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Housing Affordability during the Urban Transition in Spain

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Abstract

During the decades previous to the Civil War, Spain experienced a rapid process of urbanization, which was accompanied by the demographic transition and sizeable rural-urban migrations. This article investigates how urban housing markets reacted to these far-reaching changes that increased demand for dwellings. To this end, we employ a new hedonic index of real housing prices and construct a cross-regional panel dataset of rents and housing price fundamentals. This new evidence indicates that rents were not a significant financial burden on low-income families and, hence, housing was affordable for working classes. Also, we show that families' access to new homes was facilitated by a sizable growth of housing supply. Substantial investments in urban infrastructure and the institutional framework enabled the construction of new homes at affordable prices. Our results suggest that housing problems were not as pervasive during the urban transition as the literature often seems to claim.

Housing Affordability during the Urban Transition in Spain[1]

Every developed economy has experienced the transition from a rural to an urban society. Typically, during this critical period of economic development, the demand for accommodation rises to unprecedented levels because a massive number of people are redistributed across places and because new families are created during this process. To respond to these demands, the construction industry has to provide an increasing number of homes for the market. To do so, this industry must mobilize sizeable portions of the nation's capital and a large workforce to generate a considerable amount of private wealth.

Hence, housing failures can profoundly affect a country's overall economic growth and the well-being of its citizens in the early stages of economic development.[2] Inefficiencies in housing markets can generate not only an inelastic supply of new dwellings but also insufficient market transactions with respect to housing demand and any future run-up of housing prices, which can develop into asset bubbles. Such problems in housing markets can easily affect the rest of the economy through three main channels. First, the failures in housing markets could generate broad

[1] Earlier versions of this paper with different title were presented at Iberometrics Conference, Seminar at University of Warwick, and EHS Annual Conference (2012). Raquel Carrasco read the paper and gave us useful insights. Pablo Martinelli helped us with international housing census data. The Editor of this journal, Jaime Reis, and three referees provided us with useful insights. Financial support was received by the Spanish Ministry of Economy and Competitiveness projects: 2013/00066/001 (Juan Carmona), ECO2011-25713 (Markus Lampe) and ECO2012-39169-C03-01 (Joan R. Rosés). The usual disclaimer applies.

[2] Malpezzi ('Economic Analysis' and 'Global perspectives') provides a review of the evidence on housing markets in developing countries.

health problems and reduce workers' living standards.[3] Second, the scarcity of housing, the low liquidity of housing assets and/or their excessive price can delay structural change by imposing severe restrictions on labour migration.[4] Third, if housing transactions absorb too much capital because of overvalued house prices, then the growing demand for capital from the housing market can generate a 'crowding-out effect' that leads to increasing overall interest rates and absorbed savings, which may reduce the economy's stock of productive capital.[5]

The first stage of the English industrial revolution between 1760 and 1830, with its peak in city growth at yearly rates of 2.5 per cent in 1821-31, is an obvious historical example of the damaging consequence of failures in housing markets.[6] According to Williamson, despite fast urban growth of England and Wales during that period, urbanization and hence industrialization actually were hampered by a combination of "an enormous deficit in social overhead capital stocks"[7] in the form of insufficient urban and sanitary infrastructure and underinvestment in housing for individual families. This led to a lack of affordable housing of an appropriate quality and hence to a disproportionate increase in nominal and real housing costs for workers, who

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[3] This topic is beyond the scope of this paper but the available evidence supports the view that urban disaminities decreased in Spain during this period. For example, Reher ('Urban penalty') shows that the urban penalty decreased significantly during the period and that life expectancy increased. Similarly, Gómez Redondo (*La mortalidad infantil*) found that infant mortality rates decreased during the period and that the rural advantage in infant mortality over cities disappeared. Relative urban wages also increased largely and faster than rural wages, particularly during the 1920s (see Rosés and Sánchez-Alonso, 'Regional Wage Convergence').

[4] Muellbauer and Murphy, 'Housing markets'.

[5] Weale, 'House Price Worries'.

[6] Williamson, *Coping with City Growth*, p. 3. See, however, below (notes to table 2) for a qualification of the way in which this city growth was calculated.

[7] Williamson, 'City Growth', pp. 354.

consequently (over)crowded their individual dwellings which in turn were penned up in the densely populated "Victorian slums" characterized by two-story back-to-back housing constructed in the backyards of pre-existing houses. This crowding of and in individual dwelling led to worse sanitary conditions, higher infant and general mortality rates and increased urban disamenity premia for workers in English cities, the main channel through which inefficient housing markets slowed down the pace of industrialization before 1840.[8] In fact, many problems remained pressing until the late ninetieth century, in part because urban populations kept growing not only because of migration, but due to natural increase in the context of the demographic transition, which had its fertility turning point in Britain around 1880.[9]

Similar patterns of city growth and demographic transition can be found, with some regional variation in extent and timing, in most Northwester European countries. In most of them, with the notable exception of France, the phase of maximum city growth coincided in with the phases of the demographic transition that implied maximum population growth in the two or three decades prior to 1900.[10] With Britain as a precedent, France, Germany, Scandinavia and the rest of Europe had to "cope with city growth", and, in the late ninetieth century, developed and adopted technologies to limit the potential economic costs and social penalties of an inadequate urbanization process, for example sewage systems to improve sanitary conditions, public lighting

[8] Williamson, 'City Growth', pp. 348-55, Rodger, *Housing in urban Britain*, pp. 6-12, 18-20 and 28-33; Daunton, *House and Home*, pp. 15-21 and 246-248; and Clark, 'Shelter'.

[9] Williamson, *Coping with City Growth*, ch. 2, Easterlin, 'Worldwide Standard of Living', p. 7.

[10] Williamson, *Coping with City Growth*, p. 3; Knodel, 'Family Limitation', p. 236; and Easterlin, 'Worldwide Standard of Living', p. 17. Reher ('The Demographic Transition') estimates the onset of fertility decline for most of these countries, including France and Britain, as 1900 or later, but nevertheless labels them as 'forerunners'. The only countries with onset of fertility decline before 1900 according to that study were Sweden (1865), Hungary and Uruguay (both 1890).

and intra-urban transport to maintain spatial coherence of urban areas.[11] These technologies could eventually be applied by latecomers in this process, that is, countries experiencing the urban transition process during the twentieth century.

One of these latecomers was Spain, the object of the present study, where urbanization advanced at a flourishing rate in the decades prior to Civil War.[12] Domestic migration rates, mostly from the agrarian areas in the countryside to industrializing und urbanizing regions reached historically unmatched levels.[13] At the same time, Spain saw its income per capita and total factor productivity increase at unprecedented levels, especially during the 1920s.[14] Increasing internal migration and economic growth were accompanied by a demographic transition, leading to population growth and a rapidly rising number of new families.[15] Each of these factors would increase the demand for urban housing; jointly, they surely presented a substantial challenge to the Spanish housing market, in particular, and Spain's economy, in general.

In this paper, we consider whether Spain suffered a housing crisis -similar to that experienced by Britain at the times of the Industrial Revolution- during the first phase of the Spanish urban transition. In other words, we study whether housing affordability increased or decreased during this period of dramatic changes in the demand for new homes. To do so, in the following section, we present some basic evidence on the evolution of urbanization in Spain. Section II reviews the evolution of housing prices and transactions. In section III, we discuss

[11] See, on these new technologies, Brown, 'Reforming the urban environment'; Easterlin, 'How beneficient is the market?'; Divall and Bond, *Suburbanizing the Masses*; Ferrie and Troesken, 'Water and Chicago's mortality transition'; and McKay, *Tramways and Trolleybus*.

[12] Reher, 'Desarrollo urbano'. See, the evidence collected in section I of this paper.

[13] Silvestre, 'Internal migrations'.

[14] Prados de la Escosura and Rosés, 'Sources of long-run Growth'.

[15] Pérez Moreda, 'La población española'.

several alternative measures of housing affordability. In particular, we revise the cost of renting homes for working-class families. Then, in the next section, we estimate an econometric model of housing demand to disentangle the forces behind housing prices in Spain. Our results points to a low elasticity of housing prices to changes in permanent income, a finding normally associated in urban economics with an elastic supply of housing. Finally, in section V, we discuss potential factors which might explain this elastic housing supply. Taken together, our evidence indicates that Spanish housing markets did not underperform during the first phase of the urban transition process and that homes were affordable for Spanish working-classes.

I

Urban transition is defined as the shift from rural to urban and from agricultural employment to industrial or service employment.[16] In Spain, the urban transition took place in two different periods: the first period lasted during the first three decades of the twentieth century while the second period developed throughout the 1950s and 1960s.[17] This article will consider only this first phase of Spain's urban transition, which took place at the same time as the demographic transition.[18]

[Table 1]

[16] On the evolution of relative employment across industries in Spain see Prados de la Escosura, 'Growth and structural change'. Note that less than half of working males were employed in agriculture for the first time ever in 1930. On the rural depopulation see Collantes and Pinilla, *Peaceful Surrender*.

[17] Lanaspa et al., 'Spanish urban structure' and Le Gallo and Chasco, 'Spatial analysis'.

[18] On the demographic transition see Pérez Moreda, 'La población española'.

Table 1 reviews the portion of the urban population in locations with more than 25,000 inhabitants in Peninsular Spain and the Balearic Islands during the first third of the twentieth century. The 25,000 cut-off is chosen for practical reasons — it is the cut-off employed by previous studies and it allows each province to have at least one city. As our data shows, the share of urban population grew from 19.25 percent in 1900 to 26.17 percent in 1930. In absolute numbers, urban population grew from about three-and-a-half million people to more than six million people in only three decades and the number of cities also increased from 47 to 69. The Mediterranean was the most urbanized region while the least urbanized was Northern Castile. The six provinces with the most populated cities in 1930 (i.e., Barcelona, Biscay, Madrid, Saragossa, Seville and Valencia; hereafter: 'six provinces') had the highest urbanization ratios with, on average, more than 50 percent by 1930. On the contrary, the remaining provinces were scarcely urbanized with, on average, an urbanization ratio of less than 17 percent by 1930.

[Table 2]

In table 2, we consider the rates of growth of the different types of population settlements during the first third of the twentieth century. When one moves to decade-by-decade analysis of population growth rates, the chronology of the urban transition becomes utterly apparent. During the first decade of the series (1900-10), rural population growth was faster than urban growth; that is, the urban transition had not yet started. The most likely explanation for this situation is that rural-urban migrations did not counterbalance higher urban mortality rates (i.e., the urban penalty) and the lower urban fertility rates.[19] However, the situation changed dramatically during the next two decades: urban population growth rates tripled rural ones. This large difference between

[19] On the urban penalty see Reher, 'Urban penalty', and on the low urban fertility rates see Reher, 'Desarrollo urbano'.

Spanish cities and the countryside can only be explained by mass rural migrations.[20] From 1910 to 1920, urban growth rates were of 1.77 percent per year and decreased slightly in the next decade (1920-1930) to 1.59 percent per year. In the same two decades, rural population growth rates were, respectively, of 0.51 and 0.61 percent per year. The table also presents data on the evolution of the different types of urban settlement. To do so, we have divided cities into three different categories: "small cities" (between 25,000 and 50,000 inhabitants), "medium cities"(between 50,001 and 100,000 inhabitants), and "metropolis" (100,000 or more inhabitants). Over the entire period, metropolis outperformed medium and small cities. Furthermore, the difference between metropolis and the rest increased over time, particularly during the 1920s. Overall, these results indicate that Spain experienced a genuine urban transition during the decades before the Civil war and that urban growth put necessarily pressure on Spanish housing markets.

II

In a previous article, we have reconstructed the basic data on Spanish housing markets from 1904 to 1934, especially the number of urban properties sold and their prices.[21] The main sources for our data are the Registrars' Yearbooks, which give the total value and number of sales of urban non-farm properties in each Spanish province in each year. Due to the Spanish property regime, these refer to vertically integrated units of land and building; the registration or sale of individual dwelling units was not permitted.[22] Furthermore, this source only contains information on a provincial level, which makes it impossible to reconstruct property values and numbers of transaction per municipality or metropolitan agglomeration, which would be preferable *a priori* since a province naturally might contain a mix of relatively booming and relatively declining areas,

[20] Silvestre, 'Internal migrations', documents this rural exodus. See also Collado and Pinilla, *Peaceful Surrender*.

[21] Carmona et al. 'Spanish Housing Markets'.

[22] We will return to the implications of this for the average urban dweller in section III.

between which internal migration might occur. However, in evidence presented in an online appendix to this article, we find that our provincial price series are stationary at a national level (as were prices for rural properties),[23] which implies that they should also be stationary within provinces, so that dynamics internal to provinces should not be distorting the overall picture emanating from our data and analysis.

From the raw data on transaction values and numbers, we calculate yearly nominal mean housing prices per province and for the whole of Spain by dividing the total value by the number of sales. To account for inflation, we compute real average prices per province using province-specific urban consumer price indices (CPI),[24] which we aggregate into a Divisia index at the national level. Finally, since arguably the characteristics of the average urban property also vary from province to province and over time during the transition process, we have elaborated a hedonic index using complementary data from the Spanish housing censuses of 1900, 1910, 1920 and 1930. To control for the main sources of systematic differences in the dwelling park per province, our hedonic adjustment takes into account the reconstructed average age and share of new buildings, the average number of floors (related to the number of individual dwelling units) and the share of isolated (that is, outside urban nuclei) buildings in each province.[25]

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[23] Carmona and Rosés, 'Land markets'.

[24] CPI are drawn from Rosés and Sánchez-Alonso, 'Regional Wage Convergence', see Carmona et al., 'Spanish Housing Markets', p. 133, for details.

[25] For computing housing price indices, the advantages of the hedonic methodology have long been recognized by the literature (Case et al. 'House price index'; Diewert, 'Real estate price'). While inflation-adjustment is a standard practice in economic history, the hedonic (quality-adjustment) undertaken here is not so common and might require a short introduction. The idea behind these indices is to estimate econometrically how the price of a product can be related to the product's characteristics to be able to control for changes in the average observed variety and price. The estimated coefficients from this 'hedonic regression' are then used to calculate price indices for a constant-quality 'counterfactual' version of the

Figure 1 presents some basic information on the number of houses sold in all of Spain and the market share of the 'six provinces' during this period.

[FIGURE 1]

From an inspection of the figure 1, one could divide the evolution in the number of houses sold into three main periods. In the first period, from 1904 to 1914, approximately 50,000 houses were sold per year, which was about one per cent of the total housing stock.[26] In the following period, from 1914 to 1924, the number of transactions grew at faster rates (5 per cent per year). Then, the peak of the series was reached in 1924, when more than 88,000 houses were traded (i.e., 1.2 per cent of the housing stock). During the last period, from 1925 to 1934, the number of market transactions began to decline and, subsequently, the share of the stock traded decreased to one per cent in 1930. Note that by 1934, the number of transactions was similar to the number before the First World War (i.e., approximately 50,000 houses were traded). The year 1934, however, is a highly untypical year in our sample, known as 'bienio negro' (black biennium) or 'conservative biennium', a period of intense social, economic and political conflict after a right-wing coalition won the elections of November 1933, and values observed for 1930 seem to be more representative (and are used in our econometric analysis below).

product (which is used to generate the hedonic price index). For a more detailed discussion of this issue see Carmona et al. 'Spanish Housing Markets'.

[26] More specifically, in 1900, the traded stock represented 1.1 per cent of the total housing stock. In 1910, the traded stock represented 1.0 per cent of the total housing stock. We obtained these figures by dividing the number of houses sold in 1904 and 1910 (interpolated) by the number of houses counted in Spain's 1900 and 1910 censuses, respectively.

Figure 1 also makes evident that the share of the 'six provinces' in the second and third decades of our sample are much higher than before, although there are annual variations. It increases from 25.6 percent in the decade 1904-13 to 29.0 percent in 1914-23 and 33.0 percent in 1924-33, with a peak in 1924, when 36.7 percent of all transactions were in the 'six provinces'.[27]

[FIGURE 2]

Figure 2 compares the evolution of the real, not hedonic, index of housing prices, the hedonic index of housing prices, and the 'six provinces' hedonic index of housing prices. At first sight, the evolution of the three indices differs only slightly and seems to follow a common cyclical pattern. Only the hedonic index moved more slowly from 1920s on when the quality of housing began to increase (mainly due to the increase in the number of floors of each house, which imply more dwelling units). Furthermore, successive phases of expansion and contraction were more pronounced in the 'six provinces' index than in the other two indices. However, housing prices did not appear to have grown significantly faster in the long run in the 'six provinces' than in the rest of Spain despite that these provinces received a substantial part of domestic (rural) migrants[28] and experienced a noteworthy urban expansion.[29]

More specifically, Spanish housing prices remained stable during the first decade of our new series, decreased sharply during the first two years of the First World War (1914-15) but grew considerably since then until 1920. During the 1920s, housing prices decreased again and

[27] Also, according to the Spanish building census for 1930, houses in the 'six provinces' had on average more floors (2.04) than the Spanish average (1.86) or the remaining 42 provinces (1.83); weighted averages calculated from data underlying Carmona et al., 'Spanish Housing Market'.

[28] Silvestre 'Internal migrations'.

[29] Reher, 'Desarrollo urbano'.

recovered, again, after 1929. Overall, these indices did not show a growing tendency since any increase in prices seems to have reversed to previous levels.

A simple comparison of Figures 1 and 2 offers relevant information on how housing markets worked in Spain. We note that increases in the number of houses traded did not translate into large movements in the hedonic-adjusted housing prices (and also in the simplest cost-of-living adjusted indices). In particular, during the 1920s, the number of transactions expanded, but housing prices remained stable at historically lower levels in Spain and the 'six provinces'.

III

In the previous section, we have shown that, despite the rise in the number of transactions, housing prices remained stable in Spain during first third of the twentieth century (if we abstract from the untypical year 1934). In a situation where the majority of families own their homes, the evolution of housing prices could be used as indication of access to housing. However, the Spanish housing market during the first third of the twentieth century was not characterized by a large number of house-owners, instead most families rented their homes. This was caused by a feature of Spanish property law that before 1960 did not allow independent ownership of land and the buildings constructed on it.[30] In other words, blocks of flats had only one owner (who also owned

[30] We have observed that this characteristic of Spanish law was not extraordinary in its historical origins, since the joint vertically integrated ownership of soil and buildings was the international norm. Horizontally divided (or mixed) property rights regarding individual floors or appartments (*condominium*) in most countries were only introduced after 1935. For example, in Britain, *commonhold* was introduced as a legally defined form of property only in 2002. See, on the evolution of property regulations and tenancy laws in Europe, the documents of the project TENLAW (http://www.tenlaw.uni-bremen.de/).

the land) and, hence, many renters. Given that blocks of flats predominated in Spanish cities, one can confidentially assume that a large part of Spanish urban population lived in rented homes.[31]

Ideally, any good historical statistic of housing rents could serve us to show how affordable was the access to family housing in Spain. Unfortunately, to our knowledge, no historical statistics and long-terms series are available for the period considered here. Instead, we have some sparse observations for rents of working-class dwellings and consistent evidence on the amount of people living, on average, in each dwelling.

[TABLE 3]

In table 3, we show a basic measure of housing affordability, the ratio between (yearly) rents and wages. We have been able to collect information on rents for all Spanish provinces' capitals (except Madrid) around 1920. The data is drawn from several studies on cost-of-living across Spanish provinces, which were organized by the Instituto de Reformas Sociales (the forerunner of the Spanish Ministry of Labour). The Instituto collected data on a "typical" home for working classes in all Spanish provinces' capitals.[32] Regarding the denominator, we consider two different wage measures: wages of unskilled construction workers (*peones*) and wages of semi-skilled construction workers (*albañiles*: ie. bricklayers).[33]

[31] This situation was corroborated by British Consular Reports. See, for example, Roberts, 'Report on the Trade'.

[32] We have tested the quality of the data by comparing them with newspapers advertisements. So, we have observed that prices roughly corresponded to an unfurnished apartment of 2-3 bedrooms in a low-middle class neighbourhood.

[33] This data on wages is drawn from Rosés and Sánchez-Alonso, 'Regional Wage Convergence'.

The results are quite obvious. It does not seem that housing represented a dramatic burden for Spanish working-class population by 1920. On average, unskilled workers spent 11 per cent of their income on rent and semi-skilled workers about 7.7 per cent. Even, the relative cost of renting houses was not prohibitive in the most densely populated provinces. In the five provinces were the largest Spanish cities were located (we have no data for Madrid), these ratios were higher than in the rest of Spain but rents were far from prohibitive. On average, unskilled workers spent on rents about 14 per cent of their wages and skilled workers about 10 per cent in these five provinces with the largest cities.[34]

At this point, some readers could wonder if there is any relationship between rents and housing prices that could allow us to use housing prices as substitute for rents in our measurement of housing affordability during the whole period considered in this paper (as we mentioned above, yearly data on rents for the period is not available). According to the standard literature on housing, rents and housing prices are closely related. Broadly speaking, rents are determinants of housing

[34] Employing the same sources, Rosés and Sánchez-Alonso ('Regional Wage Convergence') computed that, on average, rents represented a 10.2 per cent of overall expenditure in Spanish working classes. Note that these figures, in international terms, were considerable low. Williamson ('Global Labor Markets') allocated to rents the 18 per cent of working-class expenditure in the period from 1905 to 1914 for a sample of countries (United States, Great Britain, Sweden, Germany, France, Belgium and Italy) and the 23.7 per cent in the interwar period (in this latter calculation, the countries considered were Australia, Canada, United States, Denmark, France, Great Britain, Ireland, Netherlands and Sweden). More recently, Broadberry and Burhop ('Real Wages') have assigned to rents about the 20 per cent of German and British expenditure shares in 1905 and 1937.

prices in a short-medium horizon, since housing prices tend to adjust to (capitalized) rents.[35] In other words, housing prices contain information on rents.

Given the paucity of our data, we cannot conduct sophisticated tests on the relation between housing prices and rents but, at least, we can replicate Clark's ('Rents and prices') basic econometric exercise with Spanish historical data. We have been able to collect an unbalanced panel (203 observations)[36] of provincial monthly rental prices from 1913 to 1921, referring to rents for one apartment (see above) from the *Boletín del Instituto de Reformas Sociales*. These prices were deflated across time and space by the same consumer price index that we used to adjust the housing prices. From the rent series and our real-hedonic price index we calculate the rent-to-price ratio in every year (R_{it}/P_{it}), which we relate to the rent growth rate for the following period ($g_{i,t+1}$), which is normally one year.[37] Specifically, we estimate the following regression:

$$(1) \qquad g_{i,t+1} = \beta_0 + \beta_1 (R_{i,t} / P_{i,t}) + \varepsilon_{i,t} .$$

As Clark ('Rents and prices') notes, this specification ensures that any error in forecasting growth between year *t* and *t+1* appears in the residual ε_i and is uncorrelated with the rent-price ratio. If the rent-price ratio is significantly and inversely related to the average future rent growth,

[35] In particular, Clark ('Rents and prices') has shown that rent-prices ratios explain rent prices in the future. More recently, Gallin ('The Long-Run Relationship') has proved this with more sound econometric techniques and high-frequency data.

[36] As compared to 1470 observations in our house price dataset. Of course, there might be more data in other sources like contemporary newspapers, etc., but their use would compromise the homogeneity of our rent data, since we would not know what these other data refers to.

[37] For province years with gaps in the rent series, we calculated the average growth rates among the available data points and compared these rates to the initial rent-price ratios for the corresponding period.

then the current rent-price ratio acts a predictor of rent growth during the next period because prices at least partially capitalize on the present value of future rents. As we can see from the results presented in Table 4, this is indeed the case during our period. This provides further evidence that the people renting their urban homes benefited from the price stability in the housing markets because both the rental and housing markets were clearly linked.

[TABLE 4]

Coefficients in the variable of interest ($R_{i,t}$ / $P_{i,t}$) shown that the adjustment period is about 5 years, which is not an extraordinary result.[38] This implies that a good proxy for the current rents is an average of the current years and the previous four years housing prices. This is the exercise that we perform in the following figure 3.

[FIGURE 3]

The results are quite eloquent. The housing burden decreased for Spanish workers during the 1920s, when the major part of migrations took place. More specifically, the burden increased significantly during the First World War (about 20 per cent) but decreased abruptly over the next years (more than 30 percent from the initial value of 1915).[39] What could have caused this decline? A simple observation of the data on housing prices and wages shows that this phenomenon was

[38] With quartely US data, Gallin (The Long-Run Relationship') estimated a similar speed of adjustment between rents and housing prices.

[39] Unfortunately, studies on the Spanish home migrations have not considered the contribution of housing prices (rents) to deter (foster) the movement of people across Spanish provinces during the ninetieth century and early twentieth century.

provoked by the interaction of two different forces: the presence of housing price stability in the long-medium horizon which was accompanied by substantial increases in real wages. In other words, it seems that the increase in workers' disposable income did not result in an increase of housing prices.[40]

[TABLE 5]

After reviewing the evolution of relative housing prices (as measure of housing affordability), we consider several alternative measures that show the relation between the number of dwellings and population (see table 5). In Panel A, we discuss the overall measures for Spain, whereas in Panel B, we analyse the 'six provinces'in greater detail and compare them to the rest of Spain. Every measure presented in Panel A shows that the proportion of dwellings to population remained quite stable from 1900 to 1930. Furthermore, Spanish houses were not particularly overcrowded during this period. Specifically, the ratio between census households and population indicates that, on average, only around 4 people lived in each dwelling. This number is low in comparison to other countries at similar stages of economic development. According to the Maddison Project, Spain in 1920 had a GDP per capita similar to that in Britain in 1830, to Germany around 1890 and to Italy in 1921.[41] In these countries, the respective inhabitants per dwelling/census units were 5.17, 4.66 and 4.5 at the same level of development, indicating that

[40] This is, *per se*, a very relevant result since failures in housing markets (like supply constraints) provoke that landowners get a substantial part of, if not all, increases in labour productivity (see, for example, Moretti, 'Local Labor Markets' and Glaeser et el., 'Urban growth'). In other words, our results seem to indicate that housing supply was quite elastic (see the rest of the paper for more compelling evidence on this).

[41] Http://www.ggdc.net/maddison/maddison-project/home.htm, 2013 version.

indeed there seem to be advantages of backwardness in terms of housing or crowding, of about 0.2 percent per year, when comparing Spain in 1920 to Britain in 1830.[42]

Panel B investigates the impact of increasing urbanization on housing from 1900 to 1930. The impact on the six provinces varied in this respect. In Barcelona and Valencia, the number of inhabitants per census household improved. However, in Madrid, the ratio was stable, and in Biscay, Saragossa and Seville, the ratio worsened slightly. In any case, despite the rapid demographic changes and urbanization, the ratio between inhabitants and census households did not dramatically worsen in any Spanish province during the first thirty years of the twentieth century.[43] It is also relevant to note that the differences between the six provinces and the rest of Spain were not large (within one standard deviation of the estimated values).

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[42] Person per dwellings ratios in Britain from Clark, 'Shelter', table 5, p. 501; for Germany, *Statistisches Jahrbuch* 1892, p. 1; and for Italy Instituto Centrale di Statistica, *Censimento,* vol. XIX, pp. 136-144 (numbers refer to urban centres of at least 15,000 inhabitants plus provincial capitals; due missing population numbers, Lecce and Venice are not included in this figure). In 1931 the figure for all of Italy is 4.5 (including all inhabited dwellings), Instituto Centrale di Statistica, *Indagine sulle abitazioni*, part 1, prosp. 7, p. 26. Nevertheless, France would be a well-known outlier (O'Brien and Keyder, *Economic growth*) to this relationship, with a person to dwelling unit ratio of 3.63 in its 1881 census – with its GDP per capita at the Britain 1830 level in 1892. Date on France from Insee, *Recensements de 1851 à 1921*, table 39, 'Recensement de 1881, Départements'.

[43] From Panel B, one can also observe that the provincial differences in the number of housing units per capita widened. In particular, Madrid appears to have been particularly overcrowded because the ratio implies that approximately six persons lived in each dwelling. In Seville and Biscay, approximately four persons lived in each dwelling, whereas in Barcelona, approximately 3.5 people lived in each dwelling. Valencia and Saragossa had numbers similar to those prevalent in the rest of Spain.

IV

In light of the rather dramatic changes that occurred during the urban transition process throughout this period, we are quite surprised by the housing market's price stability and rapid adjustments to the growing number of transactions observed in the first section. Apparently, Spanish housing market operated smoothly: increasing demand was met by increasing supply, and prices remained stable over the medium time horizon of this paper. Evidence on rents collected in the section II also points in the direction the findings of the section I.

A straightforward way to confirm that Spanish housing markets worked smoothly is to test if their prices were driven by economic fundamentals and to study their corresponding elasticities. To conduct this research, we specify and estimate the following inverted housing demand equation:[44]

$$(2)\ Log(\text{Prices})_{i,t} = \beta_0 + \beta_1 log(\text{Y})_{i,t} - \beta_2 log(1+\text{HOUSE/POPULATION})_{i,t} - \beta_3(\text{RR})_{i,t} + \beta_4 log(1 + \text{CREDIT})_{i,t} + \varepsilon_{i,t},$$

where *i* indexes provinces and *t* years, real new house prices (i.e., our Hedonic Index of Housing Prices) are modelled as a function of real GDP per capita (Y),[45] the housing stock per capita

[44] See on inverted house demand equations: DiPascuale and Wheaton, 'Markets for real estate'; and Malpezzi, 'Economic Analysis'.

[45] We use GDP per capita to assure comparability of the income elasticity, one key coefficient of our exercise, with other studies. The use of, say, unskilled wages as in table table 3, would have two conceptional shortcomings: firstly, as we argue, most workers rented and did not buy houses, and secondly, the use of wages of any specific occupation (e.g., bricklayers) raises potential critiques regarding the representativeness of the profession and their exposure to industry-specific developments.

(HOUSE/POPULATION)[46] and credit availability (CREDIT), which is calculated as the ratio between the number of mortgages and the number of housing transactions at *t*. In other words, we argue that housing demand is a function of permanent income, the demographic structure, and, crucially, the credit availability.[47] Note that the model of equation 2 is a departure from the prototypical model of housing demand which does not include any variables that capture the effect of credit availability on housing prices.[48] However, because of its high cost in relation to family incomes, housing must be financed.[49] As a result, changes in interest rates and the availability of mortgages may have a substantial effect on housing demand.[50]

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[46] We also experimented with a variable measuring the percentage of young adults (i.e., people 21-30 years old) without significantly different results. Additionally, this variable was highly correlated with the variable HOUSE/POPULATION. Hence, these two variables should not be considered together in regressions.

[47] However, our model underscore two specific features of housing markets have a strong influence on housing demand (e.g., DiPascuale and Wheaton, ' Markets for real estate'). First, the relative number of dwellings rises gradually because houses typically have long lives and because the demographic circumstances in individual economies change slowly. As a result, the number of new houses built each year and the demand for new houses are typically a small proportion of the total housing stock. Second, housing demand is segmented because some economic agents market housing as a durable consumer good to homeowners, whereas other economic agents invest in houses to put them on the rent market or as a part of their investment portfolio.

[48] Note that several empirical studies (e.g., Fitzpatrick and McQuinn, 'House Prices'; McQuinn and O'Reilly, 'Role of income') used, as we used here, alternative versions of the standard model by including different financial variables in their estimated equations.

[49] Malpezzi, 'Economic Analysis'.

[50] We also consider a modified version of equation 2 by including the user cost of capital (RR), which is calculated according to the equation of Mankiw and Weil ('The Baby Boom'). There are two problems with this specification: we have not provincial variability in RR since interest rates are only available at national

Previous empirical studies on housing demand have shown that the income variable is usually the single most important economic determinant of real housing prices in the long run.[51] In other words, the coefficient of the permanent income variable gives us a crucial clue of whether housing supply responds swiftly to demand shocks. Specifically, a lower elasticity is associated with well-functioning markets and elastic supply of housing.[52]

Before we proceed to the econometric estimation of equation 2, it seems useful to discuss the evolution of the right-hand side variables during the period considered here. Permanent income, which is measured as the average GDP per capita over a given time span, rose during the first third of the twentieth century. From 1904 to 1934, per capita GDP rose at an annual rate of 1.15 per cent. The GDP per capita growth rates accelerated slightly during the years prior to the First World War. Despite Spain's neutral status during the conflict, its per capita GDP growth rates were negative during the war years. After the war, Spain's economy grew again and then slowed down after 1929.[53] Overall, the growth rate of per capita GDP was slightly higher than the growth rate of housing prices since the hedonic housing price index grew over the period at a yearly rate of 0.97 per cent and per capita GDP at a yearly rate of 1.12 per cent.

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level and we had to estimate a new equation only with RR since this variable is highly correlated with CREDIT. However, because the variable CREDIT exhibits provincial variability and because it is robust to the inclusion of random effects, we only present the results with this variable and will use them in our further discussion (estimations with RR are available, upon request, from the authors).

[51] See, for example, Malpezzi, 'Global perspectives'; Case and Shiller, 'Is There a Bubble'; and Holly and Jones, 'House prices'.

[52] Malpezzi, 'Global perspectives' offers a theoretical justification for the relationship between elasticity of housing prices to permanent income and supply of housing. Furthermore, Harter-Dreiman ('Drawing inferences') estimated the correspondence between different demand and supply elasticities.

[53] Spanish GDP data is drawn from Prados de la Escosura, *El progreso*.

The relation between the demographic structure and the demand for new dwellings is reflected by the ratio between the existing housing stock and the population (see table 3). In the long run, this relation tends to be in equilibrium, but in the short or medium term, it can be altered by various demand factors (e.g., the demographic transition, migration outflows and migration inflows and urbanization rates) and supply factors (e.g., depletion rates, wars and natural disasters), which decrease the stock of the existing houses. For housing demand, modifications in the age distribution of the population are as important as increases in the absolute number of people. In particular, baby booms cause the number of new families searching for accommodation to increase after twenty years. For this reason, a substantial number of studies have shown that the absolute and the relative number of young adults are prime movers of housing demand.[54]

In the first three decades of the twentieth century, Spaniards' demand for housing suffered several major demographic shocks. On the one hand, the demographic transition induced an increase in the number of new families.[55] On the other hand, many people relocated from the countryside to the cities.[56] Furthermore, a large percentage of rural migrants to cities were composed of young adults.[57] We observe the impact of this migration by comparing the proportion of young adults in the six provinces with the largest cities, which attracted a considerable proportion of home migrants, with the proportions in the rest of Spain's provinces. From 1900 to 1930, the proportion of young adults i.e., those between 21 and 30 years old, in these six provinces remained close to 18 per cent and reached 19 per cent in 1930. However, in the rest of Spain, this proportion was lower. Although in absolute numbers, young adults (i.e., the population between 21 and 30 years) increased from approximately 3 million in 1900 to approximately 4 million in

[54] See Mankiw and Weil, The Baby Boom'.

[55] Pérez Moreda, . 'La población española'; and Reher, 'Desarrollo urbano'.

[56] Silvestre, 'Internal migrations'. See section I.

[57] Silvestre, 'Internal migrations'.

1930, their share of the country's total population was quite stable. Specifically, in 1900, 16.16 per cent of Spain's inhabitants were young adults. In 1910, this proportion decreased to 14.84 per cent, increased to 15.47 per cent in 1920, and arrived at 16.80 per cent in 1930. This effects unexpectedly stable demographic structure was likely the consequence of external migration and the increase in life expectancy.[58]Of all the age groups, young adults participated more actively in international migration.[59]

[FIGURE 4]

Finally, we review the evolution of housing credit. Unfortunately, information on the total amount of credit lent to the people who purchased houses from 1904 to 1934 is not readily available. Hence, we have to rely on the annual data regarding the total number of mortgages from the Registrars' Yearbooks. We must note that many mortgages were not issued to finance housing purchases because real estate was sometimes employed as collateral in exchange for consumer and corporate credit. Thus, our information may exaggerate the amount of credit lent for housing transactions. Nevertheless, to investigate the evolution of housing credit, we will consider two different indicators: the number of new mortgages and the ratio between the number of new mortgages and the number of housing transactions (see figure 4). Overall, the number of new mortgages grew from 1904 to 1934. By the end of the period, the number of mortgages had multiplied by 1.25, which implies an average annual growth rate was 0.75 per cent. However, the 1934 value was not the maximum for our period, which was obtained in 1930. If we consider this year to be the peak, then the number of new mortgages grew 1.6 times since 1904, which implies

[58] The demographic data are drawn from Instituto Geográfico y Estadístico, *Censo de población,* 1900, 1910, 1920 and 1930.

[59] Sánchez-Alonso, 'Those Who Left'.

an annual growth rate of approximately 1.9 per cent. Our period also shows a pronounced cyclical component. The number of new mortgages decreased from 1904 to 1919, after which the number increased at faster rates until arriving at a peak in 1927. With the exception of the year 1930, the number decreased afterwards. The ratio between mortgages and housing transactions declined from 1908 to 1919, when the ratio attained its minimum value. Then the ratio experienced an intense boom that ended abruptly in 1927-29. In 1930, the ratio returned to its highest level, but in 1931, it began to decrease again. In any case, the ratio was higher at the end of the period than at the beginning. This finding indicates that the amount of mortgage financing increased overall throughout the period. In sum, both indicators show that credit for housing grew over the period, but that the amount of available credit also exhibited a strong cyclical component.

Now, we estimate equation (2) by utilizing panel-data econometrics for a panel of four cross-sections because we do not have yearly information on the evolution of the housing stock and income per capita. We therefore use information for 48 provinces and the 4 benchmark years (1904, 1911, 1921 and 1931), which gives us a total of 192 observations. A major problem with this type of estimation is the presence of endogeneity among explanatory variables. For this reason, we use lagged explanatory variables (for 1900, 1910, 1920 and 1930) in our estimations. Specifically, we compute weighted OLS estimates (with mean number of houses sold as weights) with robust standard errors (column 1) and GLS random-effects estimates with robust errors (column 2).[60]

[TABLE 6]

[60] We also tested the fixed-effects GLS regressions, but an F-test of the significance of these factors does not allow them to be used at conventional confidence levels.

The variables show the expected sign (i.e., positive in Y and CREDIT but negative in HOUSE), and the coefficients suggest that the elasticities were of reasonable size. According to the F-statistics, the simplest econometric estimation (column 1) is the most efficient.

In our preferred estimation (column 1), the income elasticity is 0.37. This elasticity is lower than the elasticities obtained by Capozza et al. ('Determinants of Real House Prices') for 62 metro areas in the US (0.45) from 1979 to 1995 and also lower than those obtained by Meese and Wallace ('House price dynamics') for a supply-constrained area like Paris (0.65 in 1986-92).[61] This result strongly confirms our previous finding: Spanish markets work smoothly and housing supply adjusted reasonably well to the substantial demand shocks that happened during this period.

[TABLE 7]

Table 7 presents estimates of the substantive significance of the variables considered in our econometric estimations. As we mentioned above, the income variable is the most important explanatory variable while the variable house / population reduces final prices. Finally, the relatively important contribution of the credit variable (which is larger than those of the house / population variable) is also worth nothing. Given these results, it is plausible that any rapid expansion of mortgage lending could feed a substantial rise of housing prices.

V

After reviewing the evidence on housing prices, rents and demand, we turn to housing supply. According to the evidence presented in the previous sections, it seems that housing supply rose enough during the period to avoid sharp increases in housing prices. In accordance with this,

[61] We cannot compare our estimation with historical studies since, to our knowledge, no similar estimation exists for other countries in this period.

previous quantitative research has shown that the supply of new houses rose significantly during the studied period.[62] The basic available data on housing supply, income per capita and the stock of dwellings is presented in the figure 5.

[FIGURE 5]

Housing supply experienced considerable cyclical deviations from the prevailing long-run trend during the period considered here.[63] We can easily observe four pronounced cycles within these thirty years. Specifically, housing supply grew until the First World War, decreased during the war years, and experienced an intense boom that began in 1918 and abruptly ended in 1929-30. Then from 1930 to 1934, the construction of new houses returned to their initial low levels.[64] Note that from 1930 to 1931, the production of new houses plummeted by an enormous 44 per cent! Interestingly, Spain shared the same building boom experienced by the United States, Canada, Germany and Finland during the 1920s.[65] Each of these countries also experienced a halt in construction due to the Great Depression.

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[62] See, Tafunell, 'Urbanización y vivienda'; and Prados de la Escosura, *El progreso*. The few studies available on construction licenses for new houses have also underlined the rapid increase in the number of new houses constructed during the period. See, Fernández Clemente and Forcadell, 'Crecimiento económico' on Zaragoza; Gómez Mendoza, 'La industria' on Madrid; Sorribes 'La transición urbana' on Valencia; and Tafunell, 'La construcción' on Barcelona.

[63] The same has occurred throughout the history of OECD countries (Ball and Wood, 'Housing Investment').

[64] Growth rates were 1.4 per cent per year from 1904 to 1914, 9.2 per cent per year from 1914 to 1918, 7.7 per cent per year from 1919 to 1930 and 16.2 per cent per year from 1930 to 1934.

[65] Ball and Wood, 'Housing Investment'.

Figure 6 offers additional insights on how housing supply responded to the demand for new houses. The construction of new homes seems to adjust after a certain delay to changes in permanent income. In particular, permanent income grew faster than housing supply from 1914 to 1923, whereas the opposite occurred during the following six years (i.e., from 1924 to 1930).[66]

However, the stock of houses is not only composed by the new houses but also by those constructed in previous years. For this reason, if one considers the entire period (i.e., from 1904 to 1934), the total housing stock grew much faster than GDP per capita (i.e., 2.36 per cent versus 1.15 per cent)[67] and housing crises are much difficult to observe. Note that this result is in line with our previous evidence on the stability of housing prices and rents, and the low elasticity of housing prices respect to changes in permanent income.

Why was housing supply so elastic in Spain during the urban transition? A substantial literature[68] points the importance of the availability of land in housing supply because cities mainly expand in the long run by increasing the amount of land that can be used in new housing developments.[69] In this sense, many empirical analyses for contemporary cities conclude that

[66] This is a universal feature of housing markets given that builders cannot adjust instantly housing supply to expansions and contractions of housing demand. See, for example, Rosenthal, ‚Residential Buildings'.

[67] These numbers imply an elasticity of housing supply with respect of personal income of about two: that is, housing supply was very elastic in Spain during the period considered here.

[68] See, for example, Leunig and Overman, 'Spatial patterns'.

[69] Obviously, cities and villages can also expand by maintaining the constructed area while increasing the urban density. We can obtain indirect evidence regarding this process by examining the evolution of the number of floors per building. In Spain, this ratio increased from 1.65 in 1900 to 1.72 in 1930 (a mere 4 per cent). That is, increases in urban density appear to have played a secondary role in the expansion of the Spanish housing market.

geography and regulation (zoning) constrain the availability of land for new houses.[70] Surprisingly, contemporary literature on housing tends to downplay the importance of public infrastructure on housing supply.[71] In our view, however, geographic (spatial) constraints on urban growth are not independent from the development of urban infrastructures, particularly transport infrastructures.

The tyranny of geography was very important in the densely populated pre-industrial towns and cities. Workers worked close to their homes and walked to their jobs. This resulted in high population densities and the subsequent health problems. This also put a limited to the size of the efficient city and increased housing prices. When industrialization arrived, the situation became worse since workers still walked to the factories and factories were bigger and more pollutant than pre-industrial workshops. The only solution of this problem was the creation of systems of mass transport that allowed workers to live far from their job and facilitated the spatial expansion of cities.[72] To be efficient, urban expansion should be accompanied of the development of the necessary public infrastructures.[73] These infrastructure investments not only included urban transport but also sanitation, streets, secondary roads, water, electricity and communications. Few households directly provide their own infrastructure for housing and, then, public sector or larger

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[70] See, for example, Haugwouth et al., The Supply Side'; Glaeser et al., 'Urban growth'; Glaeser and Ward, 'Land use regulation'; Paciorek, 'Supply Constraints'; and Saiz, 'The geographic determinants'.

[71] A notable exception is the article of Leunig and Overman, 'Spatial patterns' and the classical study of Ingram, "Patterns of metropolitan Development". Also, Baum-Snow ('Did Highways') has showed how public highways changed the spatial structure of US cities and favoured suburbanization. The importance of infrastructure investment is also discussed in Offer, *Property and Politics,* Ch.15 and 17.

[72] Divall and Bond, *Suburbanizing the Masses*; and; and McKay, *Tramways and Trolleybus.*

[73] Brown, 'Reforming the urban environment'; Easterlin, 'How beneficient is the market?'; Ferrie and Troesken, 'Water and Chicago's mortality transition';Offer, *Property and Politics.*

firms were tasked with this kind of development, which also benefited from substantial economies of scale.[74]

[FIGURE 6]

Spain's investment in infrastructure rose significantly over the studied period at an average of more than 3 per cent per year. Figure 6 shows that these investments grew at a faster rate than the housing supply. However, not all types of investments grew at the same rate. Interestingly, during the first few decades of the twentieth century, the types of investment that grew fastest were related to housing development. For example, investment in urban transport grew at 5.2 per cent per year from 1890 to 1930,[75] and investment in water infrastructures and sanitation grew at 6.17 per cent per year, whereas railway investment experienced negative growth rates.[76] In sum, this rapid increase in infrastructure investment likely facilitated the expansion of cities and the amount of land available for urban development, which may have restricted the increase in housing prices.

Despite all the developments in public infrastructure, expansion of cities could not have been possible with an inadequate government policy. The main role of the Spanish government in housing markets during the period under study was to enforce property rights while its participation as housing developer was very limited and circumstantial.[77] Spain, like other

[74] Malpezzi, 'Economic Analysis'.

[75] On the developments of urban transport in Spain see Martínez, 'Energy Innovation and Transport' and Martínez and Mirás, 'The Second Industrial Revolution'.

[76] Herranz, *Dotación de infraestructuras*, p. 93.

[77] Carmona et al. ,'Spanish Housing Markets' for a more detailed account of the institutional structure of Spanish housing markets during the period.

European countries, formulated and implemented housing policies, as social housing and rent control, during the first third of the twentieth century. However, the impact of these policies was extremely limited because the construction of working-class dwellings lacked of funds and rent control was not effectively enforced. From 1911 to 1921, Spain's government collaborated in the construction of only 1,250 houses (that is, the 0.4 percent of all households formed annually during the same period) and the corresponding subsidies only represented the 0.016 percent of the national budget.[78] From 1923 to 1931, the Primo de Rivera's government initiated another housing programme but this only resulted in the creation of a handful housing co-operatives and soft loans for the construction of working-class dwellings. Unfortunately, data on the number of houses constructed by the government is already unavailable but different studies agree in the limited impact of all these measures.[79] The first Spanish law on rent control (Decree Bugallal) was issued by 1921. This new regulation was not enforced since the available series show that housing rents grew faster than the maximum allowable rent increases.[80]

On the other hand, there are no reasons to think that Spanish regulatory policy impeded the continuous expansion of land available for new houses.[81] The Liberal reforms in the first half of the ninetieth century created an institutional framework that eliminated restrictions on real estate sales and established freedom of contract. Nevertheless, ownership laws created a dual market of owners and renters, the latter of whom comprised the majority of the Spanish population. Furthermore, the regulation of land for urban development did not restrict the continuous increase in the amount of land available for new dwellings. During the second half of the ninetieth century, a series of laws created development plans for major Spanish cities. The

[78] Conferencia Nacional de la Edificación, *Memoria,* p. 537-8.

[79] Sambricio, 'La política urbana de Primo de Rivera'.

[80] Artola, 'La transformación' and Carmona et al. ,'Spanish housing markets'.

[81] Carmona et al. ,'Spanish Housing Markets'.

plans' successful reforms forced the developers and builders to pay for the construction of streets and other urban infrastructure in exchange for tax exemptions.[82] However, the acceleration of urban growth in Spanish cities during the turn of the century rendered the new expansion plans obsolete and the available land for new construction scarce.[83] The developers and constructors tried to bypass this restriction by increasing the cities' density (e.g., by increasing the number of floors or constructing in the space between houses) or by expanding accommodation to the suburbs, an area that was not regulated by urbanization plans. Spanish law allowed owners to build houses on their land without asking the government for permission and without size restrictions in areas outside of the plan's jurisdiction.[84]

VI

Our aim in this paper was to analyse housing affordability in Spain during the urban transition. In other words, we studied how the housing markets responded to the dramatic increase in demand for accommodation that followed the massive migration from countryside to cities. The economic costs of any failure in the housing markets could have been enormous and, thus, severely harmful to Spain's prospects for economic growth. In the historical episode examined in this study, because housing represented a large share of Spain's total capital investments,[85] this negative effect could have been amplified such that Spain's GDP growth rates would have been dramatically affected. However, we showed that this negative scenario did not occur in Spain,

[82] Bassols, *Derecho urbanístico*.

[83] For example, in 1900, Madrid doubled the urbanized surface area and practically exhausted the land available for new houses.

[84] Nuñez Granés, *El problema de la urbanización*, p. 12.

[85] Prados de la Escosura and Rosés, 'Long-run Estimates'.

where a prompt supply response to major demand shifts occurred during the first three decades of the twentieth century.

The evidence supporting this strong assertion is remarkable. First, housing rents for working families were affordable and remained affordable during the 1920s, when the major movements of population from countryside to cities took place. Second, we showed that real housing prices, particularly hedonically adjusted prices, did not grow over the time period considered in this article. Third, our econometrically estimated, long-run income elasticity of demand is similar to the demand prevalent in the less supply-restricted areas. Finally, over the entire period, the housing stock grew much faster than the principal source of housing demand, GDP per capita.

Why were Spanish housing markets not constrained by their supply? We speculate that the increase in the availability of land for new homes, which was induced by rapid infrastructure investments and the flexible and efficient institutions governing the housing markets, lie behind this expansion of the housing supply.

Why the urban transition was so different between Spain and Britain? Our impression is that Spain, following the seminal ideas of Alexander Gerschenkron (*Economic Backwardness*) about economic development, got some advantages of being a relatively backward country. Mainly, the urban transition arrived later in Spain and the country could employ new urban 'technologies' like trams or sanitation. Trams, and other forms of urban transport, increased the space that can be used economically to construct new homes. Industrial workers no longer lived closed to factories but could move daily from relatively longer distances.

Several topics related to the Spanish housing markets during the urban transition merit further investigation. First, we can obtain further evidence of the efficiency of Spanish housing markets by studying the market's regional dimension. We can also test whether housing markets were regionally integrated and whether upturns and downturns were transmitted regionally. Additionally, we can test for the presence of bubbles in housing prices. The evidence presented

above indicates that, if bubbles existed in Spain, then they were regional in nature and not nationwide, such as the bubble experienced in Spain during the last few years. Finally, we showed that credit availability (i.e., the mortgage market) played a relevant role in forming housing prices and that the relative number of mortgages grew over the period. Nevertheless, we still know little about the Spanish mortgage markets and the integration of regional markets for credit. Future researchers may consider investigating the supply/demand of credit, the implication of banks and private lenders, and the role played by banking and mortgage regulations.

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Table 1. Urbanization rates transition in Spain, 1900-1930 (per cent)

	1900	1910	1920	1930
	(1)	(2)	(3)	(4)
Andalusia	20.95	21.49	25.19	25.45
Ebro Valley	9.12	10.80	13.95	15.40
Mediterranean	32.04	32.84	37.37	41.38
North	16.03	18.07	20.86	22.29
Northern Castilia	5.51	5.50	5.78	8.01
Southern Castilia	19.95	19.21	24.98	27.98
Total	**19.25**	**20.01**	**23.78**	**26.17**

Notes: Urbanization rates are computed by dividing inhabitants of cities of 25,000 inhabitants or more by total population. We have grouped the provinces into six macro-regions (following, Rosés and Sánchez-Alonso, 'Regional Wage Convergence'): Andalusia (Almeria, Cadiz, Cordoba, Granada, Huelva, Jaen, Malaga and Seville), Mediterranean (Gerona, Barcelona, Tarragona, Castellon, Valencia , Alicante and Murcia), Ebro Valley (Alava, Lerida, Saragossa, Huesca, Teruel, and Logrono), North (La Corunna, Pontevedra, Orense, Lugo, Asturias, Cantabria, Biscay and Guipuscoa), Southern Castile (Caceres, Badajoz, Albacete, Ciudad Real, Cuenca, Guadalajara, Madrid, Toledo) and Northern Castile (Asturias, Salamanca, Santander, Zamora, Leon, Valladolid, Palencia, Burgos, Soria, Segovia). The Canary Islands, Galicia and the Basque Country have been excluded in the calculations due to data problems.

Sources: Azagra et al., *La localización de la población Española.*

Table 2. Population Growth by Type of Settlement: Spain, 1900-1930 (per cent)

		1900-10	1910-20	1920-30	1900-30
		(1)	(2)	(3)	(4)
Rural		0.74	0.51	0.61	0.62
Urban		0.70	1.77	1.59	1.35
	Small Cities	0.63	1.51	0.97	1.03
	Medium Cities	0.83	1.32	0.91	1.02
	Metropolis	0.68	2.04	2.10	1.61
Total		**0.73**	**0.78**	**0.85**	**0.78**

Notes: 'Small cities' are cities between 25,000 and 49,999 inhabitants; 'Medium cities' are cities between 50,000 and 99,000 inhabitants; 'Metropolis' are cities of 100,000 inhabitants or more. We have included in our calculations cities with the initial benchmark city size at T_0 (in other words, we have eliminated from our calculations rural location that become cities during each period). Instead, if we have calculated the rates of growth by diving population in cities by overall population (like in Williamson, 'City Growth'), computed urbanization growth rates are larger: 1900-10: 1.12 per cent per year; 1910-20: 2.50 per cent per year; and 1920-30 1.81 per cent per year. Overall growth rates (1900-30) are computed as an average of the three period growth rates.

Sources: See table 1.

Table 3. The Share (per cent) of housing rents in working class incomes, c. 1920

	Unskilled	Skilled
Andalucia	10.83	7.79
Ebro Valley	11.09	7.92
Mediterranean	11.04	7.68
North	15.43	9.93
Northern Castilia	8.60	5.51
Southern Castilia	10.63	7.34
Spain	11.27	7.69
Barcelona	18.73	13.06
Seville	12.68	11.07
Valencia	10.25	7.24
Biscay	17.81	10.91
Saragossa	10.14	7.79
Five Provinces	13.92	10.01

Notes: Daily wages have been converted into yearly incomes under the assumption that workers worked during 300 days yearly. Data on wages and rents is from province capitals.

Sources: Data on rents is drawn from *Boletin del Instituto de Reformas Sociales* and wage data is drawn from Rosés and Sánchez-Alonso, 'Regional Wage Convergence'.

Table 4. The Test of the Present Value Model

Method	**WLS**	**GLSre**	**GLSfe**
	(1)	(2)	(3)
Constant	0.145^{***}	0.145^{***}	0.320^{***}
	(0.037)	(0.023)	(0.685)
(R_{it} / P_t)	-8.668^{***}	-8.668^{***}	-20.569^{***}
	(2.523)	(1.493)	(4.654)
N	203	203	203
F-test / Chi^2	11.80	24.63	19.52
R^2 / overall R^2	0.09	0.09	0.09

Notes: WLS is weighted least squares with weights given by the mean number of houses sold. GLSre is generalized least squares with fixed-effects. GLSfe is generalized least squares with fixed-effects. All standard errors are robust. *** indicates significant at 1 per cent level and ** indicates significant at 5 per cent level. The Hausman test shows that GLSfe estimation is the most efficient.

Sources: Data on rents is drawn from *Boletín del Instituto de Reformas Sociales*, several years and housing price data from Carmona et al. 'Spanish Housing Markets'.

Table 5. The Population-Dwellings Ratio, 1900-1930

	1900	1910	1920	1930
A. Spanish data	(1)	(2)	(3)	(4)
a) Inhabitants per inhabited building	5.22	5.53	5.76	6.10
b) Inhabitants per calculated dwelling unit	3.96	4.15	4.29	4.51
c) Inhabitants per census household	3.92	4.05	4.19	4.15
d) Adult inhabitants per inhabited building	3.44	3.60	3.81	4.13
e) Adult inhabitants per calculated dwelling unit	2.61	2.70	2.84	3.06
f) Adults per census household	2.58	2.63	2.77	2.81
B. Provinces (inhabitants per census household)				
Barcelona	4.13	4.18	4.25	3.92
Madrid	4.08	4.14	4.39	4.12
Seville	3.68	3.70	3.91	4.03
Valencia	4.01	4.10	4.00	3.96
Biscay	4.55	4.76	4.89	4.72
Saragossa	3.64	3.88	4.08	3.96
Remaining provinces	3.88	4.01	4.18	4.17

Notes: Number of inhabited buildings taken from the building census; it includes inhabited 'transitory and rickety buildings' (*albergues*); their number never exceeded 2 percent of all inhabited buildings at the national level; if the number of actually inhabited building is missing, the number of inhabited buildings is reconstructed by multiplying habitabile building numbers with the share of actually inhabited buildings in the 1920 census per province. Calculated dwelling units are obtained by multiplying the number of inhabited buildings by the average number of floors per building in each province, assuming that 2-floor inhabited buildings are one dwelling unit, and that inhabited *albergues* contain one dwelling unit. As can be seen, numbers of calculated dwellings and census households move very simularly, except for the 1930 census. In the 1930 census, especially in three of most populated provinces, Barcelona, Madrid and Seville, deviations of calculated dwelling units from household numbers become very large (census households in Madrid are 2.35 times calculated dwelling units), presumably because our assumption that each storey contains one dwelling unit and that two-floor houses are one dwelling unit have become less realistic for these provinces. We therefore favour the census household numbers, as they are internationally comparable.

Sources: Number of houses from *Anuario Estadístico de España* and population from population censuses (Instituto Geográfico y Estadístico, *Censo de Población*, 1900, 1910, 1920 and 1930).

Table 6. The Determinants of Hedonic Housing Prices, 1900-1930

Method	**WLS**	**GLSre**
	(1)	(2)
Constant	5.610***	5.455***
	(0.554)	(0.795)
$log(Y)_{t-1}$	0.371***	0.390***
	(0.095)	(0.090)
$log(1+HOUSE/POPULATION)_{t-1}$	-2.751***	-1.073**
	(0.370)	(0.529)
$log(1+CREDIT)_{t-1}$	1.325***	1.006***
	(0.239)	(0.230)
N	192	192
F-test / Chi^2	69.24	49.17
R^2 / overall R^2	0.57	0.39

Notes: WLS is weighted least squares with weights given by the mean number of houses sold. GLSre is generalized least squares with random-effects. *** indicates significant at 1 per cent level and ** indicates significant at 5 per cent level.

Sources: Dependent variable see Figure 1: CREDIT variable see Figure 4; Y is drawn from Rosés et al., 'The Upswing'; and see Table 5 for HOUSE.

Table 7. Substantive Significance of the Variables

	Coefficient	Mean	Std. Dev.	Coeff.*Mean
	(1)	(2)	(3)	(4)
Housing Hedonic Price		8.774	0.689	
$log(Y)_{t-1}$	0.371	6.303	0.331	2.338
$log(1+HOUSE/POPULATION)_{t=1}$	-2.751	0.408	0.113	-1.122
$log\ (1+CREDIT)_{t-1}$	1.325	1.249	0.185	1.655

Notes and Sources: See table 6.

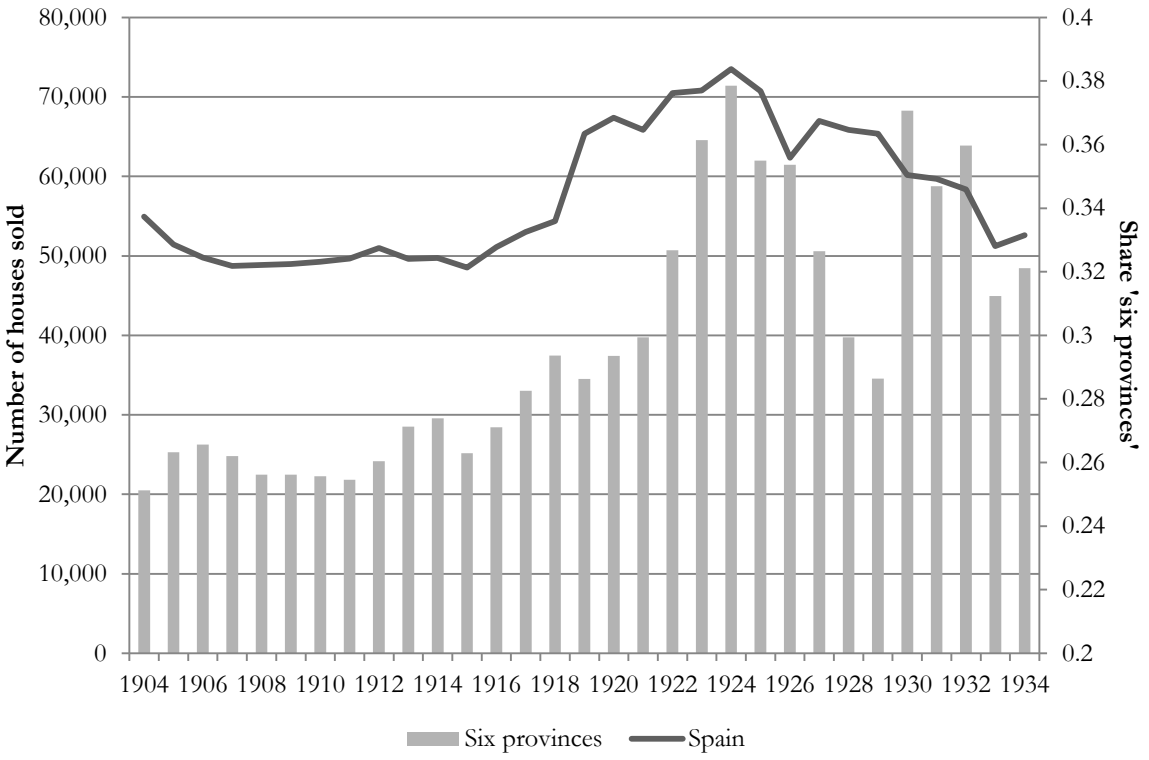

Figure 1. The Number of Houses Sold in Spain, 1904-1934

Sources: Carmona et al. 'Spanish Housing Markets'.

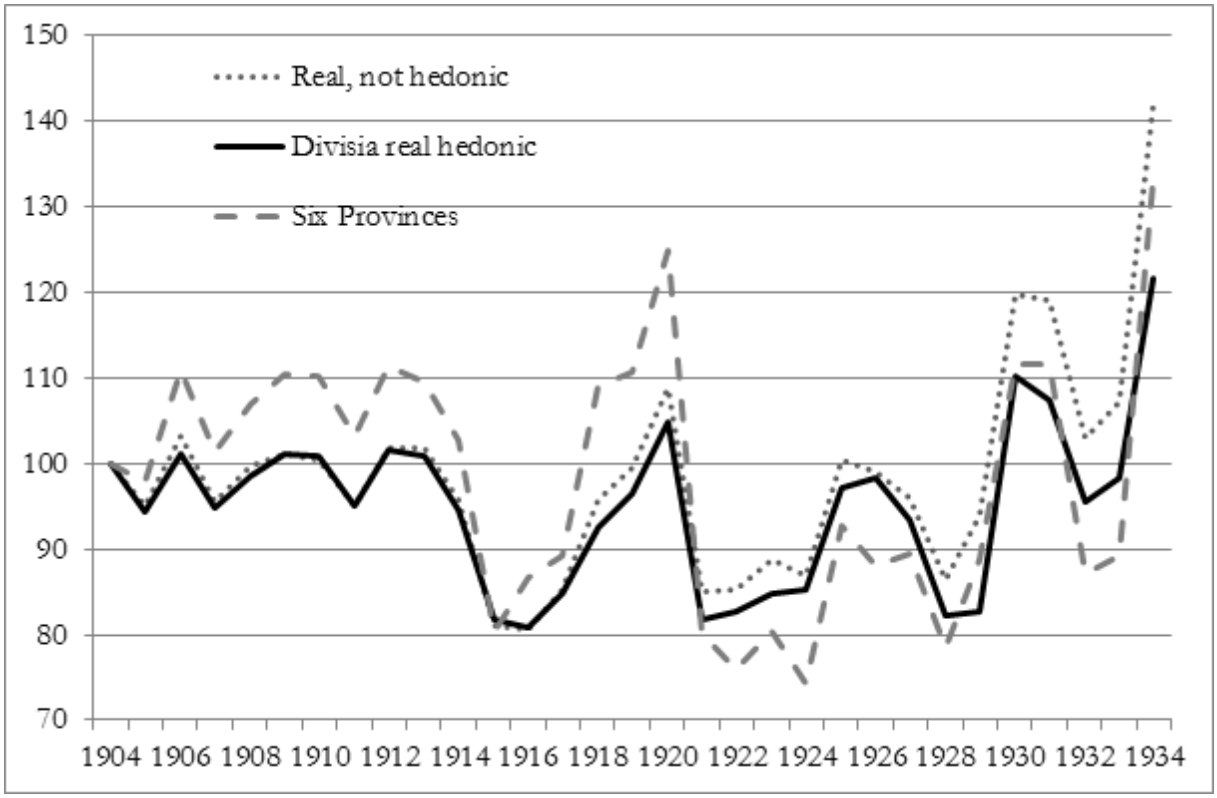

Figure 2. The Evolution of Housing Prices in Spain, 1904=100

Sources: See figure 1.

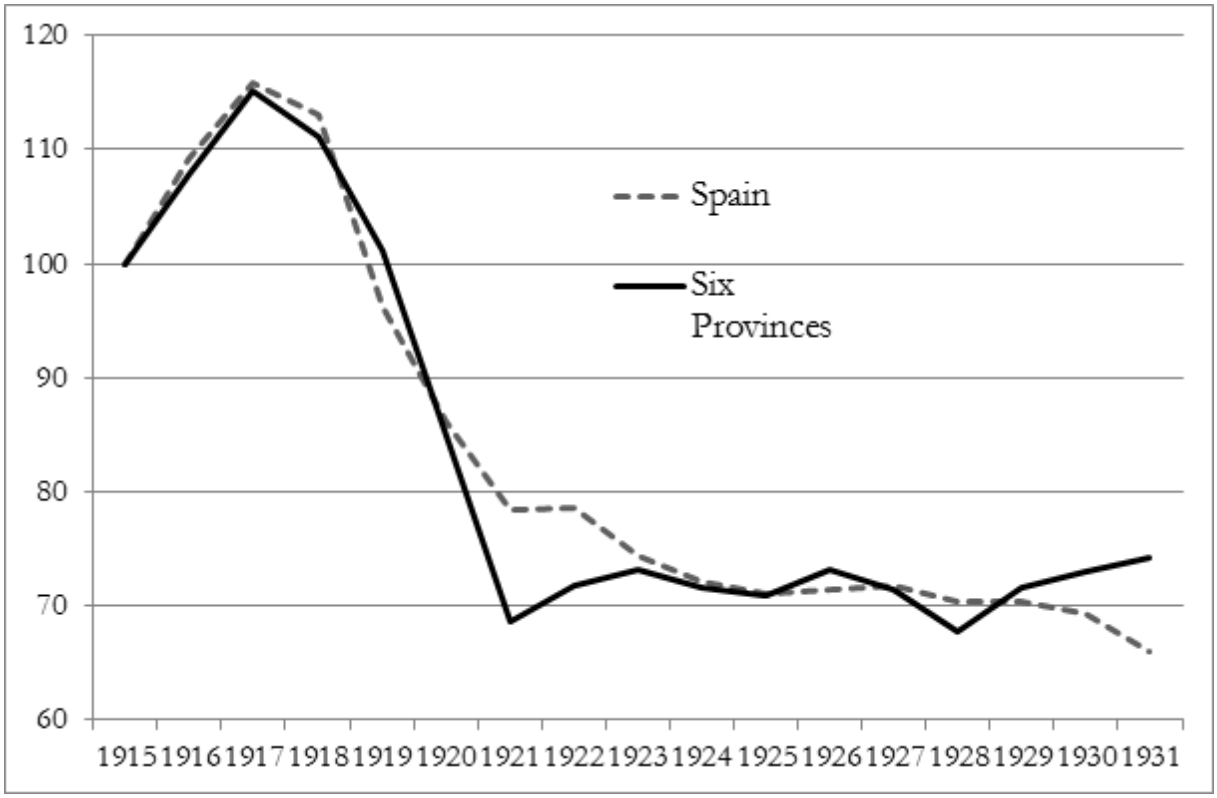

Figure 3. The relative cost of housing in Spain, 1915-1931 (1915=100)

Notes: The figure is computed as a population-weighted average of the provincial ratios between wages during the current year and an unweighted average of current housing prices and prices during the previous four years. The wages employed in this calculation are average bricklayer wages. However, it should be noted that closely similar results are obtained with alternative wage series.

Sources: See figure 1 for housing prices and *Anuario Estadístico* for wages.

Figure 4. The Evolution of the Absolute and Relative Number of Mortgages, 1904-1934

Sources: see Figure 1.

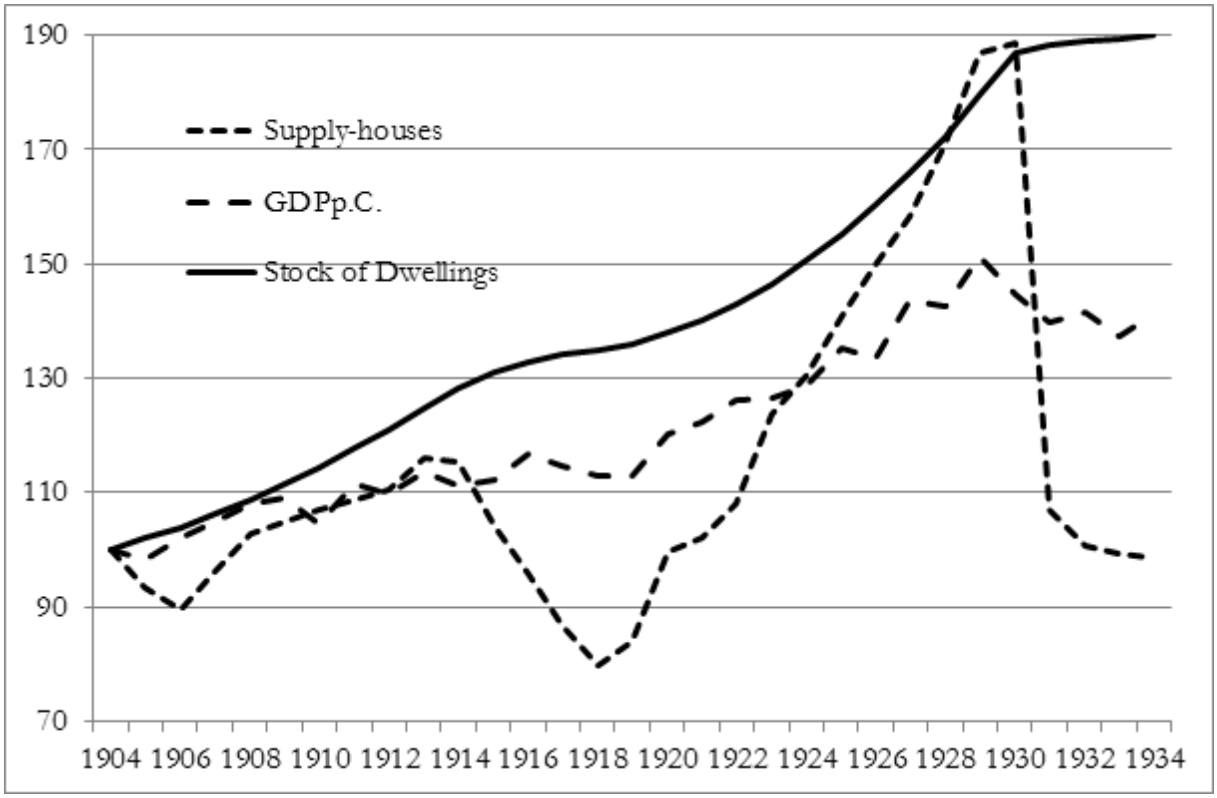

Figure 5. The evolution of the Supply of New Houses, Permanent Income and the Stock of Dwellings, 1904-1934 (1904=100)

Sources: The stock of Houses is drawn from Prados de la Escosura and Rosés 'Long-run Estimates'; and per capita GDP and supply of houses from Prados de la Escosura, *El progreso*.

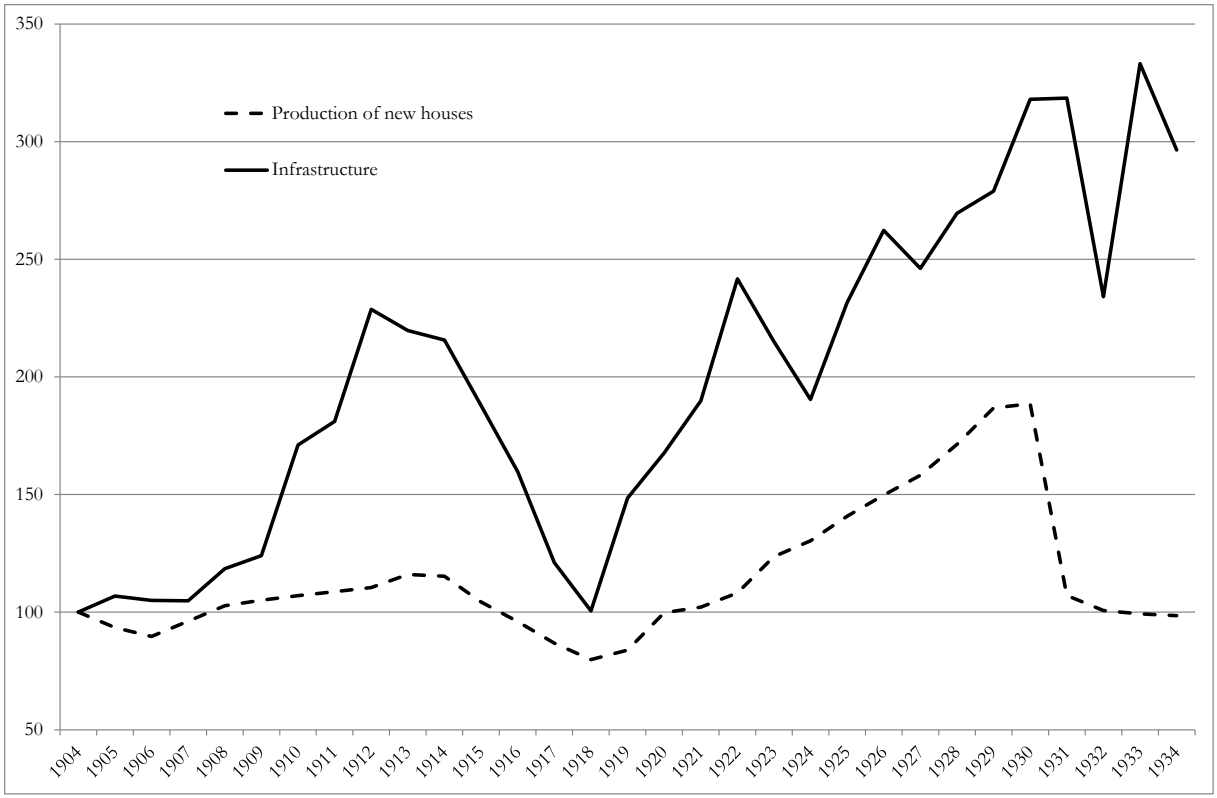

Figure 6. The evolution of the Supply of New Houses and Infrastructure investment in Spain, 1904-1934 (1904=100)

Sources: Data is drawn from Prados de la Escosura, *El progreso*.

Appendix

Panel Unit Root Tests for Spanish housing markets

In order to consider econometrically if any spatial compositional changes in houses sold may affect mean provincial housing prices, we will analyse their time-series properties. We depart from the well-known principle that price levels, like many economic variables, exhibit strong trends and are not always stationary. Specifically, we explore whether the behaviour of provincial price levels can be characterized as having a unit root or rather if prices follow a mean reverting process (that is, if they are stationary). When a substantial change in the (spatial) composition of houses sold has permanent effects on prices, price levels contain unit roots. For example, housing prices contain unit roots when, in response to increases/decreases in housing prices, families or/and investors changed the basket of houses traded (e.g., they buy houses in cheaper/expensive locations within provinces) and this translates into a permanent shock in prices. Basically, this can only happen when the different parts of the housing market within provinces are segmented and exhibit different response patters (price elasticities). The contrary also holds. When prices are stationary, such compositional (spatial) changes proven to be temporary and will be eliminated as time passes. In this case, measures based on mean values (like those presented in this article) correctly traced the evolution of provincial housing prices.

There are several methods in the literature for analysing the issue posed in the previous paragraph. Basically, we will calculate two first and a second generation panel unit root test. It should be noted that panel unit root test are more powerful than the conventional individual series unit root tests (like Dickey-Fuller and Augmented Dickey-Fuller) and, hence, improved their estimation efficiency because they provide a larger number of data points and use variation across individuals.

Levin, Lin and Chu ("Unit Root Tests"), hereafter LLC, and Im, Pesaran and Shin ("Testing for Unit Roots"), hereafter IPS, appears to be the most suitable first generation panel unit root tests since they are efficient for panels of moderate size, between 10 and 250 individuals

with 25 to 250 observations per individual. This LLC test may be viewed as a pooled Dickey-Fuller (or augmented Dickey-Fuller) test, with different lag lengths across the units of the panel. The major limitation of the LLC tests is that not allow the heterogeneity of series. Instead, IPS allows for heterogeneity across groups. This is useful because ignoring heterogeneity across groups in a panel may cause the whole panel to be modelled as non-stationary, even though there is a large proportion of stationary series in the panel.

The major problem with these two tests is that they are not efficient in presence of cross-sectional dependence (which is likely to happen in this case). A solution to this problem is the cross-sectionally augmented panel unit root test (CIPS) of Pesaran ("A Simple Panel Unit Root"). In the CIPS test, ADF regressions are augmented with the cross section averages of lagged levels and first-differences of the individual series. This procedure allows for heterogeneity in the autoregressive coefficient of the Dickey-Fuller regression and for the presence of a single unobserved common factor with heterogeneous factor loadings in the data (that is, this test is efficient in presence of cross-sectional dependence).

Table 1. Panel Unit Root Tests for Spanish Housing Markets, 1904-1934

Test	Specification	*Statistic*	*p-value*
Levin-Lin-Chu (LLC)	NI	-6.048	0.000
	I	-19.046	0.000
	IT	-23.341	0.000
Im-Pesaran-Shin (IPS)	I	-13.238	0.000
	IT	-13.894	0.000
Pesaran (CIPS)	I	-6.448	0.000
	IT	-4.912	0.000

Notes: The dependent variable is the log of the hedonic housing price in $province_{i,t}$ divided by the hedonic housing price in $Barcelona_{t.}$ The Barcelona hedonic housing price serves to control for common shocks

(alternative estimations have been performed with Madrid and Biscay hedonic prices as denominator without significantly different results). The lags have been selected on a variety basis with the AIC criterion. Statistic is unadjusted t-statistic in LLC; W-t-bar in IPS; and Zt-bar in Pesaran's CIPS. NI: Specification without intercept; I: Specification with intercept; IT: Specification with intercept and Time Trend.

Sources: See text.

The LLC, IPS and CIPS tests reject the unit root hypothesis for all different specifications at 1 percent significance level. In sum, these panel unit roots tests give strong support of our use of mean provincial hedonic housing prices to depict the evolution of Spanish housing markets. An extension of this result, it is that Spanish housing markets appears to be integrated during the period of this study.

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