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Abstract

There is a high degree of inequality in land access across Spain. In the South, and in contrast to other areas of the Iberian Peninsula, economic and political power there has traditionally been highly concentrated in the hands of large landowners. Indeed, an unequal land ownership structure has been linked to social conflict, the presence of revolutionary ideas and a desire for agrarian reform. But what are the origins of such inequality? In this paper we quantitatively examine whether geography and/or history can explain the regional differences in land access in Spain. While marked regional differences in climate, topography and location would have determined farm size, the timing of the Reconquest, the expansion of the Christian kingdoms across the Iberian Peninsula between the 9th and the 15th centuries at the expense of the Moors, influenced the type of institutions that were set up in each region and, in turn, the way land was appropriated and distributed among the Christian settlers. To analyse the effect of these two factors, we rely on the number of farm labourers for all 471 Spanish districts (*partidos judiciales*) using the information contained in the 1860 Population Census. In line with various classic works, our results show that although geographic factors did play a role, the institutional setting that arose from the Reconquest is key in explaining the unequal distribution of land in Spain, particularly in the former territories of the Kingdom of Castile.

Keywords: Land distribution, geography, institutions, Reconquista

JEL classification: D02, N93, Q15, R10

> In Spain, "the regional disparity in land tenure is so pronounced that it is worth speculating briefly on its causes. […] the fundamental problem is whether natural conditions are so harsh in Southern Spain that, even when arable, land can successfully be cultivated only in large units by individuals who possess large quantities of capital. To what extent is the latifundio system on agricultural land […] a product of geographical conditions and therefore essentially irreversible, and to what extent is it a product of history and thus at least partly alterable?"
>
> Edward Malefakis (1970, pp.33-34).

> "Climate and topography contributed to the formation of some of the differences in the structure of property ownership in Spain. But historical factors were much more important […] The country, in the form we know it today, was reconquered stage by stage from the Moors over a period of almost eight centuries (711-1492), one of the longest historical processes known to man. In each of these stages new problems had to be faced, and each involved a radically different resettlement policy. […] These early decisions had a lasting significance because, once established, the property ownership systems in each region became stronger and survived all the vicissitudes of history." [Own translation]
>
> Edward Malefakis (1978, p.13).

1. Introduction

Land has been the main productive factor in preindustrial agrarian societies. Therefore, whether land is accessible, with a permanent or a temporary tenure, or not, might have profound socioeconomic implications. In Spain, for example, there are marked differences in land access across the territory. While medium and small-sized farms have predominated in the North, large states have been the norm in large parts of the South. As a result, and in contrast to other areas of the Iberian Peninsula, economic and political power in Southern Spain has been highly concentrated in fewer hands. An increasing body of work has stressed the negative consequences that institutions may have for economic development (e.g., Acemoglu & Robinson 2012). According to this account, small elites controlling a large proportion of political and economic power have an incentive to obstruct any attempt at economic or political reform in order to maintain the status quo, hereby adversely affecting long-term economic growth.

Much of the literature has focused on inequality in land ownership. The importance of studying land inequality stems from the fact that the way land is distributed in a society may have a direct and persistent effect on the level of inequality in that society over time as land ownership can be passed down from one generation to the next (Deininger & Olinto 2000). This is particularly relevant in pre-industrial societies, where land was a key production factor.

The unequal distribution of land may then lead to institutional arrangements that could be detrimental to economic progress. A number of studies have analysed the effects that the unequal distribution of land has on certain economic aspects, stressing its negative impact on agricultural production (Banerjee & Iyer 2005; Vollrath 2007; Adamopoulos & Restuccia 2014), education levels (Galor & Zeira 1993; Galor et al. 2009; Chaudary 2009; Ramcharan 2010; Vollrath, 2013; Cinnirella and Hornung 2016) and economic growth in general (Alesina & Rodrik 1994; Deininger & Squire 1998; Li et al. 1998; Easterly 2007; Adamopoulos 2008).

However, while the long-term effects of land inequality have been widely explored, studies focusing on how the land distribution originated and how the property structure was conceived are less common. Much of the literature explores the changes introduced during colonial times. For instance, North et al. (2000) suggest that the institutions set up in Latin America, and in particular the decisions made about the land market, were the result of the interests and privileges that the colonizers brought with them, and therefore claim they played a major role. Meanwhile Acemoglu et al. (2001) argue that geography influenced the institutions the settlers established during the colonization period. In high mortality areas where tropical diseases were present, the colonizers were at greater risk. The fewer European settlers in these territories designed weak institutions, which could be the root cause of the poor long-term institutional and economic performance of these countries. Acemoglu et al. (2002) base their argument on the impact of population density and urbanization on institutions in the colonized areas. This strand of the literature thus stresses the indirect effect of geography through its interaction with past events.

Likewise, Engerman & Sokoloff (2000) maintain that during the colonization period the geographical conditions in Latin America, especially in areas with a predominantly tropical climate, led to a specialization in cash crops for export that were produced on a grand scale on plantations using slave labour. In this context the institutional framework, designed to defend the interests of a small landowning elite, created highly unequal societies and had a persistent detrimental effect on economic progress. However, in areas like North America that enjoyed a milder climate, settlers specialized in growing food crops such as cereals, and small and medium-sized family farms predominated. The existence of a large number of landowners thus led to more equitable societies and institutions that were more propitious for economic growth.

Vollrath (2006) analysed the case of the United States using county data for 1860. While in the north of the country medium size and small farms devoted mainly to the production of cereals traditionally predominated, in the south the specialization in cash crops (cotton,

tobacco and sugarcane) took place in large plantations. His results show that the type of crop chosen had indeed a significant effect on the land ownership structure; the greater the importance of cash crops, the greater the inequality in land ownership. The importance of cash crops was determined by geographical factors. Thus, like Engerman & Sokoloff (2000), he concludes that geography had an impact on land distribution and therefore on income levels via the institutions.

On a recent paper, Boberg-Fazlic et al. (2020) focused on the Danish case and on how land reforms and enclosure affected land distribution over the course of the centuries. By studying the evolution of land inequality between the late seventeenth and the nineteenth century, these authors find that land inequality in Denmark increased, and that it did so more in areas with better soil quality. Thus the distribution of land in the late nineteenth century was to a large extent the outcome of institutional change through the agrarian reforms implemented over the previous period which, among other effects, brought about an increasing number of peasants with little or no land especially in areas characterized by the existence of more productive land.

While the two previous studies analyse individual country cases, Frankema (2010) explored the determinants of cross-country variation in land inequality for a sample of 111 countries around the mid-20th century, focusing especially on ex-colonies. He finds that geographical and other factors, such as suitability for food crops and lower population density during the colonial period, gave rise to a lower level of land inequality. Regarding institutional variables, his results show that, in ex-Iberian colonies, the greater presence of Catholicism and the non-existence of a pre-colonial state have a negative impact on land inequality. Everything considered, he states that "[t]he main conclusion is that the literature tends to overemphasize the role of geography and to underestimate the role of pre-colonial institutions in shaping the colonial political economic context in which land is (re)distributed from natives to colonial settlers" (Frankema 2010, p.418).

In this respect, Spain is an interesting case to study. Not only is it a country in which there has traditionally been a high degree of inequality in land distribution, there are also notable territorial differences in its land ownership system[1]. In the north of the country and some areas of the Mediterranean coast there is a predominance of small, family-owned holdings. As a result of this land distribution, these regions have traditionally been characterized by

[1] In 1960 the Gini coefficient for land in Spain was the highest in Europe at 79.1% compared to a continental average of around 57% (Frankema 2010, p.450). A study on Victorian England, where land ownership was also highly concentrated, can be found in Lindert (1987).

the presence of a large number of peasants who were landowners on a small or medium scale. Conversely, in the southern part of the country there was a predominance of big estates known as latifundios. Throughout history, land in this part of the country has been strongly concentrated in the hands of a relatively small number of landowners, while much of the rural population has been made up of landless peasants working as day labourers. One result of this unequal distribution of land in the south was that agricultural day labourers had to cope with harsh living conditions[2].

These marked differences in land ownership patterns and, more specifically, the problem of land concentration in the latifundios of the south have been a constant presence in Spanish history[3]. This particular distribution of land ownership inevitably gave rise to rural societies that have varied significantly throughout the peninsula over time (Gallego 2007). Historians have stressed that the unequal structure of land ownership was an obstacle to agrarian modernization and therefore one of the main reasons for the poor performance of Spanish agriculture and the slow progress of industrialization (Nadal 1975; Tortella 2000). Recent studies have shown that differences in land distribution were also responsible for the big regional differences in agricultural production (Gallego 2001; Clar & Pinilla 2009), literacy levels (Beltrán Tapia & Martinez-Galarraga 2018) and standards of living (Pérez Picazo 2010). In addition to this, the concentration of land ownership in southern Spain has been linked to the existence of greater social conflict, revolutionary ideas and a desire for agrarian reform (Malefakis 1970). This latter issue would be one of the direct causes of the 1936 coup and the beginning of the Spanish Civil War (1936-39)[4].

[2] In the mid-18th century "the great mass of day labourers provided the workforce for the big estates, farms and olive groves in seasons when their labour was needed, and thus, 'although virtually naked and with only the ground to sleep on', they lived, according to Olavide, 'on the bread and gazpacho they were given'. These day labourers, when 'the dead season arrives or when it is impossible to work because of the weather, are dying of hunger and find themselves forced to beg'. They were day labourers for half the year and beggars the other half. Hence every year 'army ranks were swollen with new recruits from the paupers' who flooded across the four kingdoms of Andalusia". [Own translation] Anes (1975, p.18).

[3] The debate on land distribution in Spain gained strength after the mid-18th century when demographic expansion meant an increasing demand for land and a worsening of living conditions for day labourers. From that moment the enlightened of Spain began to argue the need for agrarian reform, which then became a constant issue in the political, economic and social life of the country. See Carrión (1975: 1932, pp.43-53) for a synthetic review of the literature on this subject.

[4] Under these circumstances, land distribution and land reform has understandably been and still is one of the most debated topics in Spanish economic history. Some recent contributions to this debate, among many others, include Robledo & González Esteban (2017), Domènech & Herreros (2017), Carmona et al. (2019), Carmona & Simpson (2020) and Domènech & Martinelli (2020).

Given the crucial significance of the concentration of land ownership in Spanish history, we are interested in exploring how these regional differences arose. Some already classic works point to two main causes: geography and institutions (Carrión 1975:1932; Malefakis 1970)[5]. While marked regional differences in topography and climate would have determined farm size, the timing of the Reconquest, i.e. the expansion of the Christian kingdoms across the Iberian Peninsula between the 9th and the 15th centuries at the expense of the Moors, had an influence on what type of institutions were set up in each region and how the land was appropriated and distributed among the Christian settlers. The aim of this paper is to quantitatively examine whether geography and/or this historical process can explain the regional differences in land access inequality in Spain.

In order to analyse the role played by these two factors, we have calculated the numbers of landowners, tenants and farm labourers for all 471 Spanish districts (*partidos judiciales*) using the information contained in the 1860 Population Census. In that year, more than half of the 4.33 million workers that made up the Spanish agricultural population were landless day labourers (2.35 million; 54.4%). Once we had collated the information, we conducted an econometric analysis that included geographical variables, the stages of the Reconquest and other potential confounding factors as controls. Our results show that the institutional setting arising from the Reconquest was key in explaining the unequal distribution of land in pre-industrial Spain, and in particular in the former kingdom of Castile. While geography did play a role, our main finding is that the effect of institutions was still present in mid-nineteenth century and that this effect is robust to the inclusion of a large number of geographic and climatic controls. This research therefore shows that the forces that shaped Spanish economic development have their roots in the very distant past.

The paper is structured as follows. While Section 2 describes the main characteristics of land distribution in Spain, the sections that follow are devoted to presenting the two main explanatory factors of the inequality in land access considered in this paper. Section 3 presents some of the basic geographical and climatic features, bearing in mind regional diversity. Section 4 briefly recounts some of the more significant events of the Reconquest during its various stages, distinguishing between the Crown of Castile and the Crown of Aragon. The empirical exercise considered in this paper and the variables used are detailed in Section 5. While Section 6 reports and discusses the empirical results, the final section contains our conclusions.

[5] See also Ruiz-Maya (1979).

2. Inequality in land access in Spain

Spain in the mid-19th century was a mainly agricultural country with 15.6 million inhabitants. Apart from in Catalonia, industry was still in the very early stages of development and the Spanish economy had barely begun to experience modern economic growth (Kuznets 1966). In 1860, the agricultural sector as a whole in Spain employed 63% of the active population and accounted for 40% of GDP (Prados de la Escosura 2003). Among the 4.3 million agricultural workers, more than half were day labourers, landless peasants (2.35 million, i.e., 54.4% of the total agricultural workforce). In addition, in 47 of the country's 50 provinces over half the population was involved in agricultural activities, with the highest figures of around 80% or more being reached in the extreme north-west in provinces such as Lugo and Pontevedra in Galicia[6]. At the other extreme was the two main urban industrial centres of Barcelona and Madrid, where the agricultural population represented 37% and 30% of the total active population respectively.

There have always been marked regional differences in agricultural specialization in Spain. Although they refer to the first third of the 20th century, and despite the difference in dates and the lack of any data nearer the time period considered, the figures in Table 1 show the main regional variations regarding agricultural specialization[7]. Livestock farming predominated in the north due to an abundance of pastures and fodder. The central area was characterized by its specialization in cereals and legumes, crops typical of areas where rain is infrequent and irregular. In Andalusia, apart from cereals and legumes, olive trees and vines were very important. In this respect the south had a more diverse and balanced distribution of crops. Mediterranean agriculture, the most dynamic and most likely to produce for export, specialized in intensive crops, mainly fruit and vegetables, grown using irrigation systems (Simpson 1995).

[6] Actually, at that time, the total number of provinces in Spain was 49 given that the Canary Islands formed a single province up to 1927 when they were split into two provinces.

[7] Although there were some relevant changes in farm use in the second half of the 20th century, the figures give a general overview of the differences between regions as regards agriculture in Spain.

Table 1. Composition of agriculture by general area (1929/33).

	Cereals	Vines/Olives	Fruit/Veg	Livestock	Total
North	16.8	2.6	26.7	53.9	100
Centre	41.0	13.2	23.6	22.2	100
Andalusia	28.4	27.5	23.6	20.5	100
Mediterranean	15.5	17.3	48.5	18.7	100
Spain	28.0	14.3	31.0	26.7	100

Source: Simpson (1995, p.85).

Agricultural specialization is in turn linked to the size of the holdings and the land ownership structure. The information most frequently used to analyse land distribution in Spain also dates back to the first half of the 20th century (Carrión 1975:1932; Malefakis 1970)[8]. The figures in Table 2 give us a broad outline of the differences in size of the agricultural smallholdings and estates and enable us to quantify the big territorial differences that have characterized land distribution in Spain. In general terms we notice that medium-sized farms are the least common in the country as a whole. And as regards regional diversity, while the small plot of land typical of the minifundio predominates in the north, the south is characterized by the much greater presence of the latifundio. In the north almost two-thirds of the holdings covered less than 10 ha (63.3%) and only 15.2% were over 100 ha, which is the threshold used to qualify large holdings[9]. Land distribution in the south, however, was very different. There the big estates (>100 ha) occupied over half the cultivated land (52.4%) and the proportion was still above 40% when only holdings covering over 250 ha were counted as big estates[10]. Finally, land distribution in central Spain, which here includes much of the Mediterranean area, is closer in type to the north than to the south with its latifundios.

[8] An alternative source is used in Ruiz-Maya (1978), where the analysis of the origins in land concentration in Spain is based on the information provided by the Agrarian Census of 1972.

[9] The various types of latifundio (pasture, grazing land, etc…) and the main characteristics of the latifundio economy in general have been analysed in the classical work by Martínez-Alier (1971, p.20).

[10] Cadiz is the province in which latifundios were of the greatest relative importance: "…of the 687,153 hectares registered as usable, 58 per 100, 398,342 hectares, were on estates over 250". In some municipalities such as Jerez, up to 73% of the land was occupied by estates of over 250 hectares. In others such as Bornos, Los Barrios and Puerto Real, the figure was close to 80%. [Own translation] Carrión (1975:1932, p.234).

Table 2. Distribution of holdings by size (%). Spain, 1930 and 1959.

	Small holdings < 10 Ha	Medium holdings 10-100 Ha	Large holdings > 100 Ha	Total	Large holdings > 250 Ha
Spain (1959)	46.5	24.9	28.6	100	16.9
North (1959)	63.3	21.5	15.2	100	8.0
Centre (1930)	53.3	22.3	24.4	100	15.6
South (1930)	27.8	19.8	52.4	100	41.2

Source: Malefakis (1970, pp.30-35). **North:** Galicia, Leon-Burgos, Cantabrian coast, Aragon-Ebro, Catalonia; **Centre:** Old Castile, New Castile, Levante, South-east; **South:** Eastern Andalusia, Extremadura, La Mancha, Western Andalusia.

As mentioned earlier, this land distribution gave rise to very different societies. In the north and some of the central area there was a peasant class that owned small and medium-sized holdings. However, in the south and south-west, the Spain of the latifundio, which covers approximately a third of the country, the fact that the land was in the hands of just a few landowners generated not only a concentration of political and economic power in this landowning elite, but also a vast number of landless peasants who worked as day labourers under harsh conditions on the latifundios.

The dataset used in this paper contributes to increasing our knowledge about regional differences in land access in Spain by providing, on the basis of an alternative indicator, information for the mid-19th century with a high degree of territorial disaggregation. We have calculated the numbers of landowners, tenants and farm labourers for all 471 Spanish districts (*partidos judiciales*) using the information contained in the 1860 Population Census. Hence the variable we use here is the percentage of day labourers as a proportion of the active agricultural population as a whole. As we will illustrate, using this variable has a number of advantages over other measurements of land concentration.

Previous research analysing land distribution show that in Spain there is a strong link between the way the land is structured and our variable, the number of day labourers[11]. Likewise, using land ownership concentration indicators based on the size of the holdings, i.e. the Gini index, also generate other problems. Firstly, one landowner might own different tracts of land and

[11] "The correlation between property and class is almost perfect in Spain. The Atlantic coast, where property concentration is low, has the highest peasant-landowner ratio and the lowest proportion of day labourers among its rural population. Old Castile, another region with small properties, follows closely in second place in both categories. Aragon and New Castile again occupy intermediate positions. In the south-west of Spain, where big estates predominate, the class structure is the reverse of that on the Atlantic coast and in Old Castile, with landless day labourers outnumbering landowning peasants by three to one. Only on the Mediterranean coast is there no close correlation" [Own translation] (Malefakis 1978, p.16).

these tracts might not be adjoining. If this were the case, the number of holdings would be greater than the number of owners and the Gini index would create a bias in the picture given by the results.[12] Secondly, Gini coefficients based on farm size do not take into account the value of the land and are therefore unable to tell us whether the small landowners have the best quality land, in which case the inequality would be lower than that reflected by the Gini coefficient, or whether it is the big landowners that have taken possession of all the best land, in which case the inequality would be greater than shown by the Gini (Vollrath 2006, pp.4-5)[13]. Lastly, using the size of the holdings to calculate the Gini coefficient means that it only covers landowners and provides no information about landless peasants, thereby giving only a partial view of agrarian inequality[14]. By computing the percentage of agricultural labourers as a proportion of the active agricultural population as a whole, our variable allows us to capture the differences in land access across all farmers, a crucial aspect of land inequality.

Using information obtained from the 1860 Population Census, Figure 1 complements and extends the data presented in Table 2, showing the great diversity in land access in Spain. While the average of the country, as previously mentioned, was around 54%, the north exhibited a significantly lower degree on inequality in land access (in the district of El Burgo de Osma, for instance, day labourers only constituted 11% of the active agricultural population). Southern districts suffered the opposite situation (in 12 districts in Andalusia and Extremadura, the proportion was over 85%). Regardless these two extremes, there is a clear general geographical pattern: landless labourers were more important in the southern

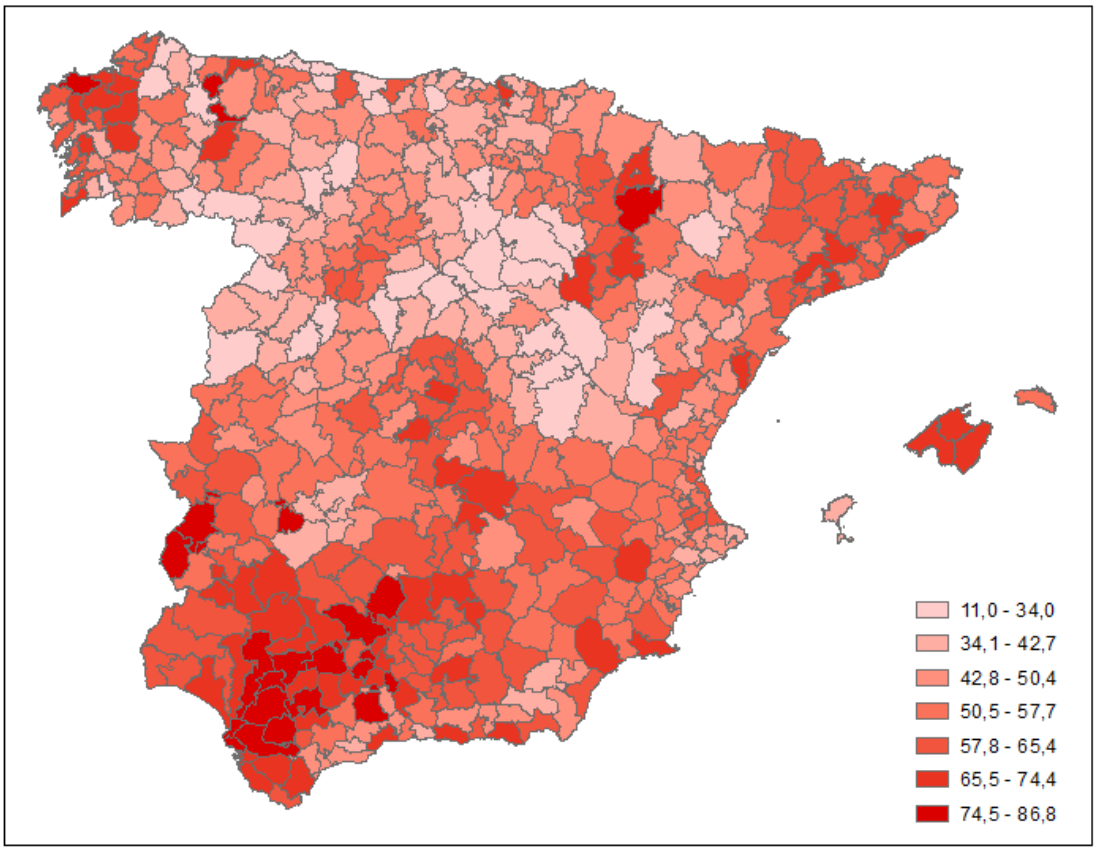
[12] "In Spain, where agricultural holdings are almost twice as numerous as the entire population, owners and holdings are not conterminous" (Malefakis 1970, p.25). Therefore in the case of Spain, between property and holdings "the connection is not so close as in the United States or Britain, where the entire property of an individual tends to be united into a single farm. In Spain a holding is not necessarily a farm in this sense; it is merely a parcel of land which is not contiguous to any other parcels owned by the same person" (Malefakis 1970, p.14). The author also warns that properties might be scattered among different municipalities, could be in the wife's name if she brought land as part of her dowry, or may be common land, i.e. municipal property.

[13] In the case of southern Spain it is argued that "within a single district we have already said that the best land can often be found in the possession of big landowners, while the worst is made up of small plots […] workers only have easy access to sandy ground, hillsides and other places which need a great deal of work before they produce anything" [Own translation] (Carrión 1975:1932, p.278).

[14] "The Gini […] only captures inequality in the distribution of existing farms, without regard for the actual number of farms relative to the rural population. The Gini thus cannot account for the presence of landlessness among the rural population" (Vollrath 2006, pp.4-5). In the same vein, "previous work (Deininger & Squire 1998) has focused on the inequality of land holdings within the group of landowners, measured by a Gini coefficient. This measure misses the important inequalities across the land-holders and the landless in a country" (Erickson & Vollrath 2004, p.6).

half of the peninsula, particularly in western Andalusia, Extremadura and La Mancha, i.e. typical latifundio areas. It was here that a greater proportion of peasants had no land access[15].

Figure 1. Day labourers, as a percentage of the active agricultural population, 1860.



Source: 1860 Population Census (excluding the Canary Islands).

The aim of this study is to use this information to explore the determinants of the unequal distribution of land access in Spain, focusing primarily on the two possible determinants highlighted in the literature: geography and history, the latter referring to the historical process deriving from the Christian Reconquest of the peninsula. The main characteristics of these two potential explanatory factors are presented in the following sections.

[15] Although in some areas of the north-west (Galicia) and the east and north-east of the peninsula (Catalonia) the number of day labourers was also relatively high.

3. Geography

As mentioned earlier, one of the potential explanations for the regional differences in land ownership is geography (Brenan 1943; Malefakis 1970, 1978; Martínez-Alier 1971; Carrión 1975:1932)[16]. It is suggested that the harshness of the climate and the poor quality of the soil increases the risk of a bad harvest. In these conditions small landowners and farming families have to cope with an environment characterized by great uncertainty and may find themselves forced to sell up in times of difficulty. The owners of big estates, however, are better equipped to face these risks. They can also manage higher fixed costs thanks to economies of scale. The existence of latifundios could therefore be a result of harsh geographical conditions[17]. However, a number of Spanish historians have argued that the division of the territory by geography and climate does not exactly match the division by land ownership (Malefakis 1970, p.53; Martínez-Alier 1971, pp.22-27; Simpson 1995, p.77).

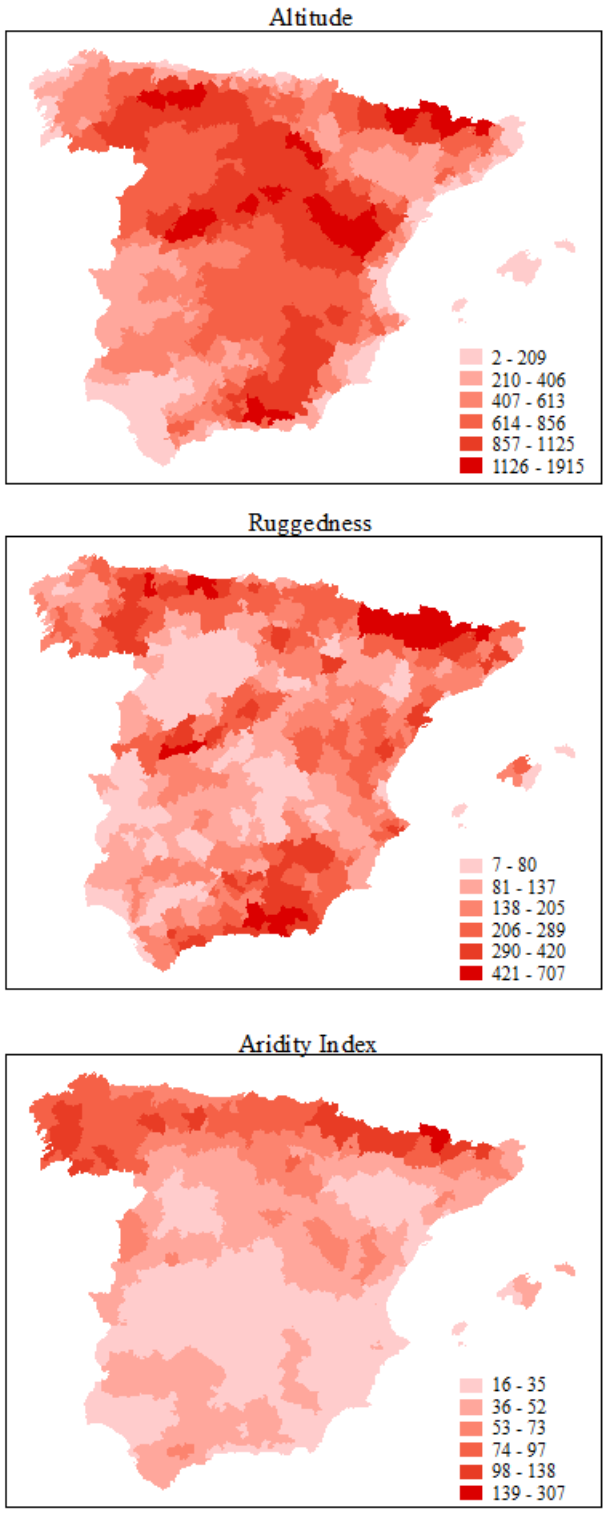
Located on the Iberian Peninsula in the extreme south-west of Europe close to Africa, Spain is a large country in European perspective. Its geographical position results in particular physical and environmental conditions as far as orography and climate are concerned: generally speaking, it is a high, dry country. However, its size means that geographical and climatic conditions vary widely across the geography of the peninsula: within the general model just described there are also extensive valleys and plains and areas of high rainfall. This variety can be seen, for example, by the fact that "the northern coastline has a rainfall index as high as that in Scandinavia or the British Isles, but the south-eastern coast is almost as arid as the Sahara Desert" [Own translation] (Malefakis 1978, p.11).

Spain is the fifth most mountainous country in Europe[18], with an average height above sea level of 660 m. Figure 2 (upper map) shows the differences in altitude of the different areas of the peninsula measured by the median altitude within each district. The first thing we notice is the elevation of the central area of the peninsula occupied by the Meseta, which is in turn crossed by the Iberian and Central mountain systems. Along with these, the areas with the greatest elevation on the peninsula can be found in the Pyrenees, which act as a natural barrier with continental Europe, in the Cantabrian range in the north-west and in the Baetic systems in the south-east. The areas with the lowest elevation are located along the extensive coastline, in the Ebro and Guadalquivir river valleys in the north and the south

[16] A more recent overview of the impact of environmental conditions on Spanish agriculture can be found in Simpson (1995, pp.67-76) and Clar et al. (2015, pp.1-3).
[17] "The small man cannot live without difficulty in a dry area, because he is not able to stand the seasonal variation of the crops" (Brenan 1943, p.91).
[18] After Andorra, Switzerland, Liechtenstein and Austria.

respectively, and also in the westernmost parts of the Guadiana and Tagus valleys extending through the border with Portugal.

Figure 2. Altitude, Ruggedness, and Aridity index.



Source: see Table A.1 in the Appendix.

A visual examination of the map shows that the traditional area for latifundios (western Andalusia, Extremadura and part of La Mancha) does not particularly stand out due to the elevation of the land. In fact it is the northernmost area typically home to the minifundio, except in coastal areas, that has a high elevation. At first glance this would point to an inverse relationship between altitude and land concentration, or to be more precise, between altitude and the existence of a higher proportion of agricultural day labourers.

A similar though more nuanced image is obtained when we look at slope gradients using the ruggedness variable (Figure 2, middle map). This feature influences the ground's capacity to retain water depending on the run-off, how easy it is to work the land and how productive it is. According to this indicator the flattest areas are in the northern Meseta (despite the high altitude), La Mancha, Extremadura and western Andalusia, while the most rugged, steepest ground is generally found in the more mountainous areas mentioned earlier. And neither is the Mediterranean coast particularly favoured when it comes to ruggedness. Hence the traditional latifundio area is not characterized by adverse topographical conditions but rather the contrary: low elevation and little ruggedness. As Carrión (1975:1932, p.276) pointed out: "Looking at the whole, then, we see that the lowest areas are those in western and southern Spain in the extensive valleys of the Guadalquivir and the Guadiana, and it is precisely in these areas that latifundios are more likely to be found. Property in provinces as rugged as Soria and Cuenca or as high as Palencia and Valladolid is less concentrated on smaller tracts of land, while Seville and Cadiz, as we have seen, have been completely taken over" [Own translation].

As far as climate is concerned, a line is usually drawn between dry and rainy Spain. The latter corresponds to the north of the peninsula, spreading from Galicia to the Pyrenees, covering a fifth of the territory and being the area with the greatest predominance of minifundios. Latifundios, on the other hand, are found in dry Spain. However, dry Spain also includes much of the central area of the peninsula and the eastern Mediterranean, places where small and medium-sized holdings have predominated. As Malefakis (1970, p.37) explains, "the Cantabric Coast classification encompasses the small-holding region that coincides with the rainy portions of northern Spain. The Mediterranean Coast classification corresponds to the region where small and medium holdings predominate despite vast areas of extraordinary aridity. The Meseta-Ebro classification includes all the other arid regions of Spain in which small and medium holdings are dominant. Southern Spain […] encompasses the large-holding arid regions".

One synthetic indicator that makes it possible to give approximate values for a location's climatic conditions is the aridity index, which in this case is obtained by dividing average annual rainfall by average annual temperature[19]. Figure 2 (down) shows the differences in the degree of aridity and clearly reflects the division between humid and arid Spain mentioned earlier. It also allows us to see that the most arid area is the Mediterranean coast, mainly in the south-east (specifically Almeria), where the average annual temperature is close to 19ºC and annual rainfall is under 220 mm. Other very arid areas can be found in Aragon (around the Monegros desert), the central-southern Meseta and westernmost Andalusia. At the other extreme we find the Cantabrian coast and the Pyrenees. In this case the north-western districts of the province of Pontevedra have an average annual temperature of around 11ºC and annual rainfall of up to 1450 mm, similar figures to those recorded in the wet Europe. Between both extremes there are other areas with high aridity such as the Meseta and the south of the peninsula[20]. In short, as Simpson (1995, p.78) observes: "The contrast between the level of aridity and the size of agricultural holdings illustrates the incompatibility of a simple division in line with these variables"[21].

The importance of the geographical factor in the unequal distribution of land in Spain has long been the subject of debate. While various indicators like those presented in this section enable us to explore the apparent relationship between geographical conditions and land ownership, to the best of our knowledge this is the first time a paper has carried out a more rigorous empirical analysis that makes it possible to establish the relationship between geography and inequality in land access and also examine the causes of the unequal land distribution in Spain. Before we do this, though, we need to present the other determinant that historians suggest lies at the root of the inequality in land access in Spain: history and institutions as represented by the long process of the Reconquest. The main characteristics of that historical process are presented in the next section.

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[19] This indicator enables approximate figures to be given for relevant aspects such as ground humidity, evaporation and transpiration. However, it does not take into account important elements like the seasonal or torrential nature of the rainfall, the existence of summer droughts or extreme winter or summer temperatures, or the number of frosty or sunny days a year.

[20] It should be taken into account that the high level of aridity could result from high temperatures and moderate rainfall like in southern Spain (between 500-700 mm) or from a combination of sparse rainfall and low temperatures like in the Meseta (around 300 mm).

[21] Carrión (1975:1932, p.280) says much the same thing, "…the existence of latifundios cannot be attributed to dryness because not only the total amount of water but also its distribution over the year is much more beneficial for vegetation in Andalusia than in other regions" [Own translation]. Malefakis (1970, p.47) points out that "the wealthiest agricultural region in Spain thus is not the Cantabric Coast, a region with abundant rainfall, but the Mediterranean Coast, the region least favored by climate, where irrigation has achieved what nature had denied". Martínez-Alier (1971, p.26) concludes: "The pattern of landholding is not correlated at all closely with geographical conditions" and "…the ecology is largely irrelevant to the stability of latifundismo".

4. History and institutions: the Christian Reconquest (711-1492 AD)

At the beginning of the eighth century the Umayyad dynasty was expanding rapidly across North Africa. In 711 AD this expansion took a new turn when an expedition of Berber tribesmen crossed the Strait of Gibraltar and landed in Algeciras. These troops defeated the army led by the Visigothic king, Roderic, and in a few short years the Muslims had taken control of much of the Iberian Peninsula. Groups of Christians took refuge in northern areas protected by mountains, and it was these populations that made up the original nucleus of resistance. From then onwards over the course of eight centuries, the Christians would advance southwards from their stronghold in the north. This historical process, generally known – not without controversy – as the Reconquista, is usually defined as the change of political power in the peninsula from Muslims to Christians between 718 and 1492, the latter being the year when Granada was taken (Lomax 1978)[22]. We are therefore talking about an extremely lengthy process which, moreover, did not take place gradually but in occasional leaps and bounds, giving rise to historical stages with clearly differentiated characteristics.

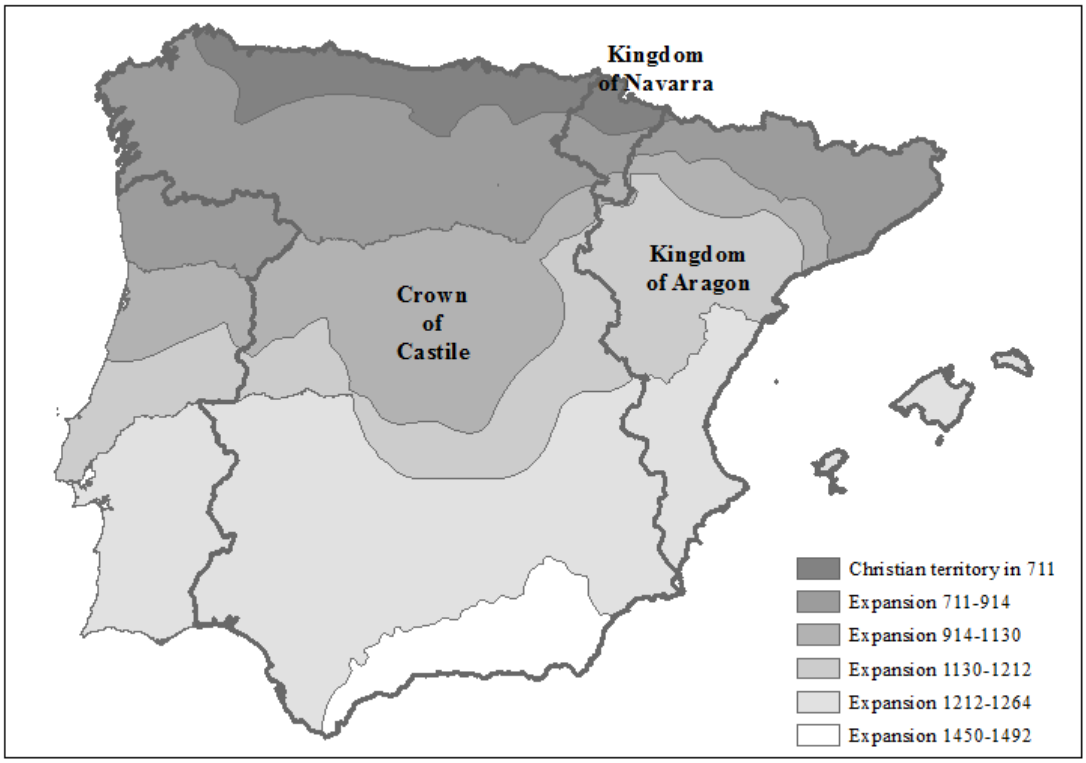
There were two main aspects to the Reconquista worth considering. First, it had a military component – the conquest of other territories – and as we have just said, this came about intermittently and spasmodically[23]. And second, once territories had been won they had to be repopulated and made secure before expansion could continue southwards (Moxó 1979; García de Cortázar et al. 1985). Thus the characteristics of the Christian advance varied over the years, especially as regards its timing and the way repopulation was carried out. The institutions that were created and the way society was organized at each stage of the Reconquista, including the distribution of land ownership, depended on the different factors and circumstances prevailing in each historical period. These included the distribution of power among the ruling classes (monarchy, nobility and the Church), the geographical size of the areas conquered, the methods of conquest, the density of the population in the areas taken and its assimilability, and the procedures used by the victors to colonize these territories. Elements such as these explain why the conquest and repopulation of the northern part of the peninsula took place under very different conditions to those in the south (Malefakis 1970, pp.50-61).

[22] Lomax (1978), MacKay (1977), Moxó (1979) and García de Cortázar et al. (1985) stand out as classic works on the Reconquista and the subsequent repopulation. More recent accounts can be found in O'Callaghan (2004), Valdeón (2006) and Ladero (2014). It is these works that have been used as the basis of the summary contained in the following pages. A more detailed account of the Reconquista can be found in Beltrán Tapia et al. (2020).

[23] The geographical limit marking the advances made at each stage of the Reconquista was determined by rivers, which in the Iberian Peninsula mainly flow crosswise (E-W/W-E).

Besides, and just as important, is the fact that the Reconquista did not take place uniformly across the territory. In fact, the conquest and repopulation of the territory by two of the great kingdoms of the peninsula (Figure 4)[24], Castile and Aragon, differed in their chronology and in many of their main characteristics, so we will give separate accounts of both expansion processes.

Figure 3. The historical stages of the Reconquest, 711-1492.



Source: Mackay (1977), Lomax (1978), García de Cortázar et al. (1985) and Ladero (2014).

4.1. The Crown of Castile

After the Muslim invasion, small groups of Christians initially took refuge in the mountainous areas of the north, in Asturias. Confined to the Cantabrian Mountains, the first uprisings against Muslim control came about in the eighth century. It was at this time that King Alfonso I (693-757) crossed the mountains and advanced as far as the River Duero, a rather sparsely populated area (Sánchez-Albornoz 1966).

[24] Portugal is not covered in this brief history and the Kingdom of Navarre was relatively small and made only limited advances in the Reconquista compared to the Crowns of Aragon and Castile. Ultimately it was annexed by the Crown of Castile in the sixteenth century.

The territory that was conquered at this time was composed of a number of small Christian kingdoms that began to spread further southwards to occupy the almost unpopulated plains of the Duero basin. The repopulation of the Duero valley was led by the monarchs and attracted mainly Christian colonists who came down from the mountains to settle on the Meseta. To encourage colonization of the rural areas north of the Duero, new settlers were granted favourable legal conditions. Incentive was given through the use of the appropriation system (*sistema de presura*), which in essence guaranteed settlers individual ownership of the barren unowned lands that they now occupied[25]. This expansion, which due to the nature of the times sought to offer incentives to encourage people to become permanently established on the land, gave rise to an egalitarian society characterized by a predominance of free peasant farmers who owned small areas of land and, prototypically, a horse and arms to use in the war. The egalitarian, independent character of these societies is reflected in the fact that they were governed by relatively democratic assemblies (Vicens Vives 1964, p.97). The expansion also brought about the creation of a network of countless small settlements of the same type, the *aldeas*, which with the passing of time led to the "formation of a network of municipalities that were smaller and more numerous than in any other area of the peninsula" [Own translation] (García de Cortázar et al. 1985, p.80).

The next stage of Christian expansion needed to push the frontier southwards, from the Duero to the Tagus, and would continue until the end of the eleventh century, culminating in the taking of Toledo in 1085. Repopulation of the territories conquered by the Christians south of the Duero was not done in the same way as the repopulation north of the river, although it had similar consequences in terms of the resulting property structure[26]. The role played by the crown was now more important because it was in more direct control of the task of repopulating and establishing councils and municipalities – relatively democratic institutions appointed by the king – which developed an organized system for dividing and sharing out the land. Each council covered a large area of land (known as an *alfoz*) that was divided into six parts (*sesmos*), which in turn were divided into twentieths (*veintenas*). These were the blocks of land to be allocated in a process that could take decades to complete because there were not enough Christian settlers (Vicens Vives 1957, p.273).

[25] Roman-Visigothic tradition established that land was property with no owner (bona vacantia) and that it was therefore at the disposal of the king, who was responsible for approving colonization (Vicens Vives 1964, p.121).

[26] "There were two prevailing criteria: one, to respect the Muslim and Jewish populations that lived in the towns and cities that were taken. This was Alfonso VI's repopulation policy in Toledo. And two, to give municipalities or councils the job of repopulation" [Own translation] (Vicens Vives 1964, p.148).

The process did attract people from all over: people who were willing to fight to protect their new properties and who ended up gathering together and forming the basis of the council militias that were set up as a defence against Almoravid hostilities. The *caballeros villanos* (peasant knights, owners of a horse and arms) played an essential role in the administration of the territory, even more so than in the north[27]. They also tended to dedicate themselves to livestock farming, especially sheep, which became the basis of their economic activity. As a result of all this and unlike in the villages further north, the southern part of the Meseta had a denser network of urban population whose basic hubs were the towns and villages that were home to council headquarters.

Nevertheless, renewed muslim pressure on the reconquered territories forced to seek help from the religious orders, who from this time onwards would play a prominent role in defending the southern border to the south of the Tagus. The creation of the military orders of Santiago (1170), Calatrava (1176) and Alcántara (1177), which worked closely together and with the Knights Templar and Knights Hospitaller, marked the appearance of a new actor in the military conflict that would be an essential element influencing outcomes between the Tagus and Sierra Morena[28]. To these forces should be added the significant participation and involvement of the nobility. The fierceness of the confrontation meant that hardly any advances were recorded in the twelfth century, although the Christians did manage to extend one part of the frontier (to the east) as far as the River Guadiana. The Almohads would eventually be defeated in 1212 at the Battle of Las Navas de Tolosa, within sight of Sierra Morena, leaving the way clear for the Christians to conquer Andalusia.

The space to be repopulated was now much larger and it had hardly any towns, especially in Extremadura and La Mancha, and therefore the role played by the councils and militias in the north could not be repeated here (García de Cortázar et al. 1985). Instead, the military orders and secular nobility, who had been in charge of leading the fight between the Tagus and the Sierra Morena, were essentially in control of repopulating this zone. Unable to deal with the organization of the immense territories that had been conquered, Ferdinand III

[27] "The peasant knights were possibly the most distinctive social result of the Christian occupation of the area between the Duero and the Tagus during the eleventh to fourteenth centuries" [Own translation] (García de Cortázar et al. 1985, p.114). Men who owned a horse and arms became peasant knights, and the loss of these possessions also meant the loss of the title. Meanwhile the commoners (*pecheros*), who held no title, had to fight in the council militias as foot soldiers and pay tributes and other taxes, although they could become peasant knights by acquiring a horse and weapon.

[28] The appearance of the religious military orders would be connected with the interest which, in the eleventh century and following the Gregorian Reforms, Pope Alexander II (1061-1073) had shown in the Reconquista and the idea of expanding the western frontier of Christianity against Islam. Indulgences and papal bulls attracted crusaders from other parts of Europe (Lomax 1978, pp.60-61) and, importantly, it was from this time that the Reconquista took on the aspect of holy war (García Fitz 2009).

(1199-1252) and Alfonso X (1221-1284) assigned the job of repopulation to the military orders and members of the nobility, thus rewarding them for their actions in the field of battle by granting them numerous extensive estates (*encomiendas*)[29]. Taken together, these factors would explain the appearance – in contrast to the north – of a system of large estates on the other side of the Tagus, in parts of Extremadura and La Mancha.

Regarding the conquest of the Guadalquivir valley, it was completed over the course of the thirteenth century. The vast territory that had been conquered therefore needed to be repopulated, but for a number of reasons this turned into a long drawn out process. First of all, there was a great shortage of people to repopulate rural areas because most were attracted to the towns and cities. Secondly, the Christians arriving from the north to repopulate the territory were accustomed to a different natural environment with a different agrarian tradition to the intensive agriculture that predominated in Andalusia[30]. This made potential settlers from the north reluctant to start working in a different ecosystem with which they were unfamiliar. Due to the difficulties involved in maintaining the technical skill that this type of agriculture required, farming activities were gradually redirected towards the booming livestock trade, cereals and olive production.

Finally, for the next two centuries much of this territory was a frontier zone with the Kingdom of Granada. It was extremely unsafe because of clashes between Christians and Muslims and therefore had to be protected. This was a task that again fell to the military orders and the nobility. The military orders and the Church would be the main beneficiaries of manorial estates in the border region during the reigns of Ferdinand III and Alfonso X, while the secular nobility would benefit most once Sancho IV (1258-1295) came to the throne (García de Cortázar et al. 1985, pp.184-185). Altogether, these factors contributed significantly to the emergence of a lengthy process of land accumulation that turned the Church and the nobility into owners of huge estates characteristic of the south-west of the peninsula[31].

It would not be until two centuries later that the Reconquista would culminate in the capture of the mountainous Nazarid Kingdom of Granada in 1492. This time the occupation and repopulation of the territory would follow a new pattern unlike that of previous periods. It

[29] Nevertheless, the main towns remained under royal control through the establishment of municipal councils.
[30] The crops of the Hispano-Arabic population of Al-Andalus included cotton, sugar cane, rice and safflower (García de Cortázar et al. 1985, p.177).
[31] "At the end of the fifteenth century, especially as far as the big villages of the Andalusian countryside are concerned, the disappearance of small- and medium-sized properties was obvious, to the point where most of the cereal fields and the income from them belonged to big absentee landowners, both secular and religious" [Own translation] (García de Cortázar et al. 1985, p.190).

was characterized by greater continuity with the previous Muslim order and by the key role played by the royal authority. The conquered land was crown property, and therefore it fell to the crown to carry out the *repartimiento* (division and distribution) and bestow its *mercedes reales* (royal favours). The crown also took charge of appointing clergy, setting up councils in the cities (which were though less independent than in the past) and deciding on what tax exemptions would apply to the new settlers (whose main destination was the cities).

4.2. The Crown of Aragon

The Reconquista in the north-east and east of the peninsula eventually led to the formation of the Crown of Aragon. It was ultimately based on a confederation of four kingdoms with their own political and administrative characteristics: Aragon, Catalonia[32], Mallorca and Valencia. From a comparative point of view, the conquest and repopulation under the Crown of Aragon was markedly different from that in Castile. To begin with – and importantly – the Catalan-Aragonese Reconquista did not happen as quickly. The slower pace of the advance in the east of the peninsula was to a large degree related to the fierce resistance mounted by the Muslims around the River Ebro. This meant that the territory conquered by the Catalans and Aragonese was smaller in area than the territory that fell to Castilian control, and this in turn meant that fewer people were needed for the purposes of repopulation. Besides, a higher proportion of the Muslim population continued to live in the areas conquered by the Crown of Aragon. The slower advance also enabled the monarchy to maintain more control over the process, and therefore there was less involvement on the part of the nobility and the military orders (Sobrequés 1972). Finally, from the point of view of the economic organization of the colonized territory, there was less reliance on livestock in this area and a greater presence of irrigated crops, especially in the coastal areas and the Ebro valley.

Reconquest and repopulation of Old Catalonia took place from the ninth to the eleventh centuries. The occupation of the land mainly resulted from the use of the *aprisio* system, i.e. "the occupation of empty land for possessory purposes, which would be accompanied by a concession by monarch or count, this land to be cultivated or cleared as appropriate" [Own translation] (Moxó 1979, pp.109-119). This system is therefore comparable to the *presura* system used in the western area of Asturias-Leon that predominated to the north of the

[32] Although formally constituted as a *condado*, in practice Catalonia functioned in basically the same way as a kingdom.

Duero. The land appropriations or *aprisios* involved various social groups and included, in hierarchical order, those planned directly by the counts, those granted to the monasteries, those carried out by nobles and notables, and – especially numerous – those carried out directly by peasants, even ahead of any action taken by the counts (Vicens Vives 1964, p.134; d'Abadal 1958; Salrach 1987; Soldevila 1962; Vilar 1987; Feliu 2010)[33].

In the twelfth century the Catalans would push the frontier southwards and westwards, conquering the lands of New Catalonia. The fall of Tortosa (1148) in the south and Lleida (1149) in the west shifted the border to the Ebro and the River Segre respectively, thus adding around 10,000 km^2 to Catalan territory, making a definitive total of 32,000 km^2. The repopulation of the area at the mouth of the Ebro was rapid, with the existing Muslim population being joined by new Christian settlers. Only in the more mountainous areas further upriver away from the coast was the repopulation process slower (Moxó 1979, p.318). The expansion continued westwards along the Segre basin, and a year later the army that had taken Tortosa took Lleida (1149). The repopulation of the New Catalonia mainly involved people from the north of Catalonia, just as the Old Catalonia had been repopulated mainly with settlers from the Pyrenees. Besides, "the restructuring of the population centres and the organization of the municipalities was the responsibility of the king along with the cities, the cathedral chapters of Tarragona, Lleida and Tortosa, the military orders and the Cistercian monasteries, all held together by a system of social relationships that encouraged an openness and freedom that had been lost or unknown to the peasants of the Old Catalonia since the establishment of the feudal-manorial regime during the twelfth century" [Own translation] (Ladero 2014, p.352).

As for the roots of the Kingdom of Aragon, these were to be found to the west of the Catalan counties, in the central Pyrenees. Reconquest started at the end of the eleventh century, when Sancho Ramírez (1043-1094) advanced over the lowlands south of the Pyrenees. His first son, Peter I (1068-1104), took Huesca (1096)[34], and his second son, Alfonso I the Battler (1073-1134) – who was himself a member of the Order of Templars – occupied Zaragoza (1118). With the capitulation of Zaragoza, the Aragonese had pushed the frontier as far as the Ebro, concluding a sizeable expansion that now had to be completed by repopulating the conquered territory (Lacarra 1951).

[33] As Vicens Vives (1964, p.131) noted, "although it is true there were no latifundia because the country's mountainous and fragmented nature did not allow them, there were indeed big landowners who possessed smallholdings scattered everywhere. Surprisingly, this group included the biggest monasteries" [Own translation].

[34] By now it was almost ten years since the Castilians had taken Toledo (1085).

As a result of its conquests between 1080 and 1130, the Kingdom of Aragon grew by over 30,000 km^2. In just a few years it had doubled the size of its territory and, like in the case of the Kingdom of Castile and its taking of Toledo (1085), the mid-Ebro valley was an area that had previously been populated and organized. Indeed, not only did it include urban centres that were larger than those in the north of the kingdom, but the conquered land was richer and more fertile, worked using farming and irrigation techniques unlike those used in the north. Notwithstanding, the king needed to reward the knights who had helped in the fight to conquer the Ebro. The general situation that resulted in these territories is neatly summarized by Lacarra (1951, p.74): "the king paid the great lords of the peninsula … with land and feudal estates in the regions of the Ebro. […] But neither the lords nor the Church always sent settlers to work this land […] The fields were tilled thanks to the old Muslim sharecroppers, whose rights the king committed himself to respecting and the great lords had the most interest in preserving" [Own translation].

South of the Ebro, however, it was a different matter. Lower Aragon, which was conquered at the end of the twelfth century, was a sparsely populated area with barely any urban centres. These extensive territories were frontier lands at great risk of war, so their repopulation was slow and difficult. This was the context in which, from the end of the twelfth century to the mid-thirteenth century, there were two main institutions in charge of securing and organizing these frontier territories: the military orders and the councils. The presence of military orders was especially noticeable in this area, ranging from Templars and Hospitallers to the Orders of Calatrava and Santiago and the Order of Alfambra[35]. The towns, using the municipal charters they were granted and with their *alfoces* and their peasant knights, also played an important role in defending and colonizing these territories, with the councils of Calatayud (1120), Daroca (1142) and Teruel (1177) being prominent in this regard.

After the death without issue of Alfonso I (1134), a dynastic union resulted from the marriage in 1137 between Queen Petronilla of Aragon and Ramon Berenguer IV, Count of Barcelona. The Crown of Aragon was thus constituted. In the years that followed, the joint territorial expansion of the Catalans and Aragonese was redirected towards the south and overseas, led by Peter II's son, James I the Conqueror (1213-1276), who incorporated the Kingdoms of Mallorca and Valencia into the Crown of Aragon (Lomax 1978).

[35] A detailed description of the distribution of the territory between the different military orders in Ladero (2014, pp.337-338).

The taking of the Kingdom of Mallorca was mainly a Catalan undertaking, led by the king. It was considered a crusade and relied on the participation of the nobility – with whom the distribution of land and the spoils of conquest were agreed – and the Catalan commercial bourgeoisie, interested in strengthening trade in the Mediterranean (Sabaté 1998, p.45). After the occupation, the entire island was divided into portions, which were then split into smaller shares (*caballerías*) and distributed between the king and the four great lords who had participated in the conquest: the counts of Roussillon, Empuries and Béarn, and the Bishop of Barcelona. The Hospitallers and Templars also received land. Settlers became the new inhabitants of the islands and were mainly of Catalan origin, although a minority of Jewish inhabitants continued to live there.

The next step in the Catalan-Aragonese advance was southwards, towards Valencia. Led by James I the Conqueror, the strategy was to focus on the taking of the urban centres, and this was achieved rapidly, in little over a decade. The result was the incorporation of an area totalling approximately 25,000 km^2 that would become the Kingdom of Valencia. The first stage of the conquest pushed the frontier from south of the Ebro to Borriana (1233)[36]. The second would include the taking of the capital, Valencia (1238), along with all the territory down to the River Xúquer, while the third would take the frontier as far as the belt of land between Xixona and Biar (1245). The conquest of Valencia was a joint Catalan-Aragonese undertaking, the effective control of which was in the hands of the king, but which also relied on the participation of nobles, military orders and urban militias. There was a notable presence of the nobility and military orders in the north of the kingdom, but in the central area around Valencia the crown's participation was much greater. Most of the territory of Valencia occupied by Christians had a number of typical features, including an abundant presence of Muslims, and an agricultural model characterized by irrigation systems and crops that were not generally grown elsewhere, found here mainly in areas of cultivation bordering the coastline. The occupation, for the most part under the control of the king, was achieved through capitulations that enabled the Muslim presence to continue.

All in all, the previous discussion suggests that the institutions that were created and the way society was organised at each stage of the Reconquest crucially influenced the distribution of land ownership with long-lasting consequences. This process however differed in the kingdoms of Castile and Aragon, thus providing a sort of natural experiment to test the

[36] In fact, the conquest had already begun in the north of the kingdom (the taking of Morella in 1231), in the interior districts of Els Ports and El Maestrat, and was led by the Aragonese nobleman Blasco de Alagón, who went on to expel the Muslim population. From then on the king took charge.

influence of institutions. Next section therefore tests the hypotheses explained before in order to disentangle the role played by geography and institutions in shaping the degree of inequality in access to the land existing in mid-19th century Spain.

5. Empirical analysis

In order to analyse the determinants of inequality in land access in Spain, we estimate the following model:

$$land\_ineq_i = a + \beta\, geography_i + \gamma\, reconquest_i + \delta\, X_i + \varepsilon_i \qquad [1]$$

where $land\_ineq_i$ measures the importance of agricultural day labourers as a percentage of the total agricultural population in each of the 464 districts or administrative areas that existed in Spain in 1860[37]. The term $geography_i$ includes the time-invariant geographical and climatic variables considered in this work and described in Section 3: altitude, ruggedness and aridity. Finally $reconquest_i$ is a dummy variable created for each of the five stages of the Reconquest described in the previous section. Thus the variable takes on a value of 1 depending on the stage when the geographical centre of the district was conquered. Along with the error term ε_i we include a set of control variables (X_i) that could be exerting an influence on our study variables. Table 3 shows a statistical summary of the variables used in the empirical analysis, while the definition and creation of the variables can be found in Table A.1 the Appendix.

Regarding the control variables, we first consider soil quality. The quality of land is indeed relevant in our story, as the type of soil affects the crops that are cultivated and agricultural productivity. Different crops might also be differently suited for being grown in big landholdings than others that can be profitably cultivated at a small scale[38]. This element has been present in the literature and plays a key role, for instance, in the explanation put forward by Engerman and Sokoloff (2000) and also in some country studies, like those for the United States (Vollrath 2006) and Denmark (Boberg-Fazlic et al. 2020)[39]. To measure soil quality we

[37] Although the total number of districts (*partidos judiciales*) was 471, we have excluded from our analysis the 7 districts corresponding to the Canary Islands because of their very particular characteristics, leaving the 464 that make up our sample.

[38] Actually, soil quality could also be considered as a geography variable, although it can somehow be modified by the action of humans, for instance, with the adoption of irrigation or through changes in the depth of soil. Thus in the analysis of our results we also pay attention, in addition to our baseline story, to the effect of soil quality on land inequality.

[39] The Spanish historiography was also well aware of this. Carrión (1975:1932, p.278), for example, wrote that: "…there is no close relationship between the quality of the ground and its division into plots […] the plains and valleys are not divided up as one might imagine, and we have numerous examples showing this anomaly in

rely on the data provided by the European Soil Data Centre of the European Commission and, in particular, to the variable "aglim1", which codes the most important limitations to agricultural use. This variable contains 18 different categories but only six of them apply to Spain. Therefore, we include five dummy variables, leaving one as the reference category in the regressions. Likewise, and related with the quality of land, we also include distance to large rivers, which are very fertile areas, as a control variable.

Also relevant are aspects relating to the differences in development levels and economic opportunities that existed outside the agricultural sector (Gallego 2007). These are captured via the percentage of the active population working in manufacturing (industrialization), the urbanization rate and the population density in each district. We also consider the total area of the district in km^2 and the number of settlements per 100 km^2 in order to capture differences in size and measure population dispersion, thereby capturing the effect that the greater or lesser proximity of the farms to the place of residence[40]. We also take into account distances to the provincial capital, to big cities and to the sea, all aspects that would be connected to access to urban areas and markets, both domestic and abroad[41]. Likewise, a higher proportion of young people exerts more demographic pressure on land use, so in order to capture possible territorial differences in this area we include the percentage of population under 16 as a proportion of the total active population.

Another important aspect when studying land distribution is the inheritance system. Two basic systems have predominated in Spain: sole heir and equal shares (Ferrer Alòs 2014). In the north, where the Carolingian counties established by the Franks were located, the indivisible inheritance system predominated. In this case the property rights would be handed down to just one son or daughter[42]. However, in Castile and the lands that were incorporated

all the latifundio provinces" [Own translation]. Similarly, Malefakis (1970, pp.48-49) concluded that "…Western Andalusia, the most fertile area in Southern Spain, has the most strongly developed latifundio economy".

[40] "Not only is there little population in the latifundio provinces, but the little that there is has to live at a distance from the land because it has no access to it and is concentrated in a small number of towns, giving rise to very big municipal areas […] The consequence of depopulation in big municipal areas is that towns are far away from each other. While in Levante they tend to be 5 or 6 km apart, in latifundio regions it is possible to travel 20 or 30 and sometimes 40 or 50 km without coming across a settlement" [Own translation] Carrión (1975:1932, pp.299-300). In southern Spain, "the agricultural population is concentrated in large towns. Around each town there is usually an area of small properties, the owners of which travel to and from them on mule-back every day. Beyond, medium-sized farms and *cortijos* begin. To some observers, it seemed apparent that, given the pattern of settlement, it was impossible for small farms to exist in the large expanses between towns as their owners would have to spend most of the day travelling" (Martínez-Alier 1971, p.26).

[41] Big cities are those that at the time had over 100,000 inhabitants, i.e. Madrid, Barcelona, Valencia, Seville.

[42] In Catalonia the estate was passed down to the sons by order of birth (*heren*), and if there were no sons, to the first daughter (*pubilla*). In the north of Aragon and Navarre, in the Basque Country, Asturias and Galicia, the progenitors were free to choose an heir (whether male or female). In areas close to the Pyrenees there was a strict system of primogeniture (Ferrer Alòs 2014).

into the Crown of Castile, the legal regulations stemmed from Visigoth law. This legal system considered all sons and daughters to be equal and therefore did not allow freedom of bequest, so the estate had to be shared equally between the heirs. A fifth of the total estate could be disposed of freely (*quinto de libre disposición*), but the rest was divided equally among the sons and daughters[43].

Interestingly, the inheritance system is related to family structure. Indivisible inheritance systems are associated with a greater presence of the stem family, in which the heir lives with the progenitors, giving rise to various generations living under the same roof (parental homestead). This is what happened in the north and east of the peninsula, whereas in Castile, which had an equal shares inheritance system, the nuclear family predominated (Tur-Prats 2015)[44]. For this reason we include family type as a control variable in our analysis, where the weight of one or another family structure in the different districts is captured via the number of adult women per family unit according to the 1860 Population Census (Mikelarena 1992; Tur-Prats 2015).

The differences between the various legal systems were also present in the Crowns and historic kingdoms of Spain. The territories that made up the Crown of Aragon had their own legal and institutional system, the *fueros*, which remained in place until the early 18th century. The Spanish War of Succession (1701-1714) and the arrival of the House of Bourbon to the throne saw the abolition of the *fueros* in the territories of the Crown of Aragon and their substitution with the laws of Castile via the Nueva Planta decrees. The *fueros* of the former Kingdom of Navarre also survived for a time, indeed longer than those of Aragon. To capture the possible effect of differences in the legal frameworks of the time, we include dummy variables for districts belonging to the Kingdoms of Aragon and Navarre respectively.

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[43] When the estate was shared equally among the heirs, it followed a strict per capita distribution. This is what happened in Castile, Extremadura, Murcia and Andalusia. However, with the part of the estate remaining once the free fifth had been bequeathed, one or another of the heirs could be favoured via the 'third for betterment' (*mejora del tercio*). Hence when the fifth and the third were joined together and passed down to a son, the system was very similar to the sole heir system. This is what happened in inland Cantabria, the western areas of Asturias and in Lugo. In Guipuzcoa, which was governed by Castilian law, country areas adopted a system similar to the sole heir system that was used in the rest of the Basque Country (Ferrer Alòs 2014).

[44] "Regarding landholding size, the Christian resettlement of conquered land in the north of the Iberian Peninsula, where the conquest began, created small and medium holdings owned by free peasants. These holdings needed to remain undivided to be viable and thus ensure family continuity: hence, again, the use of indivisible inheritance, which led to stem families. However, as the Christian kingdoms expanded south over the centuries, the increasing participation of the clergy and nobility in the war effort came to be rewarded with vast tracts of land, particularly in the areas conquered by Castile and Leon. The landless peasants and day laborers hired to work in these vast estates were typically less concerned with inheritance rules and usually complied with the equal inheritance rules mandated by Castilian law, and so tended to have nuclear families". (Tur-Prats 2015, p.4).

Table 3. Statistical summary.

	Obs.	Mean	St. Dev.	Min.	Max.
Farm labourers (%)	464	53.14	13.29	11.02	86.80
Altitude	464	571.0	343.4	2	1,915
Ruggedness	464	179.1	114.9	6.530	706.9
Aridity index	464	50.02	28.29	15.82	307.1
Soil quality. Cat.=1	464	0.414	0.493	0	1
Soil quality. Cat.=2	464	0.226	0.419	0	1
Soil quality. Cat.=3	464	0.002	0.046	0	1
Soil quality. Cat.=4	464	0.312	0.464	0	1
Soil quality. Cat.=6	464	0.037	0.188	0	1
Soil quality. Cat.=7	464	0.009	0.092	0	1
Large rivers	464	0.23	0.42	0	1
Industrialization (%)	464	10.37	6.461	0.965	64.37
Urbanization (%)	464	16.43	27.67	0	100
Population density	464	63.42	283.3	3.730	5,502
District area (km^2)	464	1,079	686.0	13	4,225
Settlement pattern	464	30.71	46.34	1.127	293.9
Distance to provincial capital	464	44.05	23.88	1.080	129.6
Distance to big cities	464	197.8	122.2	4.360	537.0
Distance to coast	464	103.2	89.84	0.330	356.2
Population aged <16 (%)	464	86.22	18.45	29.77	164.0
Family type	464	1.025	0.142	0.750	1.573
Common lands	464	0.219	0.216	0	0.75

Source: See text.

Finally, collectively-owned (municipal) common lands existed alongside privately-owned land, and their use by local residents served to help farmers by giving them the opportunity of growing crops on them, obtaining other products such as timber and firewood, or using them to graze animals. One of the most prominent reforms carried out by successive governments in the period analysed, during the transition from the Ancien Régime to a liberal system in Spain, was the privatization process involving the common lands. This process made it more difficult for much of the agricultural population to use these collective resources, thus further limiting access to land. Historians have pointed out that the outcome

of the process, given that it was set in motion and led by the same land-owning elites, was a strengthening of pre-existing property structures (Carrión 1975:1932; Malefakis 1970; Fontana 1973; Ruiz-Maya 1979; Gallego 2007)[45]. From a spatial perspective, the distribution of the common lands was characterized by big differences in the weight carried by communal ownership between regions, with these common lands being more abundant in the north than in the south of the country (GEHR 1994; Iriarte 2002; Beltrán Tapia 2015, 2016).

6. Results

Table 4 shows the results obtained in the estimates for equation 1 using OLS and correcting for heteroscedasticity (robust standard errors)[46]. Column (1) shows the estimates that only include our variables of interest: geography and the stages of the Reconquest. Next we add a first set of control variables more closely related with geography, i.e. distances from main urban centres and the sea, soil quality and distance to large rivers (column 2) and all the other controls that capture other relevant socio-economic characteristics of the district areas (column 3)[47].

Taken together the results confirm that both the geographical factors and the timing of the Reconquest have a significant effect when it comes to explaining the differences in land access, even when controlled by other factors. As far as the impact of geography is concerned, the results in column (3) show that the three variables considered had a statistically significant impact on the percentage of day labourers. However, we see a negative relationship between altitude and land access, i.e. harsher geographical conditions in the shape of greater elevation does not mean a higher percentage of day labourers, but rather the reverse. This result was somewhat expected given that, as we saw in Section 3, latifundios are mainly found in lower-lying areas around the Guadalquivir and Guadiana valleys, whereas the considerable altitudes of the central Meseta are characterized by a greater presence of

[45] The idea of transferring barren lands can be traced back to the Spanish Enlightenment: "I have here a specific proposal from Jovellanos: 'make uncultivated land private property and the state will obtain an invaluable asset' […] despite these optimistic forecasts, indeed, the transfer of these lands from common or collective use to private property meant for the peasants the loss of one of the mainstays of their sustenance, to the benefit of those who acquired these lands, and who were the same old landowners and new ones from the cities. Hence, the liberal-type agrarian reform, as far as the disassociation of assets, abolition of feudal estates and disentailment processes (ecclesiastical and general) are concerned, helped to strengthen, in Spain, the system of great estates" (Anes 1975, pp.28-29).

[46] Bearing in mind the possibility that errors may be correlated between neighbouring districts and that there may therefore be spatial autocorrelation, the model has also been estimated with standard errors clustered at province level. The results, available on request, remain unchanged.

[47] The complete results of the estimations presented in Table 4, including the coefficients for all the variables considered in the exercise, can be consulted in Table A.2 in the Appendix.

small and medium-sized holdings. Greater aridity and ruggedness, on the other hand, were related to a more unequal land distribution. In this case the harsh climatic and orographic conditions (ruggedness) were indeed associated with a higher presence of day labourers[48].

The variables that capture the five stages of the Reconquest confirm the relevance of this historical process on the land ownership structure. The coefficients are significant and positive, and the magnitude of the coefficients follows an upward trend in each of the stages considered. This result confirms that the southward advance of the Reconquest, with differences in the legal apparatus set up to deal with the resettlement and appropriation of the land by Christian colonizers in each stage, had long-lasting effects on land ownership and holding size.

Table 4. The determinants of land access inequality.

	Dependent variable: Farm labourers (%)		
	(1)	(2)	(3)
Altitude	-0.01***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)
Ruggedness	0.00	0.02***	0.02***
	(0.01)	(0.01)	(0.01)
Aridity index	0.09***	0.15***	0.10**
	(0.03)	(0.03)	(0.04)
Stage 1	10.12***	8.75**	11.07***
	(2.32)	(3.49)	(2.50)
Stage 2	11.93***	7.04	10.65***
	(2.89)	(4.79)	(3.90)
Stage 3	13.98***	10.59**	16.27***
	(2.85)	(4.19)	(3.34)
Stage 4	20.46***	16.46***	20.56***
	(2.59)	(3.86)	(2.85)
Stage 5	17.94***	19.67***	21.52***
	(3.20)	(5.79)	(4.90)
Distance and soil controls	NO	YES	YES
Other socio-economic controls	NO	NO	YES
Observations	464	464	464
R-squared	0.294	0.376	0.464

Robust standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1; for the sake of simplicity, the intercept is not reported.

[48] In general, we also find that the heterogeneity of soil types has a significant impact on the share of farm labourers. See Table A.2 in the Appendix.

In order to explore the determinants of inequality in land ownership in greater detail, the preliminary analysis is extended in two directions. First of all we carry out the same exercise as before, but in this case we separate the sample into districts belonging to the Crown of Castile and districts belonging to the Crown of Aragon[49]. By doing this we seek to find out whether the geographical differences and the different ways of sharing out the reconquered territory during the Reconquest had different effects on land distribution in the two areas. Secondly, given that land ownership is more important in rural areas, we limit the sample to the rural districts within both Crowns, considering as rural those districts that had no town over 10,000 inhabitants. The results of these two exercises are shown in Table 5[50].

As far as the impact of geography is concerned, columns 1 and 2 show that geographical conditions retain a certain explanatory power as regards to inequality in land access in both Castile and Aragon. Firstly, although the altitude is statistically significant in both, the negative sign means that we can conclude, as before, that the greater number of day labourers is not the result of adverse geographical conditions in terms of higher altitude. Secondly, the impact of geography varies between the Crowns of Castile and Aragon. While in the former the ruggedness of the terrain is positively related to the number of day labourers, in the latter the level of aridity would have determined the peasants' unequal land access. However, when the sample is restricted to rural districts, the effect of geography in Castile remains (although it is slightly smaller in terms of statistical significance), and it is reduced in Aragon, where only aridity continues to be significant (columns 3 and 4). On the basis of these results, given that the effect of the geographical variables diminishes in importance as an explanatory element, it can be concluded that the physical environment did not determine by itself the land ownership structure in Spain. Although the harshness of the climate and the rugged topography did have an influence, by themselves they do not appear to explain the existence of large landholdings[51].

However, when we look at the effect of the timing of the Reconquest, this variable does remain highly significant for the Crown of Castile even when only rural districts are considered (columns 1 and 3). Therefore, in this part of the country the institutions that sprang from the resettlement process following the Reconquest generated a long-lasting

[49] The Kingdom of Navarre is included in Castile.

[50] The complete results of the estimations presented in Table 5, including the coefficients for all the variables considered in the exercise, can be consulted in Table A.3 in the Appendix.

[51] As regards the soil quality variables, the results for Castile are similar to the previous specification without restricting the sample. Yet, when only rural districts are considered, the effect of soil quality decreases. In the case of Aragon, the effect of soil quality on the share of agricultural labourers is further decreased as only one category remains significant. See Tables A.2 and A.3 for the complete results including soil quality variables.

effect on the distribution of land ownership. In contrast, the results for the Crown of Aragon are not statistically significant and the effect of the Reconquest on land distribution disappears (columns 2 and 4)[52]. This result therefore confirms that the differences between the two kingdoms as regards the Reconquest process, as described in Section 4, also had different consequences as far as their impact on land inequality is concerned[53]. And it was in Castile that the way the Reconquest developed, with its different stages, had a long-lasting effect on land distribution, creating big differences between the north and the south of the Crown territories.

Table 5. The determinants of land access inequality. OLS. Restricted samples.

	Dependent variable: Farm labourers (%)			
	Castile	Aragon	Rural Castile	Rural Aragon
	(1)	(2)	(3)	(4)
Altitude	-0.01***	-0.01**	-0.01**	-0.01
	(0.00)	(0.01)	(0.00)	(0.01)
Ruggedness	0.02***	-0.02	0.02**	-0.02
	(0.01)	(0.02)	(0.01)	(0.02)
Aridity index	-0.02	0.12**	0.01	0.11*
	(0.05)	(0.05)	(0.05)	(0.05)
Stage 1	10.24***		11.14***	
	(2.44)		(3.35)	
Stage 2	7.66**	-1.19	9.96**	0.53
	(3.64)	(5.16)	(4.11)	(8.12)
Stage 3	11.98***	-8.72	14.43***	-9.37
	(3.11)	(4.83)	(4.27)	(5.65)
Stage 4	21.06***	-9.55*	23.16***	-10.68
	(2.49)	(4.40)	(4.53)	(6.05)
Stage 5	17.35***		16.76**	
	(4.87)		(7.51)	
Controls	YES	YES	YES	YES
Observations	353	111	247	77
R-squared	0.573	0.311	0.505	0.325

Robust standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1; for the sake of simplicity, the intercept is not reported. Rural districts refer to those with no town of over 10,000 inhabitants.

[52] The different timing of the Reconquest explains that there is no stage 1 in the Kingdom of Aragon (see Map 3). Likewise, the last stage, the conquest of the Kingdom of Granada only concerned Castile.

[53] Actually, for Aragon we find a significant effect (of negative sign) in the stage 4, which implies that the way in which the Reconquest took place in the Kingdom of Valencia resulted in a more egalitarian distribution of land (column 2). However, this effect vanishes when only rural districts are considered (column 4).

As an illustration of the long-term effect of institutions, note that in the districts that were resettled during the fourth stage of the Reconquest in Castile, an average 60.7% of the agricultural population was landless. The coefficient in column 1 (Table 5) implies that, if these districts had been alternatively resettled during the second stage, land access inequality would be, everything else being equal, around 13.4 percentage points lower (that is, 47.3% of the population would be landless), a definitely sizable effect.

Taken together, these results enable us to conclude that in the territories belonging to the Crown of Aragon, neither the natural conditions of the physical environment (except aridity) nor the Reconquest, appear to have had an influence on the unequal distribution of land ownership. Other possible causes will need to be explored in future research. In the case of Castile, however, while geography gradually loses importance as an explanatory element, the effect of the Reconquest is systematically maintained in our results. This is in line with Spanish historiography, which indicates that it is in the legacy of history and the institutions that emerged from the Reconquest that the origins of the great inequality in land access that has traditionally existed in Spain should be sought (Carrión 1975:1932; Malefakis 1970).

7. Conclusions

Spain is a country that throughout history has been characterized by a high degree of land inequality and marked regional differences between the north and south as regards land access. Small and medium-sized holdings have predominated in northern and central areas, while big estates have been characteristic of the south. This highly concentrated land ownership and the existence of latifundios in the south have had significant economic, political and social consequences in the contemporary history of Spain, including the origins of the Civil War.

In this paper we have quantitatively explored the determinants of the unequal access to land, focusing on the two factors that are usually indicated in the literature: geography and history, the latter referring to the Christian Reconquest of the Iberian Peninsula between the 9th and 15th centuries. Our results, based on information on the number of landless peasants at district level in 1860, show that although geography did play a role, the institutional setting arising from the Reconquest was key in explaining the unequal distribution of land in pre-industrial Spain.

It is often believed that the institutions set up in Latin America by colonizers from the Iberian Peninsula were the root cause of the marked inequality that has characterized Latin American countries, having a persistent effect over time on levels of inequality and being responsible for their disappointing economic performance over the long term. Indeed the colonization of Latin America and the appropriation and distribution of land carried out by the settlers was an extension of the Christian Reconquest that took place in the preceding centuries in the Iberian Peninsula. Following this line of argument, this paper provides empirical evidence showing that the historical and institutional legacy of the Reconquest was relevant in explaining the unequal distribution of land in Spain, particularly in the former territories of the Crown of Castile. Therefore, as a number of classic works have already indicated, it can be concluded that the roots of the great land inequality characteristic of Spain should be sought in the history and the timing of the Reconquest and the institutions that emerged from it. This research thus shows that the forces that shaped Spanish economic development have their roots in the very distant past.

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Appendix

Table A.1. Description of the variables used.

Farm labourers (%)	Proportion of farm labourers as a percentage of the active agricultural population.
Altitude	Median altitude in each district using SRTM 90-meter resolution digital elevation data (http://srtm.csi.cgiar.org).
Ruggedness	Standard deviation of altitude.
Aridity index	Average rainfall divided by average temperature. Climate information refers to average temperature and average rainfall during the period 1950-2000. The WorldClim 1 kilometre digital data can be found in Hijmans et al. (2005) (http://www.worldclim.org/).
Soil quality	This set of dummy variables capture the most important limitation to agricultural use as defined by the European Soil Database. The original variable (aglim1) contains 18 categories but only 6 apply to Spain: 1 No limitation to agricultural use 2 Gravelly (over 35% gravel diameter < 7.5) 3 Stony (presence of stones diameter >7.5, impracticable mechanisation) 4 Lithic (coherent and hard rock within 50 cm) 6 Petrocalcic (cemented of indurated calcic horizon within 100 cm) 7 Saline (electric conductivity > 4mS.cm-1 within 100 cm). Each district has been classified according to the most frequent category within its boundaries using ArcGIS. More details here: https://esdac.jrc.ec.europa.eu/content/european-soil-database-v20-vector-and-attribute-data.
Large rivers	Dummy variable indicating whether a big river (Ebro, Duero, Tajo, Guadiana or Guadalquivir) is present in each district.
Industrialization (%)	Proportion of active population working in manufacturing.
Urbanization (%)	Proportion of population living in towns with at least 10,000 inhabitants.
Population density	Total population divided by district area.
District area (km^2)	District area (km^2).
Settlement pattern	Settlements per 100 km^2. Settlements are *ciudades*, *villas*, *lugares*, *aldeas* and *caseríos* taken from the 1860 *Nomenclator*.
Distance to provincial capital	Distance from the district geographical centre to the provincial capital (km).
Distance to big cities	Distance from the district centroid to the nearest city with at least 100,000 inhabitants (km), i.e. Madrid, Barcelona, Seville or Valencia.
Distance to coast	Distance is computed from the district geographical centre (centroid) to the nearest coastline (km).
Population aged < 16 (%)	Proportion of population under 16 as a percentage of the active population.
Family type	Number of female adults (aged 26-80) per household.
Commons (%)	Proportion of common lands as a percentage of the total district area. Taken from Ministerio de Fomento (1859).

Source: 1860 Population Census unless otherwise stated. The geographical data were computed using ArcGIS.

Table A.2. The determinants of land access inequality. OLS. Full results.

	Dep. Variable: Farm labourers (%)		
	(1)	(2)	(3)
Altitude	-0.01***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)
Ruggedness	0.00	0.02***	0.02***
	(0.01)	(0.01)	(0.01)
Aridity index	0.09**	0.15***	0.10**
	(0.04)	(0.03)	(0.04)
Stage 1	10.12***	8.75**	11.07***
	(2.74)	(3.49)	(2.50)
Stage 2	11.93***	7.04	10.65***
	(4.10)	(4.79)	(3.90)
Stage 3	13.98***	10.59**	16.27***
	(3.68)	(4.19)	(3.34)
Stage 4	20.46***	16.46***	20.56***
	(3.70)	(3.86)	(2.85)
Stage 5	17.94***	19.67***	21.52***
	(5.14)	(5.79)	(4.90)
Soil quality (agli1) = 2		-3.62**	-3.94***
		(1.52)	(1.34)
Soil quality (agli1) = 3		8.68**	6.47**
		(3.63)	(2.96)
Soil quality (agli1) = 4		-5.65***	-6.30***
		(1.65)	(1.33)
Soil quality (agli1) = 6		1.12	-1.73
		(3.70)	(3.62)
Soil quality (agli1) = 7		-11.72***	-10.37***
		(2.49)	(3.69)
Large river		-0.14	0.86
		(1.37)	(1.25)
Industrialisation (%)			0.17*
			(0.10)
Urbanisation (%)			0.07***
			(0.02)
Population density			-0.01***
			(0.00)
District area (km2)			-0.00
			(0.00)
Settlement pattern			-0.02
			(0.02)
Distance to coast		2.84**	1.91
		(1.06)	(1.18)
Distance to big cities		-2.30	-2.99*
		(1.71)	(1.56)

Distance to provincial capital		0.35	1.73**
		(0.71)	(0.64)
Population aged<16 (%)			-0.10
			(0.06)
Family type			23.50**
			(9.26)
Commons (%)			-1.35
			(3.37)
Navarra			3.12
			(2.14)
Aragon Crown			-3.34
			(2.77)
Constant	42.42***	45.41***	27.43*
	(3.69)	(10.24)	(15.33)
Observations	464	464	464
R-squared	0.294	0.376	0.464

Robust standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1.

Table A.3. The determinants of land access inequality. OLS. Restricted samples. Full results.

	Dep. Variable: Farm labourers (%)			
	Castile	Aragon	Rural Castile	Rural Aragon
	(1)	(2)	(3)	(4)
Altitude	-0.01***	-0.01**	-0.01**	-0.01
	(0.00)	(0.01)	(0.00)	(0.01)
Ruggedness	0.02***	-0.02	0.02**	-0.02
	(0.01)	(0.02)	(0.01)	(0.02)
Aridity index	-0.02	0.12**	0.01	0.11*
	(0.05)	(0.05)	(0.05)	(0.05)
Stage 1	10.24***		11.14***	
	(2.44)		(3.35)	
Stage 2	7.66**	-1.19	9.96**	-0.53
	(3.64)	(5.16)	(4.11)	(8.12)
Stage 3	11.98***	-8.72	14.43***	-9.37
	(3.11)	(4.83)	(4.27)	(5.65)
Stage 4	21.06***	-9.55*	23.16***	-10.68
	(2.49)	(4.40)	(4.53)	(6.05)
Stage 5	17.35***		16.76**	
	(4.87)		(7.51)	
Soil quality (agli1) = 2	-3.48**	1.26	-2.79	0.13
	(1.60)	(3.54)	(2.01)	(6.96)
Soil quality (agli1) = 3	8.54**		6.90	
	(3.29)		(4.55)	
Soil quality (agli1) = 4	-6.25***	1.08	-7.69***	-0.92
	(1.62)	(2.74)	(2.00)	(4.79)
Soil quality (agli1) = 6	4.38	1.34	5.54	-1.50
	(5.53)	(3.18)	(8.84)	(6.90)
Soil quality (agli1) = 7		-14.97***		-18.83***
		(4.40)		(4.73)
Large river	0.70	3.14	-0.22	6.53
	(1.26)	(3.88)	(1.40)	(4.82)
Industrialisation (%)	0.24*	0.06	0.42**	-0.19
	(0.13)	(0.10)	(0.16)	(0.46)
Urbanisation (%)	0.06**	0.00		
	(0.02)	(0.05)		
Urbanisation, over 5,000 inh. (%)			0.01	0.07
			(0.05)	(0.04)
Population density	-0.01***	-0.00	0.05	0.01
	(0.00)	(0.01)	(0.07)	(0.07)
District area (km2)	-0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Settlement pattern	0.01	-0.03	-0.02	0.04
	(0.02)	(0.05)	(0.05)	(0.07)
Distance to coast	0.94	0.21	1.27	1.11

	(0.99)	(2.00)	(1.15)	(3.92)
Distance to big cities	-3.70**	-0.76	-4.32**	-5.01
	(1.40)	(2.06)	(1.98)	(3.28)
Distance to provincial capital	1.49**	2.24	0.98	5.14
	(0.63)	(2.24)	(1.22)	(4.03)
Population aged<16 (%)	-0.13*	-0.10	-0.06	-0.13
	(0.07)	(0.06)	(0.07)	(0.10)
Family type	26.59***	-20.63	40.41***	-20.02
	(9.22)	(14.57)	(10.11)	(17.21)
Commons (%)	-1.47	2.61	-0.44	1.62
	(4.32)	(4.77)	(4.99)	(4.85)
Navarra	7.20***		5.44	
	(2.51)		(3.28)	
Constant	40.15***	85.49***	17.05	93.52**
	(14.44)	(25.15)	(15.65)	(31.42)
Observations	353	111	247	77
R-squared	0.573	0.311	0.505	0.325

Robust standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1.