

# Immigration and Real Estate Prices in Portugal: A Panel Data Analysis

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## Abstract

The global economy's cornerstone, the real estate market, profoundly influences the well-being of individuals and the Portuguese economy. Over the past decade, housing prices in Portugal have surged, defying the trends of Gross Domestic Product (GDP) per capita and average wages. This surge is attributed, in part, to a complex interplay of factors, including immigration. Our research seeks to examine the impact of immigration on Portuguese real estate prices and offers a comprehensive analysis of past research, the Portuguese economy, the real estate market, and housing price determinants. Our analysis, grounded in econometric methodology, revealed a significant and consistent negative effect of immigration on housing prices in Portugal. This was accomplished through the examination of regional housing price data spanning from 2011 to 2020. To uncover the intricate relationship between immigration and housing prices, we utilized balanced panel data, which allowed us to study the impact over time. The application of various econometric models, including fixed effects, first differences, and instrumental variable regressions, established a robust negative relationship between immigration and housing prices in Portugal. Our results indicate that a one-percentage-point increase in immigration inflow corresponds to housing price reductions ranging from 7.8% to 14.7%. This research contributes to the existing body of knowledge, providing important insights for policymakers to address affordability concerns, investors to develop sustained investment strategies, contributes to a better comprehension of how Portuguese housing prices respond to various determinants and how immigration affects different markets around the world.

**Keywords:** Immigration; Housing Prices; Real Estate Market; Portuguese Economy; Instrumental Variables.

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## 1. Introduction

The real estate market plays a fundamental role in the global economy, affecting more individuals than any other commodity and closely linked to economic well-being (Fão, 2019; Pivar & McKenzie, 2008). Over the past decade, Portuguese housing prices have more than doubled, despite Gross Domestic Product (GDP) per capita and average wages not showing a similar upward trend.<sup>1</sup> One possible driver of rising housing prices is population growth, particularly due to an increased demand for housing. The number of foreign-born individuals in Portugal has increased by 36% since

2013, while the native and total population decreased by 4.9% and 1.3%, respectively.<sup>2</sup>

The interplay of immigration, native out-migration, and changes in income levels is complex. Portugal is presently facing a housing crisis, leading some to believe that expats and digital nomads are outpricing locals, inflating housing costs. But is this really the case? The sign of the impact of immigration on housing prices still varies in different countries, as Saiz, (2007), Accetturo et al. (2014) and Gonzalez & Ortega (2009) found for the US, Italian, and Spanish markets, respectively. This study aims to assess the impact of immigration on Portuguese real estate prices while providing a

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<sup>1</sup> <https://tradingeconomics.com/portugal/housing-index> accessed on October 18, 2023.

<sup>2</sup> [https://ec.europa.eu/eurostat/databrowser/view/migr\\_pop3ctb/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/migr_pop3ctb/default/table?lang=en) accessed on October 18, 2023

comprehensive analysis of the Portuguese economy, the real estate market, and housing price determinants. The goal is to illuminate the complexities of the housing market in Portugal.

The study analyzed regional housing price data from 2011 to 2020, examining the relationship between annual housing price changes and variations in the number of foreign-born individuals relative to the initial population. Data sources included the Portuguese Labor Force Survey (LFS), providing insights into population attributes, and the IMT and IMI databases on property taxes for housing price information. The study incorporated year fixed-effects and control variables, using various estimators, including First Differences, Fixed Effects, and Instrumental Variables regressions to address endogeneity. The analysis revealed that there was a negative relationship between immigration and the Portuguese real estate prices.

This research is unique in its focus on the regional impact of immigration on the Portuguese real estate market, contributing to the existing literature. It highlights the potential policy implications of immigration on housing, aiding policymakers in developing strategies for managing prices. Investors and real estate professionals can also benefit from understanding the impact of immigration on housing, allowing them to adapt their investment strategies. Overall, the study provides a comprehensive analysis of immigration's role in shaping housing prices and the complexities of the Portuguese real estate market.

## 2. Literature Review

### 2.1. The Portuguese Economy

After joining the European Union, the Portuguese population began aligning their consumption patterns more closely with the European average, with the expectation that this integration would lead to continued economic growth. With the speculative IT sector bubble burst around the turn of the millennium, also known as the "Dot-com downfall", Portugal's GDP growth declined significantly. The 2008 financial crisis, originating from the real estate sector, further impacted Portugal's economy, resulting in a significant decline in GDP growth and a rise in unemployment. Austerity measures and structural reforms were introduced under the Financial Assistance Programme (FAP), co-sponsored by the EU and IMF, to

address the escalating debt crisis. The country introduced the "Golden Visa program", a Residence by Investment program, with the objective of attracting foreign investment and stimulating economic growth. According to Alfaro (2017) FDI is a way of increasing employment, import technology and know-how, promote trade, and increasing productivity levels and attracting FDI through Residence by Investment programs was seen as a way to boost the economy. The Portuguese Golden Visa program generated significant investments and led many to believe it was causing an unnatural housing price increase. When analyzing the economic effect of the Golden Visa program on the Portuguese real estate market, Scherrer & Thirion (2018) state that the program generated €3.5 billion from 2012 to 2018, and the number of real estate transactions increased by more than 100% in the same period. The authors suggest that the rapid increase in applications led to a steep rise in prices. However, it is important to consider that Portugal was recovering from a severe financial crisis, and housing transactions had been significantly low in the previous years. Additionally, Surak & Tsuzuki (2021) suggested that while these programs attracted investment, their impact on housing prices was minimal.

After the FAP program concluded, Portugal's economy continued to improve, with increasing GDP growth rates and declining unemployment (Figure 2.1).

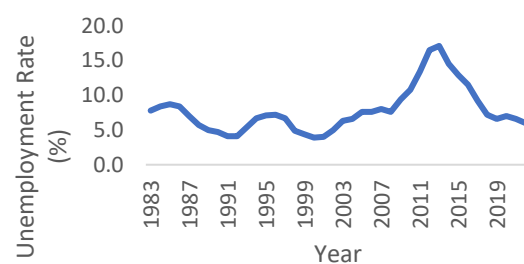


Figure 2.1: Portugal's Unemployment Rate (Source: PORDATA)

### 2.2. Immigration and the housing market

Historical research has revealed a negative relationship between immigration and wage levels in the early 20th century, as well as immigrants initially settling in low-quality housing (Ferrie, 1996; Goldin, 1995; Michael Schill & Rosenbaum, 1998). While these observations might suggest that an increase in immigration would lead to lower housing

prices, the reality is more complex. The relationship between immigration and the real estate market is not straightforward, with researchers finding inconsistent results. Theoretically, an increase in the overall population originated, for example, by a wave of immigration, should lead to an increase in housing demand and, consequently, to an increase in housing prices (Saiz, 2007). However, immigrants tend to cluster together when moving to a new city, even sharing dwellings among multiple families, thus outpricing natives (Card, 2001). This behavior leads natives to depreciate their perception of local amenities and move out to other regions. Carter (2005) also added that generally immigrants come from lower socioeconomic statuses, as such, they often look for low-skilled and poorly paid jobs, depreciating the local salary level, leading natives to leave. Also, Sá (2015) studied the connection between immigration and real estate in England and Wales and found that house prices tended to decrease in areas with a high low-skilled job supply as migrants were clustering in such areas, forcing natives out of them. There is also another important factor that researchers consider when drawing results. In the same way, immigration inflows may influence housing prices. Lower housing prices also tend to influence the inflows of immigration as immigrants tend to choose countries with lower housing costs. These kinds of problems are often referred to as reverse causality problems, and some authors suggest that it may explain the negative relationship found in some studies (Saiz & Wachter, 2011). There are multiple factors that influence the real estate market behavior. From our literature review, we could state that the predominant ones identified by researchers were immigrant clustering, education, job supply, housing supply and its elasticity, local amenities, and the immigrant perception by the native population. As stated, the results on the sign of the impact of immigration have been mixed. Saiz (2007) found that an immigration inflow of 1% relative to the city's total population represented a housing price increase of 2.9% to 3.4% in the US market. Fischer & Degen (2009) found that an inflow of 1% increased family home prices by 2.7% on the Swiss market. On the other hand, in the Spanish market, Gonzalez & Ortega (2009) found that an immigration inflow of 1% of the initial local population led to a 1.6% decrease

in housing prices. As such, the main focus of this study will be to test out this hypothesis on the Portuguese real estate market and to infer the immigration impact on the housing prices.

### 2.3. Real Estate Market Characterization

Housing prices diverge across countries, cities, and villages being determined by location, space, and consumption patterns. Additionally, a range of economic, social, and environmental factors also influence the real estate market. This includes factors such as interest rates, inflation, unemployment rates, demographic growth, technological changes, and environmental regulations. (Xu & Tang, 2014).

Demographic factors exert a significant impact on real estate prices. According to research by Winkler & Donald Jud (2002), factors such as population growth, household income, and construction costs wield substantial influence over real estate appreciation. Égert & Mihaljek (2007) have also emphasized the pivotal role of demographic factors in determining housing prices, encompassing aspects like age, household size, and family structure, which in turn affect housing demand. An increase in household income and urbanization levels correspond with heightened demand for real estate. Regions experiencing robust population growth often witness an upward trajectory in housing prices. Additionally, the characteristics of the local population, such as the presence of younger families with higher incomes, significantly influence real estate demand and prices. Employment opportunities also play a role in price dynamics, as people tend to relocate to areas offering improved job prospects. Moreover, ethnic and racial diversity can also play a role in housing price fluctuations, with research from Bloomberg indicating that regions with greater diversity may experience lower housing prices due to discrimination.<sup>3</sup>

Housing prices are also closely tied to economic factors, and various studies highlight their influence. Rehman et al. (2020) emphasize the relationship between housing prices and a country's economic state, which depends on the population's ability to pay. Unemployment rates, as highlighted by Égert & Mihaljek (2007), strongly

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<sup>3</sup><https://www.bloomberg.com/graphics/2023-home-prices-racial-gap-us-cities/> accessed on May 2, 2023.

influence housing prices, showing a negative linear relationship with the real housing price index. A prosperous economy, as discussed by Chen & Hobbs (2003), positively affects a country's investment activity. Moreover, European housing prices are correlated with economic factors such as GDP per capita, mortgage interest rates, and inflation (Égert & Mihaljek, 2007; Giussani & Hadjimatheou, 1992). Monetary policies play a significant role in housing prices, where increasing interest rates reduce capital availability and, consequently, housing demand (Xu & Tang, 2014).

### 3. Data Characterization

The data used in our study is sourced from three separate databases provided by the *Instituto Nacional de Estatística* (INE) in Portugal: The Portuguese Labor Force Survey (LFS), the IMT database, and the IMI database. The Labour Force Survey (LFS) offers comprehensive insights into the nation's workforce dynamics. Each household is assigned a distinct identification number. The survey employs a panel data approach, and each household is surveyed every three months, continuously for up to 6 consecutive quarters to track changes over time. The LFS allows us to make inferences on foreign born population, their education, income, employment situation and compare it to the native population.

IMT, a one-time tax paid by property purchasers, is contingent on various property-related factors, including the declared property value. IMI, on the other hand, is an annual tax imposed on property owners, with rates influenced by factors like property size and location. The Instituto Nacional de Estatística (INE) has compiled extensive data regarding IMT tax rates from 2007 to 2021. The study employs this data, with a focus on relevant variables, aggregating property information at the NUTS II regional level, including factors such as property value, size, and location. The IMI database, covering the period from 2010 to 2021, emphasizes individual dwelling characteristics and offers valuable information like the number of floors, typology, and land prices, aggregated at the municipality level.

#### 3.1. Summary Statistics

The LFS dataset incorporates responses from 292,165 individuals, resulting in 1,281,959 observations between 2011 and 2020. Since each

person answers the survey up to six times, the data could be unbalanced and biased if all responses were considered. Therefore, only the first response from each individual, yielding 292,165 observations, is used for population description and summary statistics. The LFS data is characterized at the NUTS II regional level, except for the regions of Região Autónoma dos Açores and Região Autónoma da Madeira, which were not contemplated in the IMT and IMI databases. The IMT database originally had 4,628 observations, one for each municipality and year, and the IMI database had a smaller time span and 3,704 observations. Outliers in the IMT database are removed. Since the LFS database is aggregated at the NUTS II level, we will later convert the IMI and IMT databases to the NUTS II level as well so we can merge them with the LFS database. We did so through a correspondence table between municipalities and NUTS II regions and observations without correspondence in the table were excluded.

##### 3.1.1. LFS Summary Statistics

In terms of descriptive statistics, the LFS sample consists of individuals with an average age of 45.1 years, but the immigrant population is notably younger, with an average age of 41.4 years. Education levels in the population show that 66% have at most a basic education, 18% completed high school, and only 15% hold a college degree. Interestingly, immigrants display a higher proportion of high school and college graduates, 59%, compared to the 31% among natives. In terms of employment, 51% of the population is in the active population, including those employed and actively seeking employment. Immigrants show a higher employment rate, surpassing natives by 16%. The non-active population among immigrants is about 31%, notably lower than the 53% observed among natives. Regarding earnings, natives have a higher proportion in the lower income percentiles, with 41% falling below the 50th percentile, while immigrants have 48%. On the higher income scale, immigrants have more individuals in the 90th to 99th percentiles, 9.6%, and above the 99th percentile, 1.3%, compared to 8.7% and 0.9%, respectively, among natives. Demographically, the average percentage of immigrants per region is 7.19%, with Lisbon and the South having the highest percentages at 11.4% and 12.7%, and Alentejo the lowest at 4.04%. Immigrant inflow is

positive at 0.13%, translating to approximately 3266 immigrants. Conversely, the native population experiences a negative net flow at an average rate of -0.5%, with fluctuations in immigration flows in response to global economic conditions over the years, peaking at 0.74% in 2020.

### 3.1.2. IMT and IMI Summary Statistics

The primary variable of interest in this database is real estate prices, and Figure 3.1 illustrates significant annual price fluctuations. In 2011, the average price was 176,201.5€, with a substantial 31.5% increase over the next decade, reaching 231,595.6€ in 2020. This translates to an average yearly nominal increase of 6,282.9€ and an average yearly percentage increase of 67.3%, indicating the dynamic nature of the Portuguese real estate market during the study period. The housing prices values have undergone treatments to address outliers, inflation adjustments, and weighted mean prices computations. Despite these efforts, they still show a dramatic 720% price change in 2014. For instance, Vila Real had an average price of €23 million in 2014, while the typically low-income neighborhood of Amadora had an average price of €3.5 million. Some unique transactions with valuations of €142 billion biased the average prices, possibly resulting from anomalies in data entry. The average prices per region vary significantly, with the Lisbon Metropolitan Area having the highest housing prices at an average of 1,243,585€, and the central region displaying the lowest prices at 269,992.9€.

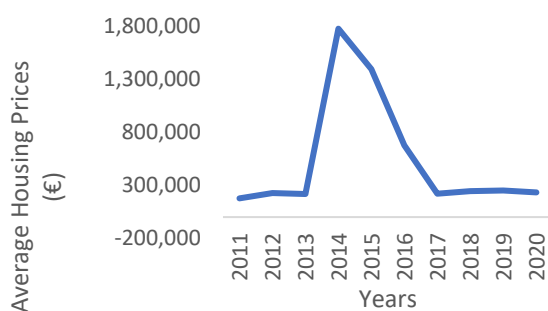


Figure 3.1: Average Portuguese Housing Prices

In terms of property characteristics, property age is most pronounced in the Alentejo region, with an average property age of 42.7 years. Regarding the total interior area, the Center region has the most spacious houses, with average sizes of 137.5 m<sup>2</sup>.

In contrast, the South region has the smallest average interior areas of 105.5 m<sup>2</sup>, respectively.

### 3.2. Model Estimation Sample

This section outlines the process of constructing the final database comprised of 50 observations. Despite its size not being ideal for robust estimates, as it was the most practical approach to aggregate the three distinct databases. The LFS database spanned from 2011 to 2020, structured at the NUTS II level, with seven regions: North, Center, Lisbon, Alentejo, South, Azores, and Madeira. The IMI database covered 2007 to 2021, and the IMT database spanned from 2010 to 2021. Given that LFS data was only available from 2011 to 2020, observations from other years were excluded. Both IMI and IMT databases initially used a municipal structure, necessitating conversion to NUTS II for LFS compatibility, with unmatched observations being removed. It is essential to note that housing price data for the Azores and Madeira archipelagos was unavailable, leading to the exclusion of LFS observations related to these regions. Despite differing time intervals between LFS and IMI/IMT data, the final database aggregated variables at the NUTS II and annual levels, resulting in a final database spanning five regions over a decade, with 50 observations. The database also underwent adjustments to real values and data treatments to address anomalies, particularly unrealistic transaction values. Outliers were identified and removed using Z-values. To mitigate the impact of singular transactions, a weighted average of each NUTS II's housing prices was computed, reducing the influence of municipalities with fewer houses on NUTS II average prices.

### 4. Methodology

Although there is variability in results across existing literature, authors tend to adopt similar modeling approaches in addressing this issue. Several notable models are discussed, highlighting a consistent methodological thread. Saiz (2007) employs a model using long differences, utilizing OLS and 2SLS methods. The dependent variable is the logarithm of housing rents, while the primary independent variable is the change in the immigrant population relative to the total population. Gonzalez & Ortega (2009) adopt a first-difference approach, employing OLS and 2SLS regressions. Their dependent variable measures changes in



the average price of a square meter, with the primary independent variable mirroring Saiz (2007). Sá (2015) similarly uses OLS and IV regression techniques, focusing on first differences to remove time-invariant factors. Her model includes the same independent variable related to changes in the foreign-born population, with the dependent variable assessing the alteration in the logarithm of real estate prices. Accetturo et al. (2014) align their methodology with previous research, primarily using a 2SLS approach to examine the effects of immigration on housing prices. The consistent approach seen in this literature guided the development of a model for estimating the impact of immigration on house prices.

$$\ln(P_{it}) = \beta_1 \frac{\Delta FB_{it}}{POP_{it-1}} + \beta_2 X_{it} + \gamma + \alpha_i + \varepsilon_{it} \quad (4.1)$$

Where  $\ln(P_{it})$  is the log of the house prices in region  $i$  and time period  $t$ . The main independent variable is the annual inflow of foreign-born divided by the total population on year  $t - 1$ . The coefficient  $\beta$  is interpreted as the percentage change in real estate prices corresponding to a one percentage-point increase in the inflow of foreign-born individuals as a proportion of the total population of the previous year.  $X_{it}$  denotes a vector of control variables capturing time-varying region-specific effects.  $\gamma$  is a set of year dummies intended to capture national trends.  $\alpha_i$  and  $\varepsilon_{it}$  represent the time-invariant and time-variant error terms, respectively.

Based on the literature review, it is evident that researchers have commonly used similar methodologies with minor variations when addressing the issue of immigration's impact on housing prices. Notably, Ordinary Least Squares (OLS) estimators are susceptible to producing inconsistent results due to omitted variable bias, and reverse causality issues are prominent when studying immigration's effects on housing costs. Immigrants often choose where to settle based on local amenities or international settlements, raising concerns about causality. Therefore, in this study, Fixed-Effects Regression and First-Differences Regression are employed as estimation techniques to mitigate omitted variable bias and account for time-invariant factors. To handle endogeneity in the immigrant inflow variable, an instrumental variable approach is adopted, utilizing a shift-share instrument based on the historical share of immigrants across different regions in Portugal. This

instrument predicts present immigration flows in each region based on past distribution. The instrument leverages the assumption that immigrants tend to settle in regions with historical settlements of people from the same country. To establish its validity, two key assumptions are made: firstly, that recent economic fluctuations in Portugal's regions are not correlated with the historical presence of immigrants, and secondly, that yearly migrant inflows into various regions are exogenous, being mainly influenced by political laws and decisions. The equation of the instrument of the current stock of foreign-born population in region  $i$  and year  $t$  is computed as follows:

$$Z_{it} = \frac{\sum_c \left( \frac{FB_{cit_0}}{FB_{ct_0}} \right) \cdot \Delta FB_{ct}}{POP_{it-1}} \quad (4.2)$$

Where  $FB_{cit_0}$  is the number of individuals foreign-born in country  $c$  residing in region  $i$  in the base year  $t_0$ .  $FB_{ct_0}$  is the number of individuals foreign-born in country  $c$  residing across all regions in year  $t_0$ . Therefore, the term in parentheses is the share of individuals born in  $c$  that resided in each region.  $\Delta FB_{ct}$  is the change in foreign-born in country  $c$  in year  $t$  and is a time-variant term. Another time-variant term is the denominator of the equation, which is the population of region  $i$  in the year  $t-1$ . Identifying a valid and robust instrument is often a challenging aspect of an instrumental variable (IV) approach. Hence, relying on an extensively utilized instrument, which has demonstrated its utility in estimating various immigration impacts, instills confidence in its reliability.

Researchers often encounter issues when their data does not meet the assumption of independent and identically distributed (i.i.d.) observations, leading to correlations within groups but independence across them. This can affect parameter estimation, like standard errors and variances. To address this, we often cluster standard errors, but in this case, clustering led to problems with Variance-Covariance Estimator (VCE), making some model tests and F-statistics impossible due to the small number of clusters in the dataset (only five). Consequently, we decided to exclude clustering of standard errors in models where these issues occurred.

## 5. Results and Discussion

The study employs logarithmic housing prices, adjusted for inflation, as the dependent variable, with the key independent variable being the change in the number of foreign-born individuals divided by the total population from the previous year. Additionally, all models incorporate year fixed effects to consider macroeconomic trends. Although variables like GDP and mortgage rates influence housing prices, these trends are already accounted for by the year dummies. Therefore, introducing more macroeconomic control variables is avoided to prevent collinearity issues and the exclusion of some year dummies. The study mainly relies on the year dummy variables and does not include national-level economic controls in its models.

Table 1 presents the baseline models, featuring the dependent variable, the primary independent variable, and year dummy variables to account for time-specific effects. The baseline models do not contain the vector of control variables. Model 1 employs a standard fixed effects regression, introducing fixed effects to control for unobservable time-invariant factors and evaluate immigration's impact on housing prices. Model 2 employs a first differences regression approach to analyze short-term effects, capturing variable changes over time. Model 3 employs a 2SLS instrumental variable regression, incorporating fixed effects and addressing endogeneity concerns with instrumental variables. Model 4 is another 2SLS instrumental variable regression, focusing on short-term dynamics by employing first differences estimation while addressing endogeneity with instrumental variables.

Analyzing the results of Table 1, we observe that both Model 2 and Model 4 exhibit statistical significance. In Model 2, the coefficient associated with the main independent variable is -0.099. This implies that, all else being equal, a one-percentage-point increase in immigration inflow corresponds to a substantial 9.9% decrease in housing prices. Model 4 reveals a similar pattern, indicating that, under identical conditions, a one-percentage-point increase in immigration inflow results in a 7.8% reduction in housing prices. As for Model 1 and Model 3, we do not find a statistically significant relationship between immigration and housing prices. However, it is noteworthy that both models exhibit negative coefficients (although not

statistically significant), reinforcing the findings of Models 2 and 4. Additionally, we conducted weak instrument tests to assess the instrumental variables' strength. The weak instrument tests for Model 3 and Model 4 and the results indicate that our instrument could be considered weak since they fall below the Stock & Yogo (2005) lowest critical value of 16.38. Importantly, the instrument we use is well-established in various research fields, which enhances our confidence in its validity. Therefore, while our weak instrument testing results may not be optimal, we believe they are sufficiently robust to provide significant and efficient coefficient estimates.

Table 1: Estimates of Baseline Specification

	FE (1)	FD (2)	2SLS FE (3)	2SLS FD (4)
<b>Immig. In- flow %</b>	-0.060 (0.057)	-0.099** (0.042)	-0.051 (0.108)	-0.078* (0.041)
<b>Constant</b>	12.554*** (0.106)		12.555*** (0.106)	
<b>Year Dum- mies</b>	Yes	Yes	Yes	Yes
<b>Adj./Within R<sup>2</sup></b>	0.94	0.88	0.94	0.88
<b>S-W F-Stat</b>			11.94	12.23
<b>Observa- tions</b>	45	40	45	40

Coefficients estimates and standard errors in parentheses (Robust standard errors in the FD regressions). Dependent variable is the logarithm of house prices. Adjusted R<sup>2</sup> for FD reg. and Within R<sup>2</sup> for FE. The S-W F-stat is the Sanderson and Windmeijer (2016) multivariate F-test of excluded instruments for weak identification of each endogenous regressor separately; \* significant at 10%, \*\*significant at 5%, and \*\*\* significant at 1%

Moving on to the results in Table 2, these models are based on equation 4.1, and in contrast to the previous specifications, they include a vector of control variables. Specifically, these control variables encompass the lagged unemployment rate, the percentage of the active population, average per capita income, the logarithm of the number of immigrant college graduates, the percentage of immigrants originating from "high-income" countries, and the average age of dwellings within each region. Among these models, only Model 5 and Model 6, yield statistically significant coefficient estimates. Their interpretations are as follows: Model 5 indicates that a one-percentage-point increase in immigrant inflow corresponds to an average 12.7% decrease in housing prices. Conversely, Model 6 demonstrates that a one-percentage-point increase in immigrant inflow is associated with an average 14.7% decrease in housing prices. However, for both Model 7 and Model 8,

we do not discern a statistically significant relationship between immigration and housing prices. It is noteworthy that these models still display negative coefficients which aligns with the findings observed in Models 1, 2, 5, and 6.

We can assert that, based on our dataset and models, there exists a negative effect of immigration on Portuguese real estate prices. The direction of the immigration-housing prices relationship, as discussed in Section 2, has lacked consensus in prior research. Gonzalez & Ortega (2009) found that a 1% increase in immigration relative to the local population in Spain resulted in only a 1.6% decline in housing prices, in line with our results. Accetturo et al. (2014) also discovered a negative link between immigration and housing prices in Italy, with their coefficient estimates being in line with our results and also their absolute value being notably lower. In our IV regressions, the lack of statistical significance raises concerns about potential instrument weakness. However, Models 7 and 8 present a different picture in the weak instrument tests. Unlike Models 3 and 4, Models 7 and 8 show significantly improved weak instrument test statistics. Model 5 comes close but falls just short of surpassing the critical value set by Stock & Yogo (2005) with a value of 15.96. In contrast, Model 6 comfortably exceeds this critical threshold with a substantial S-W F-Stat of 20.83. This provides further support for the validity of our chosen instrumental variable in the analysis.

Most of our control variables did not show statistically significant coefficients, and those that do exhibit counterintuitive results compared to our literature review and logical expectations. However, these complex relationships can vary based on the specific context and data. The presence of time dummies already explains a significant portion of the variability in the dependent variable, leaving less room for other variables to explain additional variance. The coefficient for the unemployment rate is generally not statistically significant, except in Model 8, where it surprisingly shows a positive relationship. This may be explained by regions with robust economic growth attracting job seekers, leading to higher unemployment rates but increased housing demand and prices. The lagged nature of the variable also suggests that it reflects past economic conditions. The negative coefficient for "income per capita" contradicts conventional economic theory, but higher income

levels may result in elevated living costs, making housing less affordable and reducing prices. Government policies can also influence these dynamics. The significant variable related to the percentage of wealthy country immigrants exhibits a negative coefficient, possibly because wealthy immigrants have different preferences or primarily invest in high-end properties with limited impact on lower-priced housing segments.

Additionally, we also delved into the first-stage estimates. In 2SLS regression, the first stage checks the instrument's validity. Across all models, the predicted foreign-born population's coefficients are highly statistically significant (at the 1% level), affirming its relevance and a clear link with the endogenous variable. We also conducted some additional tests, but no significant conclusions were withdrawn from them.

Table 2: Estimates of Full Specification

	FE (5)	FD (6)	2SLS FE (7)	2SLS FD (8)
<b>Immig. Inflow %</b>	-0.127* (0.065)	-0.147*** (0.045)	-0.123 (0.110)	-0.050 (0.041)
<b>Unemp. Rate (t-1)</b>	5.358 (5.110)	9.465 (5.250)	5.430 (5.304)	10.449* (6.034)
<b>Active Population</b>	-0.902 (6.187)	0.348 (6.602)	-0.855 (6.255)	-3.395 (4.948)
<b>Income per capita</b>	-3.416* (1.711)	-2.436* (1.354)	-3.379* (1.863)	0.301 (1.130)
<b>Immig. College grad. %</b>	0.319 (0.392)	0.096 (0.334)	0.311 (0.422)	0.129 (0.218)
<b>Wealthy country immig. %</b>	-0.029* (0.017)	-0.044** (0.018)	-0.037* (0.019)	-0.041* (0.022)
<b>Building Age</b>	0.038 (0.037)	0.012 (0.027)	0.037 (0.038)	-0.010 (0.042)
<b>Constant</b>	7.790 (24.112)		7.348 (25.635)	
<b>Year Dummies</b>	Yes	Yes	Yes	Yes
<b>Adj./ Within R<sup>2</sup></b>	0.95	0.90	0.95	0.90
<b>S-W F-Stat</b>			15.96	20.83
<b>Observations</b>	45	40	45	40

Coefficients estimates and standard errors in parentheses (Robust standard errors in the FD regressions). Dependent variable is the logarithm of house prices. Adjusted R<sup>2</sup> for FD reg. and Within R<sup>2</sup> for FE. The S-W F-stat is the Sanderson and Windmeijer (2016) multivariate F-test of excluded instruments for weak identification of each endogenous regressor separately; \* significant at 10%, \*\*significant at 5%, and \*\*\* significant at 1%

## 6. Conclusions

In recent years, Portugal has experienced a shift in immigration patterns, with people from various regions choosing it as their destination due to its political stability, pleasant climate, and economic prospects. This demographic change, particularly in cities like Lisbon and Porto, has led to questions



about the relationship between immigration and the housing market. Past research has shown mixed results regarding the impact of immigration on housing prices, with some studies indicating increases and others suggesting decreases. This study aimed to shed light on this issue by analyzing various databases, including the Labor Force Survey, the IMT, and the IMI databases. The data underwent rigorous treatments, including outlier removal, to ensure accuracy and reliability. We conducted an in-depth econometric analysis to assess the impact of immigration on Portuguese real estate prices. We utilized multiple models, employing various estimation methods and a wide range displayed and non-displayed control variables to comprehensively explore this relationship. Our findings revealed a consistent negative effect of immigration on housing prices in Portugal, with statistically significant results in specific models indicating that a one-percentage-point increase in immigration inflow corresponds to a significant reduction in housing prices, with decreases from 7.8% to 14.7%, respectively. These results, compared to some prior research, align with the results in other European countries and suggest that immigration exerts a downward pressure on the Portuguese real estate market. As discussed in the literature review, there are some factors that make this a sustained result. Immigrants tend to settle in low-quality dwellings after arriving in a new environment. Additionally, immigrants cluster in certain regions, since it helps with integration and cluster in dwellings, even sharing them among multiple families, in order to reduce housing costs (Card, 2001). Moreover, since immigrants usually come from lower socioeconomic statuses, they tend to cluster in regions with a high supply of low-skilled jobs and eventually depreciate the average wage level (Carter, 2005). Ultimately, these factors and others tend to depreciate the native's comfort and perception of local amenities and leads them to leave for other regions thus offsetting the inflow of immigration and potentially leading to a decrease in housing demand.

Additionally, our weak instrument tests, while not ideal, provided confidence in the validity of the instrumental variable used in our analysis. Despite the presence of several control variables, their significance in explaining housing price variance was limited, reflecting the complex and context-dependent nature of these relationships.

However, the study has limitations, such as a relatively small sample size. Future research could expand the dataset and explore additional factors, like housing supply and demand dynamics. Alternative estimation methods, like the Limited Information Maximum Likelihood model, could offer different perspectives. Additionally, the wild bootstrap approach may be worth exploring for addressing issues like heteroscedasticity and autocorrelation.

In conclusion, this study provides valuable insights into the complex relationship between immigration and housing prices in Portugal. The findings are particularly relevant given the country's current housing crisis, and the study's results can serve as a foundation for future research and policy improvements.

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