervals, and p-values[15]) and, therefore, while it might still be unbiased and consistent, the estimated coefficients obtained by OLS under these circumstances are inefficient. In order to address this issue, we also estimated the coefficients using

the basic Ordinary Least Squares (OLS) estimators, using a White's Heteroskedasticity Consistent estimator[16] (White 1980; Miller and Startz 2018; Kiefer n.d.), which proved to be more misleading than the results obtained by the usual OLS, as demonstrated by MacKinnon and White (1983). Nevertheless, one should note that White's estimator factors in heteroskedasticity, and not correlation, between errors. The use of the Generalized Least Squares estimation of the coefficients would solve this issue leading to a BLUE estimator. However, in practice, it would be unfeasible to implement such a solution given that we did not know *a prior* the true value of the covariance matrix. Therefore, as previously mentioned, we introduced a Feasible Generalized Least Squares estimation, with autoregressive coefficients, by which the covariance matrix was estimated based on the sample (Hayashi 2011). The FGLS estimator was defined as (see Equation (1)):

$$\hat{\beta}_{FGLS} = \left(X^T \hat{\Omega}^{-1} X\right)^{-1} X^T \hat{\Omega}^{-1} X \quad (1)$$

where $\hat{\Omega} = \hat{\Omega}(\theta)$ is the parameter estimation of the true unknown covariance matrix Ω.

The use of an autoregressive covariance explicitly addressed the issues arising from autocorrelation of variables at $t-1$.

Although FGLS might still not remove heteroskedasticity completely, nor is it able to completely remove the correlation between variables, it should provide a more robust result, and a better understanding of the significance and dispersion of each coefficient.

5. Results and Discussion

The results showed GDP, interest rates, number of residents and their average monthly earnings to be the most significant in regard to housing prices. The *crisis* dummy variable also proved to be significant (Table 2).

Based on Table 2, it is possible to observe that the financial crisis had a negative impact on housing prices, evidenced by the negative regression coefficient in our *dummy* variable. GDP growth and lower interest rates promoted the increase of housing values, which was consistent with previous findings (see, for reference, Rodrigues and Lourenço 2017). This accorded with the authors' initial hypothesis, as higher productivity levels and lower costs of financing led to higher levels of housing consumption. The low interest rates environment allowed homebuyers to have access to lower monthly mortgage payments and investors to have higher returns than in risk-free assets (e.g., treasury bonds), while ensuring relative safety to returns, using real estate investment as an alternative saving option (Rodrigues and Lourenço 2017).

The negative coefficient on the number of overnights in hotel establishments was not in accordance with our expectations. The significant increase in tourists in the city of Lisbon had deep and longstanding impacts on its housing market, as reported in our literature review. Thus, the authors expected a positive coefficient in our regression, signaling the positive impact of tourist activity in increasing housing prices. The negative coefficients on the population and earnings, despite being contrary to the widespread belief held in the literature, must be interpreted accordingly to the Portuguese reality. By analyzing the trend in population and earnings in recent years, we could see that both decreased while housing prices increased (average monthly earnings have decreased since 2010, if adjusted to inflation). These findings suggested that the housing price growth was not sustained by an increase in population, nor by an increase in the purchasing power of local inhabitants. Thus, the increase in prices must have been fueled by institutional and private investors, both national and foreign, contributing to the financialization of real estate properties in the city and to the decrease in affordability. This was consistent with previous findings, as, according to Rodrigues and Lourenço (2017), housing investment by non-residents has been increasing in the country since the 1990s, and, despite a decrease between 2011 and 2014, from 2014 to 2017 it grew at an average of 9% per year. Additionally, it was consistent with the findings of Schiffmann (2019 as cited in Cunha and Lobão 2022), according to

which 34% of the houses sold in Lisbon during the first half of 2019, were purchased by foreigners from 80 different countries.

Table 2. Regressions output—determinants of real house price growth. Ordinary Least Squares Regression with robust standard errors (OLS (HC0)) and Feasible Generalized Least Squares with first order autoregressive covariance matrix. The standard error of each coefficient can be seen in parentheses below each coefficient.

Variables	OLS (HC0)	FGLS
INTERCEPT	102.9110 *** (3.505)	100.0736 *** (2.820)
POP	−29.7019 *** (9.467)	−27.225 *** (9.431)
NIGHTS	0.0065 (0.034)	−0.0097 (0.034)
GDP	9.0911 *** (1.989)	7.8101 *** (2.242)
RATE	−23.7773 ** (10.933)	−23.3798 * (12.470)
EARNINGS	−9.5210 *** (2.867)	−7.5919 ** (3.230)
CRISIS	−10.7764 ** (4.368)	−8.4970 * (4.768)
R-squared	0.564	0.564
Adj. R-squared	0.474	0.471
F-statistic	8.412	6.043
Prob (F-statistic)	0.000	0.000
AIC	275.9	259.2
Durbin-Watson	1.464	1.709

* p-value < 10%; ** p-value < 5%; *** p-value < 1%.

By comparing the results from OLS, with heteroskedasticity-consistent estimators, and from FGLS we could conclude that there were no significant differences between the two results, yielding very similar outputs. This might have been the case because our series was relatively small (44 observations) and might not have been sufficient for FGLS to present efficiency gains. However, there was a decrease in the Akaike Information Criterion (AIC), which might indicate a comparatively better result than the one yielded by the OLS (HC0) model. It is also possible to see an increase in the Durbin–Watson values, signaling a decrease in the autocorrelation of residuals. There was a decrease in the coefficient of all variables and an increase in the standard errors, which might hint at an undervaluation of standard errors and confidence intervals by the OLS estimation. There was also a decrease in the significance of the EARNINGS, RATE and CRISIS variables. Nonetheless, they remained significant at 5% and 10%, respectively[17].

In light of these results, governments, and especially central banks, face a tough challenge. On the one hand, they should aim to increase credit restrictions by tightening the conditions to be considered a credit-worthy applicant (e.g., decreasing LTV or DSTI limits) or increasing interest rates. This, in turn, would limit access to the market through higher financing costs. However, as Dietsch and Welter-Nicol (2014) pointed out, this should be done considering the specificities of the local market, as a one-size-fits-all solution might not be appropriate. This should increase the robustness of the real estate market, making it less vulnerable to volatile economic conditions, such as the ones experienced during the 2008 financial crisis. It is noteworthy that Banco de Portugal has taken some measures in

this direction (see, for reference, Banco de Portugal 2022). On the other hand, the economic conditions tightening household budgets are significantly harming accessibility to the housing market, leaving governments responsible for tackling affordability issues of the local population. In this regard, measures should be taken to increase the housing supply targeted at middle class and low-income families. Therefore, there is no simple solution for this issue, as policies should take into account both the demand and supply sides.

6. Conclusions

This research provides a unique perspective on the dynamics of the real estate market in Lisbon (Portugal). The analysis of this case study provides valuable academic and professional insights considering the economic and social dynamics that have impacted Portugal in the last two decades and, in particular, Lisbon. These dynamics involve the financial crisis and sets of measures to leverage the economic rebound, such as the Golden Visas targeted at increasing foreign investment in the country.

The authors' initial hypothesis, that the financial crisis had a negative impact in real estate prices, was confirmed. As discussed by Quigley (1999), one of the main outcomes of a financial crisis is the decrease in available income and overall levels of employment, which directly affects the demand levels for real estate. Therefore, it comes as no surprise that the growth of GDP led to an increase in real estate prices in the post-crisis period. The low interest rates also contributed to the increase in real estate prices. Several authors discussed the effect of credit cost on real estate prices (e.g., Taylor 1993; Seyfried 2010), and found similar patterns. The reduction of credit costs allows an increase in the volume of demand, consequently increasing real estate prices.

More surprisingly, the number of overnights, used as a proxy for touristic volumes, had a negative coefficient. In the authors view, this might be linked to two dimensions. First, the number of overnights is not necessarily a proxy for touristic activity because there has been an exponential growth in supply of other forms of touristic housing, as discussed by Yang et al. (2023). Second, these other housing solutions for tourists are the ones most impacting the availability of housing in city centers. In fact, with growth in tourism, investors and homeowners have incentives to move their housing properties from traditional housing to short-term rentals. Vizek et al. (2022) discuss the fact that short-terms rentals provide higher returns, and, therefore, there are two effects: first, a willingness to pay more given the higher expected return; and second, a reduction in traditional housing supply, creating additional pressure on the demand side.

Future studies should expand the number of variables and analyze more disaggregate data, ideally, at the monthly level. Unfortunately, this granularity was not available at the time the authors conducted the research.

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Notes

1 Malaysia, Singapore, Indonesia and Thailand.

2 Meaning shorter tourist seasons.

3 In fact, it was not the rent itself that was frozen but the valuation of rental properties, leading to a freeze in rent increases.

4 The first regime of subsidized credit was in fact created in 1976 and updated during the 80s and 90s (Santos et al. 2014).

5 Inflation during mid-80s almost peaked at 30%, therefore, investing in a house was one of the best ways to hedge against inflation (Braga 2013).

[6] See, for reference, Santos et al. (2014), chart 15, p. 33.

[7] Decision group created by the European Commission (EC), the European Central Bank (ECB) and the International Monetary Fund (IMF).

[8] The New Urban Lease Law (NRAU), Law n.º 6/2006, presented in 2006, was set to revitalize the rental market, especially in Lisbon and Porto. However, it still presented large restrictions to rent increases, especially in the case of lease contracts prior to 1990, rehabilitation of rented properties and eviction procedures. The original document can be seen at https://dre.pt/dre/legislacao-consolidada/lei/2006-34578375; accessed on 6 January 2023.

[9] For more information refer to https://www.portaldahabitacao.pt/pt/nrau/home/apresentacao_nnrau.html; accessed on 6 January 2023.

[10] For more information refer to https://www.sef.pt/en/pages/conteudo-detalhe.aspx?nID=21; accessed on 9 January 2023.

[11] For more information refer to https://www.globalcitizensolutions.com/pt-pt/estatisticas-golden-visa/; accessed on 9 January 2023.

[12] During this period, the country saw a 234% increase, according to Cunha and Lobão (2022).

[13] https://www.pordata.pt/home/; accessed on 9 January 2023.

[14] Best Linear Unbiased Estimators (BLUE).

[15] Note that covariance matrices are used for determining significance of regression coefficients (p-value) and constructing confidence intervals for each coefficient.

[16] Heteroskedasticity-consistent (HC) estimators, HC0 in this case. For more information, see Zeileis (2004).

[17] RATE and CRISIS variables are both significant at 10% under the FGLS estimation.

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