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Decomposing the impact of immigration on house prices

The study of the economic impact of immigration in receiving regions has been a highly researched area for the past 30 years and continues to attract much attention from academics and policymakers[1]. Recent large population displacements have renewed interest in analysing the effects of large immigration inflows across locations. For example, recent papers have looked at local impact of large refugee waves from Ukraine or Syria.

Within a vast empirical literature on the effects of immigration, a few papers have provided evidence on its impacts on (consumption) goods prices (Cortés, 2008), mainly finding negative effects. In the case of housing, which is an inelastic and non-tradable good, its price adjustment to an increase in local population might be different. For a given housing and local population stocks, an inflow of foreign-born population intensifies spatial competition on housing consumption, which may initially push prices up. In addition, population shocks might trigger internal migration across locations, affecting local demand further. The total (net) impact is the result of three adjustments: (1) increased demand from newly arrived immigrants, (2) additional demand changes from relocated population and (3) changes in housing conditions (density and construction). Ultimately, the sign and magnitude of the total demand effect on local average house prices is ambiguous (Saiz, 2007). Within this context, using Lewis and Peri (2015) terminology[2], my paper aims to provide a framework to interpret the coefficients according to their partial or total effect on prices, enabling a better understanding of the total estimates. This report summarises the methodology and the main results of my recent publication "Decomposing the impact of immigration on house prices", which provides an analytical and empirical framework for analysing the impact of immigration on local house prices, using the context of Spain during the first decade of the 2000s.

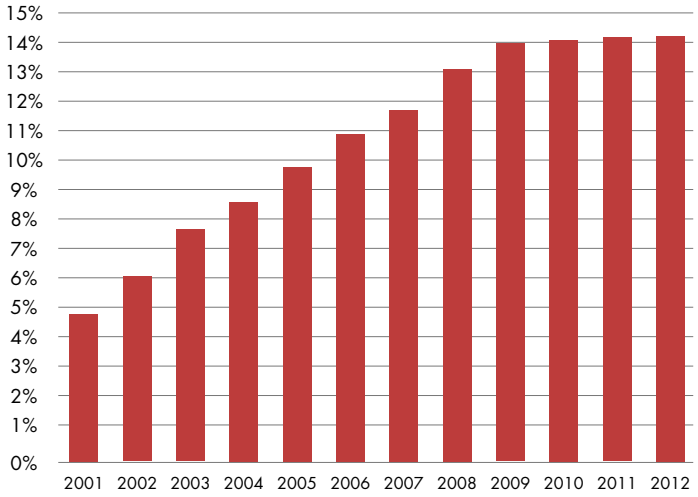
Most studies providing empirical evidence on the impact of immigration on house prices have estimated the net effect, paying little attention to the adjustments driving it. While many studies have found positive estimates of immigration on both house prices, a handful of papers (Saiz and Wachter, 2011; Accetturo et al., 2014) have found negative impacts

The effects of total demand are decomposed into those due to new arrivals of immigrants and those due to relocated natives

of immigration on average house prices, in particular when focusing on smaller geographical areas. The displacement of natives from these areas ("native-fly") is the main argument used to explain these negative findings, but, with the exception of Sá (2015), this channel is rarely explicitly estimated. In this paper, I provide novel evidence on the impact of immigration on house prices, proposing a method to tease apart the effect due to increased demand stemming from new arrivals ("partial effect") from additional demand changes from relocated natives ("induced effect").

The 2000s Spanish immigration wave is an ideal empirical setting to study this issue, as the country experienced a large increase in foreign born population shares between 2001 and 2012 (almost 10 percentage points, as shown in figure 1, coupled with an unprecedented housing

Figure 1: Evolution of the percentage of foreign-born population - Spain 2001-2012



[1] Most of the theoretical and empirical contributions on this topic have originated from the analysis of their impact on labour markets, mostly on natives' employment and wages, with still controversial results. See Dustmann et al. (2016) for discussion on the current debate.a

[2] Lewis & Peri (2015) pg 4–5: "Traditionally the economic analysis has distinguished between short and long run effects of immigration. However, the so-called short-run effects are mostly a theoretical device to decompose a complex effect. When economists analyse the 'short-run effects' of immigrants they try to isolate the consequences of immigration when all other variables (including the stock of capaital, the skill supply of natives and the technology and productive structure) are fixed. This should be called 'partial' effect. It is a way to understand and isolate a specific effect, not a way to forecast what happens, even in the short run". In fact, Saiz (2007) refers to long and short-run impacts when allowing for adjustments on native population and housing conditions or not.

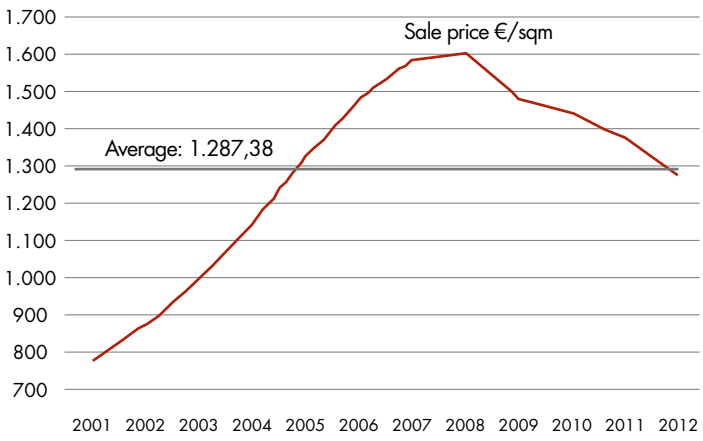
boom. In this decade, house prices initially experienced large increases (2001-2008), almost doubling, followed later by a downturn in the real estate sector and a downward adjustment of prices (2009-2012), as shown in Figure 2. A few authors have studied the role of immigration on housing markets in Spain, using different levels of spatial aggregation with mixed findings (García-Montalvo, 2010). Notably, González and Ortega (2013) attribute one quarter of house price growth to (working-age) immigration inflows in Spain during the decade 2000–2010. These papers lack an analysis of how prices are adjusted in response to immigration inflows through different channels.

My article makes several contributions. First, from combining the estimating equations I formally show that the coefficient that captures total demand changes can be decomposed as the sum of direct (immigrant) demand changes plus additional demand shifts from relocated population (induced). This decomposition offers a framework to better understand the demand adjustments on local house prices following a large immigration inflow. This is the first paper to provide causal estimates of all the elements of this decomposition, and in particular, to identify the relationship between them.

Second, to obtain causal counterparts of the decomposition elements I construct a shift-share instrument that combines historical immigrant location patterns with predicted national inflows by country of origin obtained from a push-factors gravity model. This is an improved version of the standard ethnic networks instrument widely used in the immigration literature and it is the first time it is applied to Spanish data. This modification of the traditional shift-share immigration predictor addresses many of the concerns raised in the recent shift-share instruments literature.

Finally, in order to be able to interpret the results in terms of changes of prices in equilibrium in my estimations I partial out housing supply conditions. The main results are estimated including province fixed effects and additional province-level supply-related attributes interacted with year dummies. By doing this, the coefficients correspond to demand impacts, making their interpretation more straightforward.

Figure 2: Evolution of average house prices (per square metre), by year and total for the period - Spain 2001-2012



They are estimated separately, using data from the Spanish provinces of 2002 to 2012. An increase of 1 point percentage of immigration rate increases the average price of the housing 3.3%

Framework, data and empirical methodology

The total impact of changes in foreign-born population on house prices has been previously estimated using variations of the empirical specification used in Saiz (2007). This model relates the growth of average local house prices at the province (outcome variable) with changes in the immigration rate in the previous year, or normalised immigration inflow (variable of interest). This rate is computed as the change in immigration stocks (inflows) normalised by the province population, in order to consider that the entry of the same number of immigrants might have different impacts depending on the size of the receiving region. The parameter of interest is interpreted as the percent change in house prices for an increase in the immigration rate of one percentage point (semi-elasticity). Similar models are specified to study the relationship between immigration and native location and population growth and house prices.

One of the main contributions of my work is to present an empirical identity that decomposes the different channels that drive the total (demand) impact. The first component is the estimated impact of immigration on prices via its impact on the size local population changes (*direct demand impact*). This estimate is theoretically positive and it resembles a reduced-form demand coefficient. The second component captures the changes in prices that are due to additional changes in demand from relocated (*native*) population (*induced demand impact*), and it depends the estimated impact of immigration on local native population changes (*native mobility* or the so-called "native-displacement"). This induced changes in demand can be positive or negative depending on how native mobility is affected by immigrants, e.g. if it is positive or negative. The sum of the direct and indirect impact makes up the estimated total impact. These coefficients correspond to demand effects as long as supply conditions are partialled-out in the estimation. As explained in detail in the paper, this identity relies on the correct identification of the estimated coefficients, which in the paper I achieve by means of using a first-differences panel data approach combined with instrumental variables.

To obtain the article empirical results, I use data for Spanish provinces between 2001 and 2012 to estimate the empirical counterparts of the decomposition. Population registers and immigration inflows, socio-economic, housing supply and other province characteristics data was collated to construct the estimation dataset, mainly from the *Instituto Nacional de Estadística* (INE), *the Instituto Valenciano de Investigaciones Económicas* (IVIE), the European Environmental Agency and the World Bank Database. Table 1 presents summary statistics for the main variables of the analysis. The table shows that, despite the burst of the housing bubble from 2010, the average annual growth of house prices was very

high. almost 5% per year, while rents grew almost 3%. On the other hand, the table also shows that most of population growth, a remarkable 10% per year, stemmed from immigration.

I proceed in three steps. In Step 1, I use the immigration rate as the main regressor, regressing it on the annual local house price growth. To be able to make causal claims about the estimates, I use a modified version of the standard immigration shift-share instrument to compute a prediction of immigration rates, and control for relevant local characteristics, time and province fixed effects, including housing supply conditions and other baseline characteristic trends. In Step 2, I explicitly test the impact of immigrant inflows on native mobility to obtain the number of natives that relocate as a consequence of the immigration inflows. To identify the impact of immigration on prices that is only due to increased immigrant housing demand ("partial" effect), in Step 3 I use population growth rate as the main regressor in a model equivalent to step 1. I estimate the coefficient of this variable using solely the variation on population growth which is due to exogenous location of immigrants (predicted by the instrument), e.g the main regressor is population growth and I instrument it with the immigration rate prediction. In all empirical estimations I include province-specific time varying controls, province and year fixed-effects and province attribute flexible trends, which remove fixed and observable biases in the estimates.

The location of immigrants across different provinces is not random: they locate in specific places due to factors, some observable and some not, which might also be determinants of the evolution of local average house prices. While some of these factors can be accounted for parametrically, e.g. including controls variables and fixed effects, some cannot not, and they might induce bias in our estimates. In this case, our coefficient of interest might be too large or too small depending on the correlation of the non-included heterogeneity and immigration inflows. Even after including fixed effects and control variables, a consistent estimation of the β-coefficients requires that the regressors of interest to be uncorrelated with the time-varying part of the error term. Unobserved factors could still induce omitted variables or endogeneity biasesAn important part of the empirical methodology is the construction of a shift-share prediction of the immigration rates, in order to leverage on exogenous variation to estimate the total and partial demand effects. The instrument I construct is an imputation (or prediction) of the immigration rate.

I construct the instrument adapting the "shift-share" methodology, which has extensively been used before, for instance by Card (2001). Intuitively, a province-year immigrant stocks imputation is constructed by distributing year-to-year variation on the national stocks of immigrants by country of birth (the "shift" or "shock") across different areas, using some location pattern (the "share") to allocate this magnitude. The most commonly used shift-share instrument builds up on the fact that, to take advantage of social and economic established networks, immigrants tend to disproportionately locate in areas where immigrants from the same nationality / country of birth or ethnicity have located before (ethnic networks instrument).

I use past (1991) location patterns by country of birth ("share") and province of residents to predict current location patterns. For the national yearly immigration inflow ("shift") by country of birth, I use country-of-origin-specific predicted inflows based on a gravity push factor model, a modification of the standard shift-share that addresses some of the concerns raised in the recent shift-share instruments literature (see for example Goldsmith-Pinkham et al. (2020)). The product of the shift-share produces annual imputations of the stock or inflow of foreign-born for each country of birth in each province in each year. To calculate the yearly predicted province stocks, I sum these imputations over country of birth. I additionally construct yearly predictions of the province native population stocks, which I combine with the foreign-born stocks predictions to construct predictions of the denominator of the immigration rate. Using this and the predicted change in stocks and population stock, I can construct my instrument of the immigration rate, which then I use in the estimation of the empirical specifications.

Results

The tables below depict the main results of the paper. Table 2 shows the results obtained using an OLS estimator, where biases in the coefficients are mitigated with the use of fixed effects, trends and time-varying controls, which are listed in the notes of the table.

Each column presents a specification that includes different sets of controls and fixed-effects. In all specifications the standard errors are clustered at the province level and robust to heteroskedasticity, and I include year fixed effects to control for national shocks. Specifications range from more to less demanding in terms of data variation: OLS results (column 1) to first differences province fixed effects with attribute trends model (column 5). As explained above, in these results the coefficients correspond the total demand estimate and captures the combined impact of changes in demand from immigrants and natives. The model in the last column, where I include time and province fixed effects, province attribute flexible trends and time-varying controls is the most demanding one, and the baseline specification in all the results of the paper. Here, the estimated semi-elasticities are around 2 for sale prices. Even if this is informative, these coefficients roughly correspond to partial correlations.

In order to be able to make causal claims about the estimates, I implement the IV strategy explained above. Table 3 presents the results. I depict the coefficients for the baseline specification in column 5 of Table 2. I estimate the

Table 1: Housing cost and population rates summary statistics

Variables	Time period	Mean	Std. Dev.	Min	Max
Change of long rent prices	2002/01-2012/11	0,028	0,017	-0,01	0,08
Change of long sale prices	2002/01-2012/11	0,047	0,094	-0,16	0,28
Inflow of population during t over population in (t-1)	2001-2011	0,01	0,012	-0,01	0,06
Inflow of foreign-born during t over population in (t-1)	2001-2011	0,009	0,008	-0,01	0,05
Inflow of natives during t over population in (t-1)	2001-2011	0,002	0,006	-0,02	0,03

Partial effects are smaller than total estimates because immigrants and natives co-locate. The impact of immigration on native location choices impacts net demand changes

models using 2 stages least squares. Column 1 shows the semi-elasticity for house sale prices, which correspond to the total demand semi-elasticities. The first-stage estimate is shown in column 3. I report the weak identification test, which informs about the relevance of the instrument and the mean values of the outcomes and the rates. The table shows that the instrument is very strong. As expected, in all specifications the standard errors increase when using IV. Compared to the OLS fixed effect estimates, the IV coefficients are much larger, which suggests that immigrants are moving, conditional on the controls and the area fixed effects, to provinces which are experiencing negative shocks in the growth of prices, and therefore the estimates of Table 2 are downward biased. I find a semi-elasticity of around 3.3% for sale house prices, for an increase in the immigration rate of 1 percentage point, which is very similar to previous findinags, and corresponds to the total effect.

I then move to estimate the relationship between immigration and native mobility. In line with existing estimates for Spain (Fernández-Huertas et al., 2009), I find that immigrants attract natives to areas in which they locate (approximately 3 natives for each 10 immigrants). This finding suggests that natives and immigrants are contemporaneously co-locating in the same provinces. The attraction or co-location estimate, although counter-intuitive, has also been found in other papers (for example Mocetti & Porello, 2010; Wozniak & Murray, 2012). In order to provide some intuitions on the co-location finding, I lay out a simple theoretical framework where natives and immigrants specialise in different sectors (high-skill natives in the tradable sector and low-skill immigrants in the non-tradable local services sector). In the model, an inflow of immigrants reduces the price of local services making locations more attractive to natives, who co-locate with the immigrants. While data availability prevents a full test of the model predictions, I provide some correlations that indicate this mechanism could be credible, especially in provinces that receive a large number of natives and immigrants.

The last step is to estimate the partial demand effect, applying the methodology described above. I use population growth rate as the main regressor and instrument it with the immigration rate prediction. This instrument predicts exogenous foreign-born location. Conditional on controls and fixed effects, the predicted-by-the-instrument population growth second-stage estimate only captures changes in population due to immigrant inflows. This coefficient captures the impact on house prices stemming from changes in foreign-born demand, abstracting from the induced demand due to other population changes. By doing this, the estimated coefficient corresponds to a direct immigrant demand elasticity (partial impact),

Table 2: Total demand effect estimates – OLS\FE results

	(1)	(2)	(3)	(4)	(5)
Δ Log Sales Prices (t)					
Immigration rate (t-1)	0,604**	1,069***	1,468***	1,947***	2,024***
	(0,291)	(0,331)	(0,374)	(0,596)	(0,584)
Adjusted R^2	0,85	0,85	0,86	0,86	0,86
Province attributes		Yes			
Province FE			Yes	Yes	Yes
Province attributes * Year FE				Yes	Yes
Time-var controls (t-3\t-2)					Yes

Notes: Significance levels. *p<0.05, **p<0.01, ***p<0.001. Each column presents results froma a different specification. All regressions include year dummies and use 550 observations (50 provinces over 11 periods). t=2002/2012. Clustered (province) standard errors in parenthesis. *Time-varying controls* (lagged two periods e.g. t-2/t-3) include change of log current GDP per capita, change of log of number of credit establishments, change of unemployment rate, change average years of education employed, change share working-age-population without any degree, change of log transport infrastucture and change of log urban infrastucture. *Province attributes* (time invariant) include share of residential secondary dwellings, share of households which own a secondary home, share of employed in construction sector, share of employed in services sector, share of foreign-born renters (residents in family homes), share of natives renters (residents in family homes), log average sqm dwelling per person foreign-born, log average sqm dwelling per person natives; all these in 2001. They also include log road distance to Madrid, length of coastline un 100s of kms, log of rain precipitation (January), share of developable land (Corine 2000) and average ruggedness index. Province attributes **Year FE* interact the time-invariant characteristics with year dummies.

independent from demand changes from relocated natives. The estimated immigrant demand semi-elasticities for house prices using this methodology is 2.5%. The difference between the empirical estimates of steps 1 and 3 corresponds to the change in demand from natives locating in the region contemporaneously to the immigrant inflow, i.e. "induced" native demand, which in my case is 0.8%.

The total and partial estimated coefficients correspond to demand effects when housing supply is accounted for in the regressions. In the estimation of the baseline results, which already include province fixed effects, I also include local attributes in flexible trends that relate to housing supply conditions. I further explore the impact that directly controlling for housing stock changes has on the estimates, using an instrument for changes in housing stock. I find that they have very little additional effect on the coefficients. Multiple tests on the validity of the instrumental variable strategy are provided in the article. The empirical results are robust across different specifications, to different constructions of the instrument and remain very similar when using long differences instead of year-to-year variations.

Conclusion

The results of my research highlight the importance of considering local population mobility when interpreting the effect of immigration on house prices, or any other local outcome affected by population changes. The impact of population mobility on the identification of aggregate local effects gained renewed interest after the publication of Borjas (2003). This paper criticised studies on regional labour market impacts of foreign-born inflows, claiming that the United States worked as a single labour market and that the existence of mobility across areas could hinder the estimation of regional effects. The lack of local effects could be the result of the exit of native population after an inflow of immigrants, resulting in a net zero or very small change in local labour demand. As total housing demand changes are affected by direct and induced population inflows, if these have opposing signs, the net estimates might be close to zero but masking sizeable partial adjustments. Previous papers have relied on the existing US evidence to argue that native area displacement due to immigration is small or not large enough to cancel out increased demand stemming from increased area population so its impact on the estimates is irrelevant, and thus discussed total and partial effects as equivalent. However, my findings suggest that the impact of immigrants on native location can be non-negligible, so we need to be more careful about making these claims.

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Table 3: Total and partial demand effect estimates – IV 2SLS results

	(1)	(2)	(3)	(4)	(5)
	Δ Log Sale Prices (t)	Native Rate (t-1)	Immigr Rate (t-1)	Δ Log Sale Prices (t)	Popul Rate (t-1)
Immigration rate (t-1)	3,278**	0,308***			
	(1,236)	(0,088)			
Population rate (t-1)				2,506***	
				(0,881)	
Immigration rate SSIV (t-1)			0,684***		0,894***
			(0,143)		(0,180)
Test weak identification (KP)			22,94		24,78
Mean Value of Outcome (Y)	0,0089	0,0089	0,0069	0,0105	0,0069
Mean Value of Rate (X)	0,0474	0,0016	0,0089	0,0474	0,0105
All province FE and controls	Yes	Yes	Yes	Yes	Yes

Notes: Significance levels: * p<0,05, ** p<0.01, *** p<0,001. Prices are in log changes. All specifications include province FE, province attibutes*YearFE and time-varying controls, as described in Table 3. Clustered (province) standard errors in parenthesis. Obs=550s.

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