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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 pervasive during the urban transition as the literature often seems to claim.

**Keywords:** Demand and Supply of Housing; Regulation in Housing Markets; urban growth.

**JEL Codes:** N93; N94; R30.

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# Housing Affordability during the Urban Transition in Spain

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. For this reason, housing markets play a decisive role in developing economies, and their failures can profoundly affect a country's overall economic growth and the well-being of its citizens.<sup>1</sup>

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.<sup>2</sup> 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”<sup>3</sup> 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 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.<sup>4</sup> In fact, many problems remained pressing until the late 19<sup>th</sup> century, in part because urban populations kept growing not

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<sup>1</sup> Malpezzi ('Economic Analysis' and 'Global perspectives') provides a review of the evidence on housing markets in developing countries.

<sup>2</sup> Williamson, *Coping with City Growth*, p. 3.

<sup>3</sup> Williamson, 'City Growth', pp. 354.

<sup>4</sup> 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.

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.<sup>5</sup>

Similar patterns of city growth and demographic transition can be found, with some regional variation in extent and timing, in most Northwestern 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.<sup>6</sup> With Britain as a precedent, France, Germany, Scandinavia and the rest of Europe had to “cope with city growth”, and, in the late 19<sup>th</sup> century, developed 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 and intra-urban transport to maintain spatial coherence of urban areas.<sup>7</sup> These technologies could eventually be applied by latecomers in this process, that is, countries experiencing the urban transition process during the 20<sup>th</sup> century.

One of these latecomers was Spain, the object of the present study, where both the moment of maximum population growth and maximum city growth happened during the first three decades after 1900, in the period under study here. Urbanization advanced at a flourishing rate,<sup>8</sup> both through the disproportionate increase of the large metropolis and through the growth of smaller towns and villages into cities. Domestic migration rates, mostly from the agrarian areas in the countryside to industrializing and urbanizing regions reached historically unmatched levels.<sup>9</sup> At the same time, Spain saw its income per capita and total factor productivity increase at unprecedented levels, especially during the 1920s.<sup>10</sup> Increasing internal migration and economic growth were accompanied by a demographic transition, leading to population growth and a

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<sup>5</sup> Williamson, *Coping with City Growth*, ch. 2, Easterlin, ‘Worldwide Standard of Living’, p. 7.

<sup>6</sup> 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).

<sup>7</sup> See, on these new technologies, Brown, ‘Reforming the urban environment’; Easterlin, ‘How beneficent is the market?’; Divall and Bond, *Suburbanizing the Masses*; Ferrie and Troesken, ‘Water and Chicago's mortality transition’; and McKay, *Tramways and Trolleybus*.

<sup>8</sup> Reher, ‘Desarrollo urbano’.

<sup>9</sup> Silvestre, ‘Internal migrations’.

<sup>10</sup> Prados de la Escosura and Rosés, ‘Sources of long-run Growth’.

rapidly rising number of new families.<sup>11</sup> 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 the 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 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 housing prices and transactions. In section II, we discuss 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 IV, 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

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.<sup>12</sup> The main source for our data is the Registrars' Yearbooks, which give the total value and number of sales of urban properties in each Spanish province in each year. From this, 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 provincial Consumer Price Indices (CPI) deflators,<sup>13</sup> 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.<sup>14</sup>

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<sup>11</sup> Pérez Moreda, 'La población española'.

<sup>12</sup> Carmona et al. 'Spanish Housing Markets'.

<sup>13</sup> CPI are drawn from Rosés and Sánchez-Alonso, 'Regional Wage Convergence'.

<sup>14</sup> 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-

Figure 1 presents some basic information on the number of houses sold in all of Spain and the market share of the six provinces with the most populated cities (i.e., Barcelona, Madrid, Biscay, Seville, Valencia and Saragossa; hereafter: ‘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.<sup>15</sup> In the following period, from 1914 to 1924, the number of transactions grew at respectably 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).

It is also evident from figure 1 that the share of the ‘six provinces’ in the market was growing during the period. These provinces accounted for one-fourth of the market until 1920, but in the remaining fourteen years, their market share reached approximately more than thirty per cent of the total (the peak was in 1924 when they were responsible for about 38 per cent of market share).

### [FIGURE 2]

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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 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’.

<sup>15</sup> 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 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). 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<sup>16</sup> and experienced a noteworthy urban expansion.<sup>17</sup>

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 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 rapidly expanded, but housing prices remained stable at historically lower levels in Spain and the ‘six provinces’.

## II

In the past section, we have shown that, despite the rise in the number of transactions, housing prices remained stable in Spain during first third of the 20<sup>th</sup> century. 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 20<sup>th</sup> 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.<sup>18</sup> In other words,

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<sup>16</sup> Silvestre ‘Internal migrations’.

<sup>17</sup> Reher, ‘Desarrollo urbano’.

<sup>18</sup> 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.

blocks of flats had only one owner (who also owned 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.<sup>19</sup>

Ideally, any good historical statistic in 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 data for rents of working-class dwellings and consistent evidence on the amount of people living, on average, in each dwelling.

### [TABLE 1]

In table 1, 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 (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” house used by working classes in all Spanish provinces’ capitals.<sup>20</sup> Regarding to the denominator, we have also consider two different wage measures: wages of unskilled construction workers (peones) and wages of semi-skilled construction workers (albañiles: ie. bricklayers).<sup>21</sup>

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

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Horizontally divided (or mixed) property rights regarding individual floors or apartments (*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/>).

<sup>19</sup> This situation was corroborated by British Consular Reports. See, for example, Roberts, ‘Report on the Trade’.

<sup>20</sup> 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.

<sup>21</sup> This data on wages is drawn from Rosés and Sánchez-Alonso, ‘Regional Wage Convergence’.



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.<sup>22</sup>

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 prices in a short-medium horizon, since housing prices tend to adjust to (capitalized) rents.<sup>23</sup> 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)<sup>24</sup> 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-

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<sup>22</sup> 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.

<sup>23</sup> 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.

<sup>24</sup> As compared to 1470 observations in our house price dataset.

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.<sup>25</sup> Specifically, we estimate the following regression:

$$(1) \quad g_{i,t+1} = \beta_0 + \beta_1 (R_{it} / P_{it}) + \epsilon_{it}.$$

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  $\epsilon_i$  and is uncorrelated with the rent-price ratio. If the rent-price ratio is significantly and inversely related to the average future rent growth, 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 2, 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 2]

Coefficients in the variable of interest ( $R_{it} / P_{it}$ ) shown that the adjustment period is about 5 years, which is not an extraordinary result.<sup>26</sup> 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).<sup>27</sup> What could have caused this

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<sup>25</sup> 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.

<sup>26</sup> With quarterly US data, Gallin ('The Long-Run Relationship') estimated a similar speed of adjustment between rents and housing prices.

<sup>27</sup> 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 19th century and early 20th century.

decline? A simple observation of the data on housing prices and wages shows that this phenomenon was 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.<sup>28</sup>

### [TABLE 3]

After reviewing the evolution of relative housing prices (as measure of housing affordability), we will consider several alternative measures that show the relation between the number of dwellings and population (see table 3). In Panel A, we discuss the overall measures for Spain, whereas in Panel B, we analyse the six provinces with the largest cities 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 dwellings and population indicates that, on average, only 2.2 people lived in each dwelling.<sup>29</sup> In comparison with recent European housing statistics, this ratio is low.<sup>30</sup>

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 Biscay and Valencia, the ratio between dwelling units and population improved. However, in Madrid and Saragossa, the ratio was stable, and in Barcelona and Seville, the ratio worsened slightly.<sup>31</sup> In any case, despite the rapid

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<sup>28</sup> 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 al., '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).

<sup>29</sup> However, Spanish censuses do not distinguish between buildings devoted to dwellings and those devoted to commerce and workshops. Prados de la Escosura (*El progreso*) estimates that approximately 5 per cent of all buildings were devoted to economic activities. Consequently, if we introduce this modification to our calculations, then the initial ratio increases to 2.3 people per dwelling.

<sup>30</sup> In European countries from 1980 to 2003, this ratio oscillated between a minimum of 1.9 (i.e., Sweden in 2003) and a maximum of 3.7 (i.e., Ireland in 1980), with an average value of 2.68. This data is drawn from National Board, *Housing Statistics*, table 1.9.

<sup>31</sup> In Barcelona, this ratio increased by approximately 15 per cent from 1900 to 1930 and, in Seville, by approximately 16 per cent during the same period.

demographic changes and urbanization growth, the ratio between dwelling units and population did not dramatically worsen in any Spanish province during the first thirty years of the 20<sup>th</sup> century.<sup>32</sup>

### III

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:<sup>33</sup>

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

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 ( $Y$ ), the housing stock per capita ( $\text{HOUSE/POPULATION}$ )<sup>34</sup> and credit availability ( $\text{CREDIT}$ ), which is calculated as the ratio between the number of mortgages and the number of housing transactions at  $t$ . In other words,

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<sup>32</sup> 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.

<sup>33</sup> See on inverted house demand equations: DiPasquale and Wheaton, 'Markets for real estate'; and Malpezzi, 'Economic Analysis'.

<sup>34</sup> 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  $\text{HOUSE/POPULATION}$ . Hence, these two variables should not be considered together in regressions.

we argue that housing demand is a function of permanent income, the demographic structure, and, crucially, the credit availability.<sup>35</sup> 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.<sup>36</sup> However, because of its high cost in relation to family incomes, housing must be financed.<sup>37</sup> As a result, changes in interest rates and the availability of mortgages may have a substantial effect on housing demand.<sup>38</sup>

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.<sup>39</sup> 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.<sup>40</sup>

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

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<sup>35</sup> However, our model underscore two specific features of housing markets have a strong influence on housing demand (e.g., DiPasquale 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.

<sup>36</sup> 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.

<sup>37</sup> Malpezzi, ‘Economic Analysis’.

<sup>38</sup> 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’). RR is highly correlated with CREDIT and, then, we had to estimate a new equation only with RR. 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).

<sup>39</sup> See, for example, Malpezzi, ‘Global perspectives’; Case and Shiller, ‘Is There a Bubble’; and Holly and Jones, ‘House prices’.

<sup>40</sup> 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.

income, which is measured as the average income over a given time span, rose during the first third of the 20<sup>th</sup> 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.<sup>41</sup> 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.

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 the previous 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.<sup>42</sup>

In the first three decades of the 20<sup>th</sup> 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.<sup>43</sup> On the other hand, many people relocated from the countryside to the cities.<sup>44</sup> In particular, from 1900 to 1930, the share of Spanish population living in cities of more than 50,000 inhabitants increased from the 13.7 per cent to 19.8 per cent.<sup>45</sup> Furthermore, a large percentage of rural migrants to cities were composed of young adults.<sup>46</sup> 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

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<sup>41</sup> Spanish GDP data is drawn from Prados de la Escosura, *El progreso*.

<sup>42</sup> See Mankiw and Weil, 'The Baby Boom'.

<sup>43</sup> Pérez Moreda, 'La población española'; and Reher, 'Desarrollo urbano'.

<sup>44</sup> Silvestre, 'Internal migrations'.

<sup>45</sup> If we consider population living in cities of more than 10,000 inhabitants, this share grew from the 32.5 to 42.6 per cent (Azagra et al., *Localización de la población*).

<sup>46</sup> Silvestre, 'Internal migrations'.

migrants, with the proportions in the rest of Spain's provinces. From 1900 to 1920, 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 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.<sup>47</sup>Of all the age groups, young adults participated more actively in international migration.<sup>48</sup>

#### [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 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

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<sup>47</sup> The demographic data are drawn from Instituto Geográfico y Estadístico, *Censo de población*, 1900, 1910, 1920 and 1930.

<sup>48</sup> Sánchez-Alonso, 'Those Who Left'.

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 because we do not have yearly information on the evolution of the housing stock per capita. Specifically, we have information for 49 provinces and 4 benchmarks (1904, 1911, 1921 and 1931). A major problem with this type of estimation is the presence of endogeneity among explanatory variables. For this reason, we use lagged explanatory variables in our estimations. Specifically, we compute weighted OLS estimates with robust standard errors (column 1) and GLS random-effects estimates with robust errors (column 2).<sup>49</sup>

#### [TABLE 4]

The variables habitually 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). 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 5]

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<sup>49</sup> 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.



Table 5 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.

#### IV

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, previous quantitative research has shown that the supply of new houses rose significantly during the studied period.<sup>50</sup> 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.<sup>51</sup> 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.<sup>52</sup> 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,

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<sup>50</sup> 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.

<sup>51</sup> The same has occurred throughout the history of OECD countries (Ball and Wood, 'Housing Investment').

<sup>52</sup> 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.

Canada, Germany and Finland during the 1920s.<sup>53</sup> Each of these countries also experienced a halt in construction due to the Great Depression.

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).<sup>54</sup>

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)<sup>55</sup> 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<sup>56</sup> 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.<sup>57</sup> In this sense, many empirical analyses for contemporary cities conclude that geography and regulation (zoning) constrain the availability of land for new houses.<sup>58</sup> Surprisingly, contemporary literature on housing tends to downplay the importance of public infrastructure on housing supply.<sup>59</sup> In our view, however, geographic (spatial) constraints on

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<sup>53</sup> Ball and Wood, 'Housing Investment'.

<sup>54</sup> 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'.

<sup>55</sup> 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.

<sup>56</sup> See, for example, Leunig and Overman, 'Spatial patterns'.

<sup>57</sup> 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.

<sup>58</sup> 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'.

<sup>59</sup> 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

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.<sup>60</sup> To be efficient, urban expansion should be accompanied of the development of the necessary public infrastructures.<sup>61</sup> 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 firms were tasked with this kind of development, which also benefited from substantial economies of scale.<sup>62</sup>

## [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 20<sup>th</sup> 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,<sup>63</sup> and investment in water infrastructures and sanitation grew at 6.17 per cent per year, whereas railway investment experienced negative growth rates.<sup>64</sup> In

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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.

<sup>60</sup> Divall and Bond, *Suburbanizing the Masses*; and; and McKay, *Tramways and Trolleybus*.

<sup>61</sup> Brown, 'Reforming the urban environment'; Easterlin, 'How beneficent is the market?'; Ferrie and Troesken, 'Water and Chicago's mortality transition'; Offer, *Property and Politics*.

<sup>62</sup> Malpezzi, 'Economic Analysis'.

<sup>63</sup> On the developments of urban transport in Spain see Martínez, 'Energy Innovation and Transport' and Martínez and Mirás, 'The Second Industrial Revolution'.

<sup>64</sup> Herranz, *Dotación de infraestructuras*, p. 93.

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 a restrictive regulatory framework that blocked the construction of new houses. However, there are no reasons to think that Spanish regulatory policy impeded the free operation of the housing markets and the continuous expansion of land available for new houses.<sup>65</sup> 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. The Liberal reforms in the first half of the 19<sup>th</sup> century created an institutional framework that eliminated restrictions on real estate sales and established freedom of contract. On the one hand, ownership laws created a dual market of owners and renters, the latter of whom comprised the majority of the Spanish population. On the other hand, 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 19<sup>th</sup> century, a series of laws created development plans for major Spanish cities. The plans' successful reforms forced the developers and builders to pay for the construction of streets and other urban infrastructure in exchange for tax exemptions.<sup>66</sup> 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.<sup>67</sup> 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.<sup>68</sup>

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<sup>65</sup> See, Carmona et al. , 'Spanish Housing Markets' for a more detailed account of the institutional structure of Spanish housing markets during the period.

<sup>66</sup> Bassols, *Derecho urbanístico*.

<sup>67</sup> For example, in 1900, Madrid doubled the urbanized surface area and practically exhausted the land available for new houses.

<sup>68</sup> Nuñez Granés, *El problema de la urbanización*, p. 12.

## V

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. This increased demand is an important challenge for any country's economy. 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. Inefficiencies in the 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 the housing markets can easily affect the rest of the economy through three main channels. First, the failures in housing markets could generate broad health problems and reduce workers' living standards.<sup>69</sup> 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.<sup>70</sup> 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 (i.e., expanding foreign debt), which may reduce the economy's stock of productive capital.<sup>71</sup> In the historical episode examined in this study, because housing represented a large share of Spain's total capital investments,<sup>72</sup> 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, where a prompt supply response to major demand shifts occurred during the first three decades of the 20<sup>th</sup> 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

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<sup>69</sup> This topic is beyond the scope of this paper but the available evidence supports the view that living conditions and urban disamenities 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 rural advantage in infant mortality over cities disappeared.

<sup>70</sup> Muellbauer and Murphy, 'Housing markets'.

<sup>71</sup> Weale, 'House Price Worries'.

<sup>72</sup> Prados de la Escosura and Rosés, 'Long-run Estimates'.

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 available for 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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*Boletín del Instituto de Reformas Sociales*, several years.

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Roberts, Consul-General, 'Report on the Trade and Commerce of the Consular District of Barcelona (comprising the Provinces of Huesca, Zaragoza, Teruel, Barcelona, Lérida, Tarragona, Gerona, Valencia, Alicante and Castellon, and the Balearic Islands) for the Year 1908', *Parliamentary Papers* 1909 (Cd. Nr. 4446-115), pp. 287-318.

**Table 1.** The Share (per cent) of housing rents in working class incomes, c. 1920

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

Notes: Daily wages have been converted into yearly incomes under the assumption that workers worked during 300 days yearly.

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

**Table 2.** The Test of the Present Value Model

Method	WLS (1)	GLSre (2)	GLSfe (3)
<i>Constant</i>	0.145 <sup>a</sup> (0.037)	0.145 <sup>a</sup> (0.023)	0.320 <sup>a</sup> (0.685)
$(R_{it} / P_t)$	-8.668 <sup>a</sup> (2.523)	-8.668 <sup>a</sup> (1.493)	-20.569 <sup>a</sup> (4.654)
N	203	203	203
F-test / Chi <sup>2</sup>	11.80	24.63	19.52
R <sup>2</sup> / overall R <sup>2</sup>	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. <sup>a</sup> indicates significant at 1 per cent level and <sup>b</sup> 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 3.** The Population-Dwellings Ratio, 1900-1930

	1900	1910	1920	1930
<i>A. Spanish data</i>	(1)	(2)	(3)	(4)
<i>a) Inhabitants per house</i>	3.68	3.73	3.83	3.80
<i>b) Inhabitants per dwelling unit</i>	2.23	2.20	2.24	2.20
<i>c) Adult inhabitants per house</i>	2.43	2.43	2.53	2.57
<i>d) Adult inhabitants per dwelling units</i>	1.47	1.43	1.48	1.49
<i>B. Provinces (inhabitants per dwelling unit)</i>				
<i>Barcelona</i>	3.01	3.10	3.36	3.47
<i>Madrid</i>	5.72	5.29	5.99	5.82
<i>Seville</i>	3.27	3.30	3.77	3.91
<i>Valencia</i>	2.39	2.31	2.27	2.26
<i>Biscay</i>	5.04	4.48	4.63	4.26
<i>Saragossa</i>	1.69	1.68	1.75	1.70
<i>Remaining provinces</i>	2.08	2.06	2.06	2.00

*Notes:* Dwellings units are computed by multiplying the number of houses by the estimated number of floors per house. See Carmona et al. ‘Spanish housing prices’ for more details.

*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 4.** The Determinants of Hedonic Housing Prices, 1900-1930

<b>Method</b>	<b>WLS</b>	<b>GLSre</b>
	(1)	(2)
<i>Constant</i>	5.610 <sup>a</sup> (0.554)	5.455 <sup>a</sup> (0.795)
<i>log(Y)<sub>t-1</sub></i>	0.371 <sup>a</sup> (0.095)	0.390 <sup>a</sup> (0.090)
<i>log(1+HOUSE/POPULATION)<sub>t-1</sub></i>	-2.751 <sup>a</sup> (0.370)	-1.073 <sup>b</sup> (0.529)
<i>log(1+CREDIT)<sub>t-1</sub></i>	1.325 <sup>a</sup> (0.239)	1.006 <sup>a</sup> (0.230)
N	192	192
F-test / Chi <sup>2</sup>	69.24	49.17
R <sup>2</sup> / overall R <sup>2</sup>	0.57	0.39

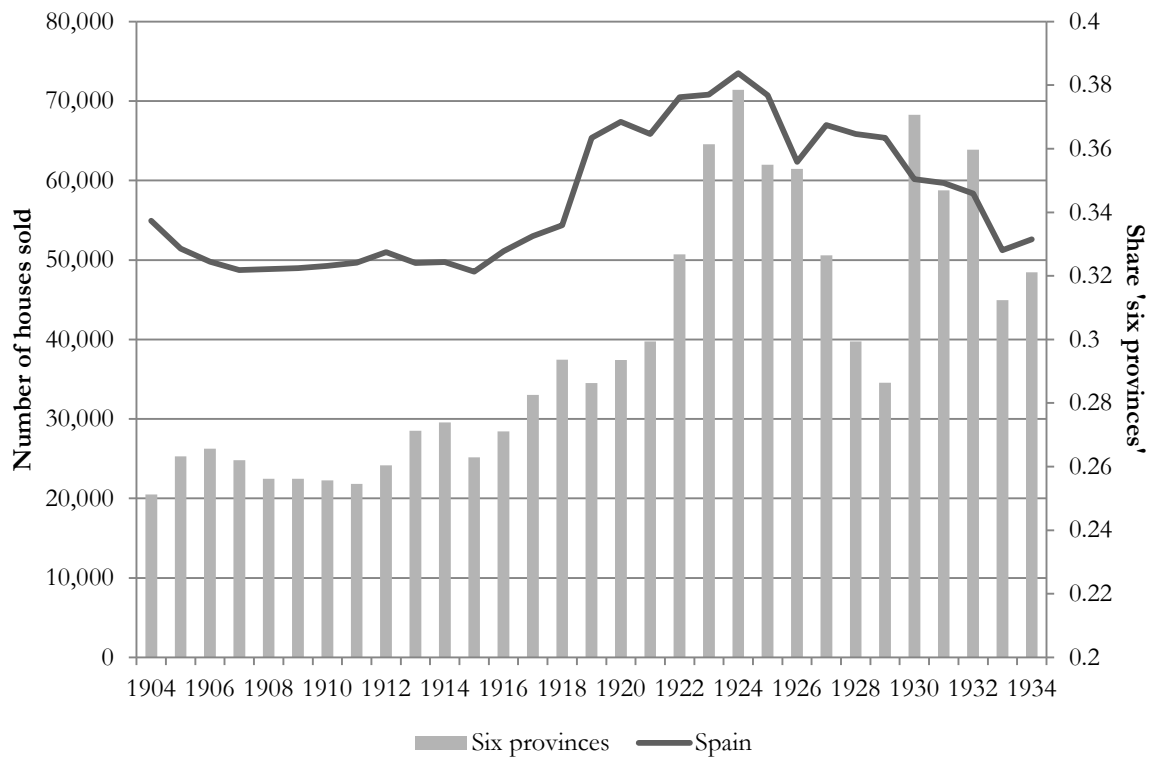
*Notes:* WLS is weighted least squares with weights given by the mean number of houses sold. GLSre is generalized least squares with random-effects.

*Sources:* Dependent variable see Figure 1; CREDIT variable see Figure 4; Y is drawn from Rosés et al., ‘The Upswing’; and see Table 3 for HOUSE.

**Table 5.** Substantive Significance of the Variables

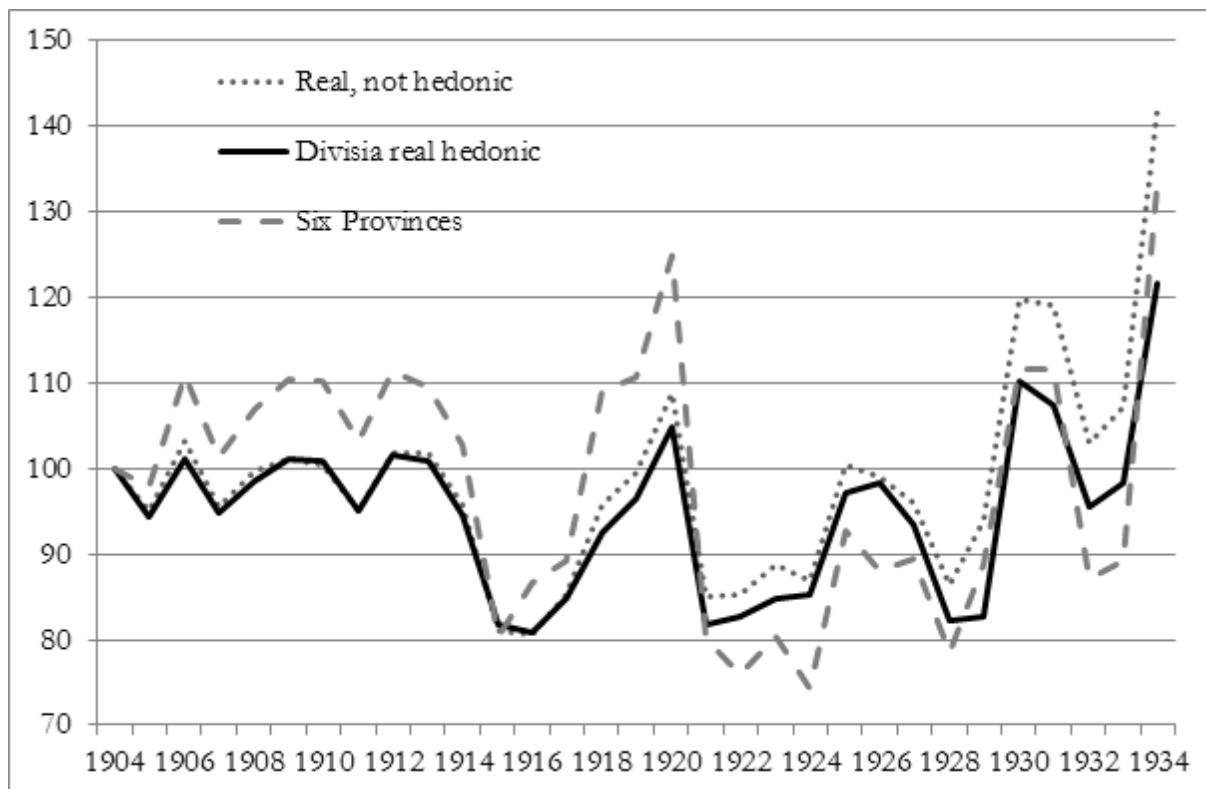
	Coefficient (1)	Mean (2)	Std. Dev. (3)	Coeff.*Mean (4)
<i>Housing Hedonic Price</i>		8.774	0.689	
$\log(Y)_{t-1}$	0.371	6.303	0.331	2.338
$\log(1+HOUSE/POPULATION)_{t-1}$	-2.751	0.408	0.113	-1.122
$\log(1+CREDIT)_{t-1}$	1.325	1.249	0.185	1.655

*Notes and Sources:* See table 4.



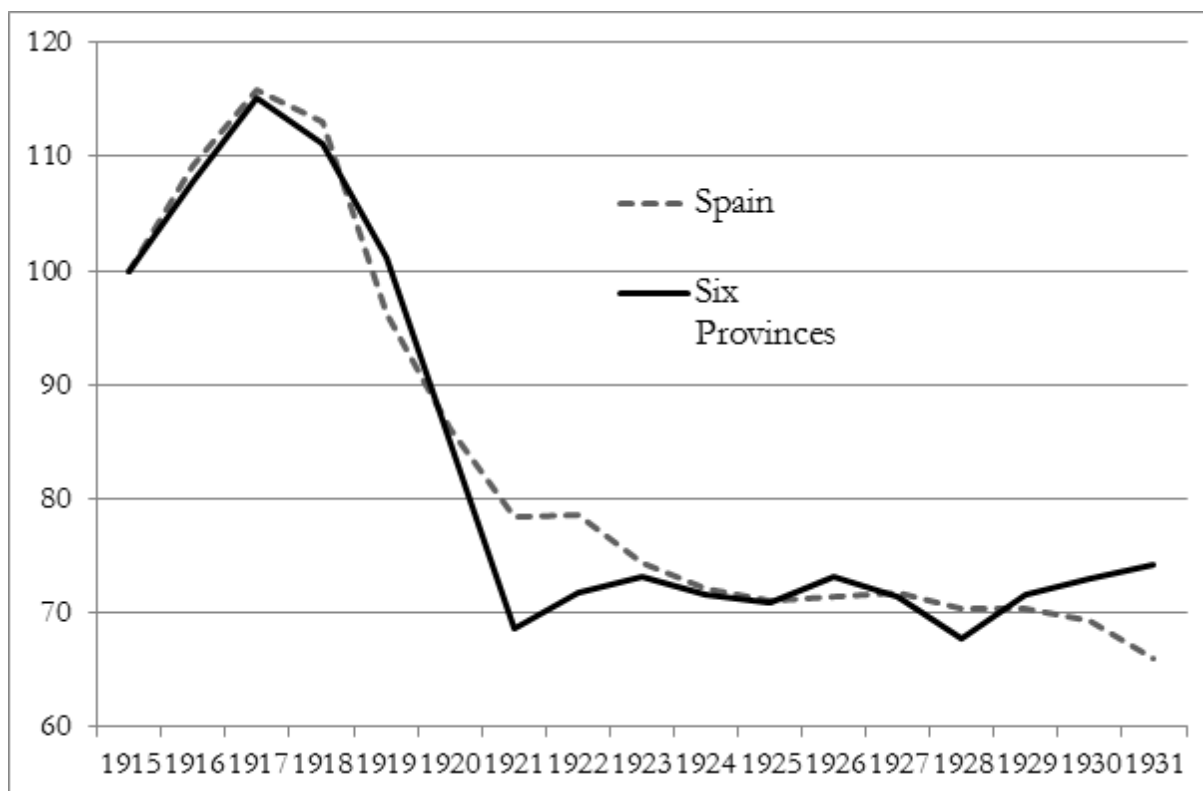
**Figure 1.** The Number of Houses Sold in Spain, 1904-1934

*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.

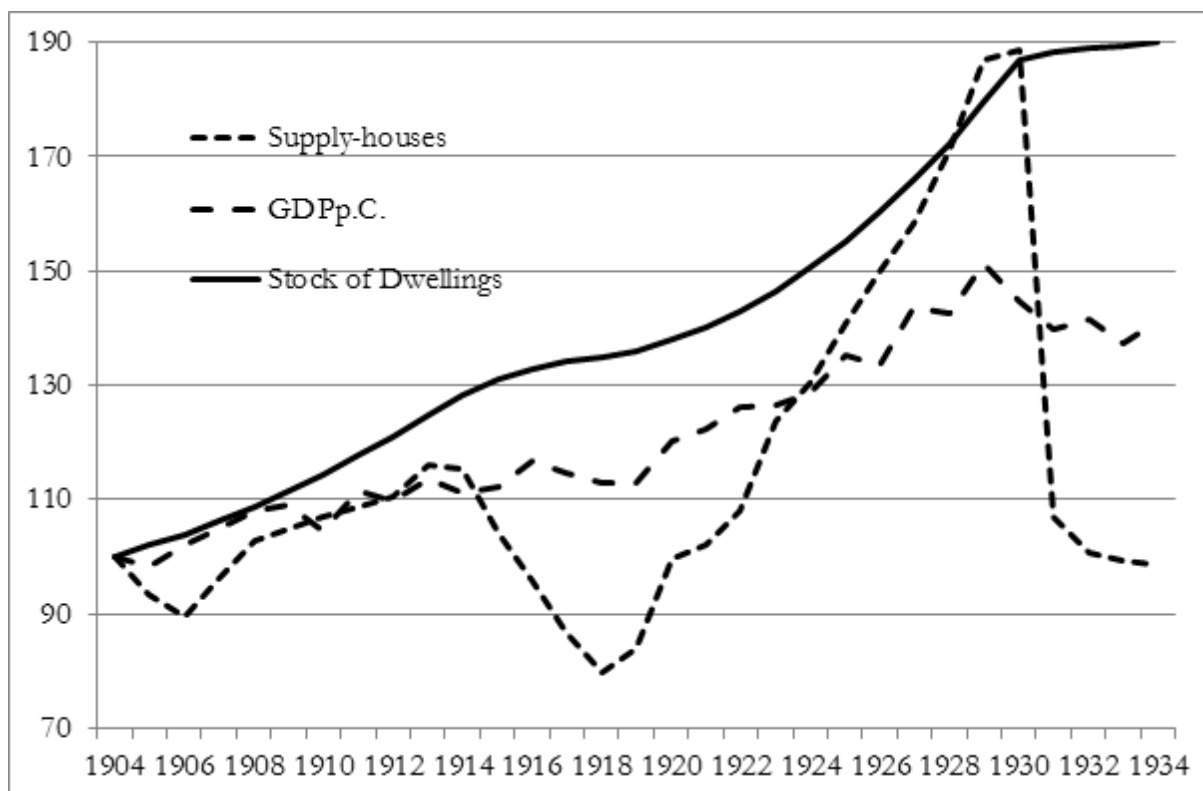
*Sources:* See figure 1 for housing prices and *Anuario Estadístico* for wages.





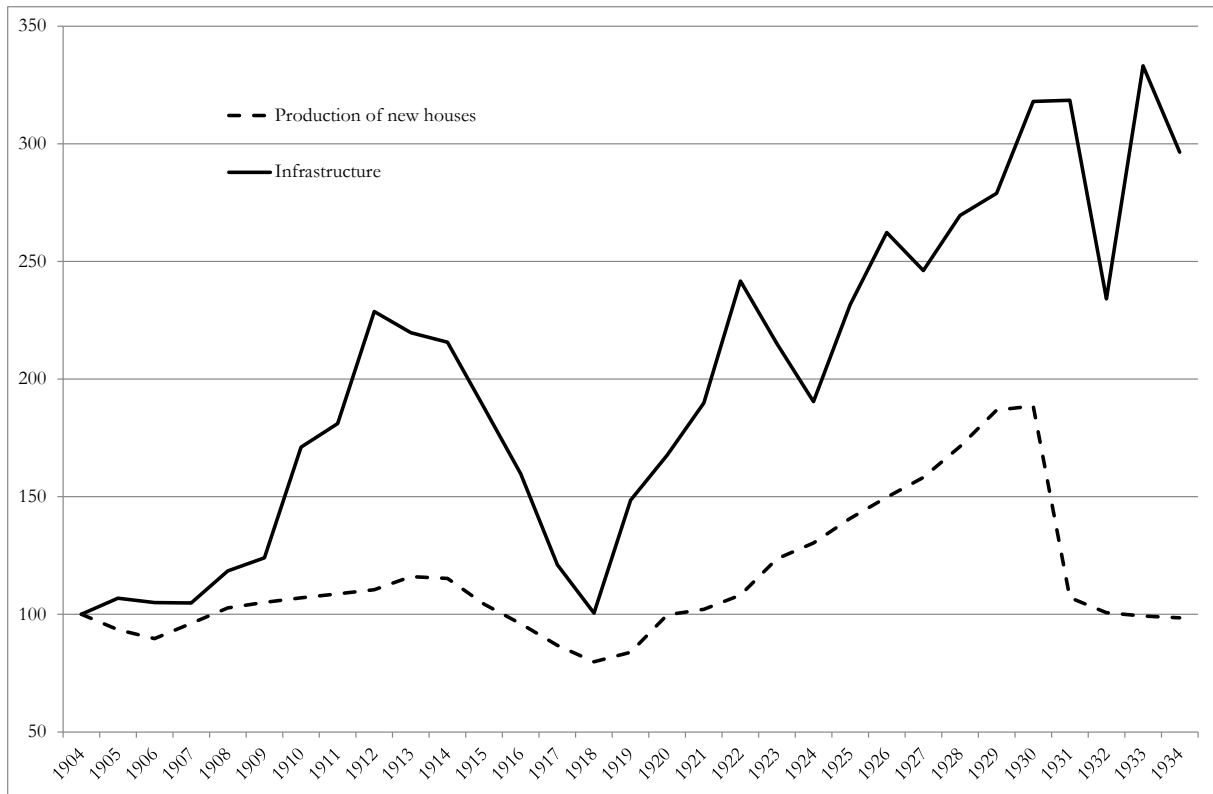
**Figure 4.** The Evolution of the Absolute and Relative Number of Mortgages, 1904-1934

*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*.