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Ownership Structure and Literacy: Evidence Across Spanish Districts in Late 19th Century

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Abstract: This paper studies the association between ownership structure and literacy across Spanish districts in the late 19th century. We find a positive correlation between the ownership rate of the type of livestock mostly used in agriculture (i.e. cattle) and the literacy rate, which is robust to controlling for a large set of factors including spatial correlation. We observe a similar association also for the second type of livestock mostly used in agriculture (i.e. mules). This result suggests that the structure of livestock ownership, which is used as a proxy for land ownership, played a role in shaping literacy rates. We use a province-level analysis to assess the importance of demand and supply channels in determining this correlation.

JEL classification: O15; O43; N33;
Keywords: ownership, education, Spain

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1 Introduction

One of the first steps in implementing a national system of primary education in Spain was the introduction of the *Ley Moyano* of 1857. This established compulsory schooling attendance for children aged between 6 and 9 years, that could be voluntarily extended to the age of 12. However during the second half of the 19th century school attendance was relatively low on average in Spain, especially compared to other European countries.[1]

This paper studies the role of the ownership structure in shaping literacy rates across Spanish districts in the late 19th century. The main aim of the paper is to provide a quantitative assessment of the association between the ownership rate of the type of livestock most used in agriculture and educational levels. Demand side factors might have been more relevant than supply side factors in explaining variations in literacy rates across Spain in the late 19th century. Nuñez (2005b) suggests that peasant owners had a higher demand for schooling than landless day-labourers because of higher expected returns related to, for example, reduced transaction costs. Hence, being a landowner - independently of the size of the property - would increase the incentives to acquire skills such as literacy in order to be able to understand and deal with (land ownership) contracts and related matters. Our measure of ownership rate aims at capturing this element of heterogeneity: that is, the presence of a relatively large number of land owners compared to landless individuals. Following the argument of Nuñez (2005b), in areas where landownership was more common, the incentives to acquire education, at least in the form of literacy, should have been higher. To test whether the demand for education was actually higher in areas where (land) ownership was more diffused, we look at the association between literacy rates of adult men and the ownership rate.[2] As an additional test we also check whether a similar relationship emerges when using a measure for the supply of schooling services.[3]

A strand of the recent literature has focused on analysing one supply

[1] According to Morrisson and Murtin (2009), average years of schooling in the adult population in Spain in 1900 were 4.51. These are lower compared to other western European countries: 6.63 in France, 6.36 in Germany and 5.83 in the United Kingdom.

[2] In our analysis we use specific types of livestock owners as a proxy for land ownership.

[3] Where the demand for education was higher, local politicians should have implemented policies aimed at matching the supply of schooling to its demand. We exploit the fact that throughout the 19th century the system of financing for public primary school was decentralised (Nuñez 2005a). Since the burden of funding schools fell on local authorities, local politicians could have had a relevant role in the decision to allocate resources to education. According to Pidal and Rosés (2011) historical evidence suggests that landowners used their local power to influence policy decisions in Spain. Hence, where ownership was more diffuse and peasants counted for a larger share of the population, politicians would have higher incentives to support education in order to respond to the needs of local citizens. To test this hypothesis we use as a measure of local support to education, the number of teachers per child.

side channel. Specifically, this refers to the negative effect on education expansion due to the presence of large land owners. That is, as human capital is not complementary to land in production, large land owners do not perceive any advantage by promoting schooling (Galor et al. 2009), and thus try to constrain the supply of education. Recent empirical studies tend to confirm the relevance of this channel (Cinnirella and Hornung 2013; Hippe and Baten 2012).

The main contribution of this paper is to provide evidence of a complementary demand side mechanism, through which the ownership rate, rather than the share of large land owners, played a role in shaping literacy rates. Using men's literacy as a measure of educational attainment, we provide evidence of a robust positive correlation between literacy and local ownership rates. In this district level analysis, we cannot explicitly differentiate between demand and supply channels: hence the correlation we find between ownership and literacy rates might reflect an effect running through both channels. Using a province-level analysis, we run a horse-race which suggests that the demand-side channel might be more relevant.

The paper is structured as follows. Section 2 reviews the related literature. Section 3 describes the data and the empirical strategy. Section 4 displays the results of the district-level analysis while Section 5 exploits province-level data. Finally, Section 6 concludes.

2 Related Literature

Identifying the role of institutions is crucial to shedding light on differences in development across space. A vast literature has analysed this issue adopting different strategies (e.g. Acemoglu et al. 2001; Easterly and Levine 2003; Michalopoulos and Papaioannou 2013, 2014).

The work of Engerman and Sokoloff forms part of this literature (e.g. Engerman and Sokoloff 2000). Their main argument is that geography has a long-lasting impact on development through its effect on institutions. Focusing on the different development paths of South-Central and North America, they suggest that different geographical endowments, such as the type of crops most suitable for cultivation, affected the land ownership structure that endogenously arose in different geographical areas. Specifically, certain endowments would favour large scale exploitation (in the presence of economies of scale), thus leading to the creation of large plantations and landed properties. This would lead to the formation of institutions protecting these large landowning elite, and consequently against growth-enhancing policies such as those promoting education.

Several empirical investigations of the channel linking geography, ownership structure, institutions and development have been carried out. Among these, Easterly and Levine (2003) find evidence that endowments (measured in terms of tropics, germs, and crops) affect development through in-

stitutions. Easterly (2007) provide further cross-country evidence in favour of the Engerman-Sokoloff argument by showing first that agricultural endowments determines inequality and that the latter determines development. Other geographical and climatic characteristics might have had a similar impact. Acemoglu et al. (2001) argue that geographical and climatic conditions were crucial in determining historical institutions developed by European colonizers. Where settler mortality was higher, colonizers developed extracting institutions while where they found favourable conditions they settled in large numbers and developed growth-enhancing institutions.

However, one of the main issues faced by cross-country empirical investigations of the role of historical factors in fostering economic development is the difficulty in accounting for other cross-country heterogeneity that might be responsible for different development paths. A way to partially solve this issue is to focus on more homogeneous geographical areas: one possibility is to exploit within-country differences.

Recent studies have focused on the role of the ownership structure, suggesting that historical inequality in land ownership was among the main determinants of the level of support to education expansion. According to Galor et al. (2009) inequality in the distribution of landownership delays the implementation of human-capital promoting institutions. This would happen because large landowners would not gain from the accumulation of human capital since the latter is not complementary to land in production. The authors test this hypothesis using state-level data for the United States and find that education expenditures across states over the period 1900-1940 were negatively affected by land inequality. Focusing on Prussia and using several cross-sections during the 19th century, Cinnirella and Hornung (2013) analyse specifically the effect of landownership concentration on school enrolment. Finally, using a large data set on regional numeracy in 19th century Europe, Hippe and Baten (2012) find a negative correlation between land inequality and numeracy, especially in less industrialised countries.

3 Data and Empirical Strategy

3.1 Data

To measure ownership rates we use indices computed combining data from the livestock census (*Censo de Ganaderia*) for the year 1865 and the population census of 1860. Literacy rates and most control variables are taken from the population census of 1887. The data we use in our main empirical analysis is measured at the district-level.[4] Because of changes in administrative borders in this period of time, our sample (see Appendix) consists

[4] Censuses are available at www.ine.es.

only of those districts that were not affected by such changes, that is those formed by the same municipalities in 1860 and 1887. We take into account municipalities that just changed their name and mergers between municipalities within the same district.[5]

The *Censo de Ganaderia* of 1865 provides information on the number of owners of different types of livestock. Information about the size of livestock ownership is not available at the district-level, whereas it is available at the province level. In Section 5 we exploit the province-level data to show two main things. First, that livestock (ownership) inequality is a good proxy for land (ownership) inequality, thus suggesting that livestock ownership can be used as a proxy for land ownership.[6] Second, that across Spanish provinces the (positive) correlation between literacy and ownership rates is stronger and more robust than the (negative) correlation between literacy rates and ownership inequality. The livestock census also provides the allocation of each type of livestock according to the task it was assigned. Overall there are five possible destinations: consumption, agricultural work, movement of machinery, transportation and reproduction (including production of dairy products, etc.).

Among all types of livestock the ones that were assigned to agricultural tasks are the following: cattle (cows, oxen), mules, horses and donkeys. By analysing the distribution across Spain, two main features characterised the allocation of these types of livestock according to the above tasks (Table 1). First, the livestock that, within its type, is used mostly in agriculture is the mule, followed by donkeys, cattle and horses. Second, by looking only at the number of animals used in agriculture, the most used is cattle, followed by mules, donkeys and horses. We use various indices as measures of ownership rates. One index is the ratio between the average number of livestock owners (of cattle, mules, donkeys and horses) in 1865 and the number of adult men in 1860 (labelled *Ownership rate*). The other indices are constructed in a similar way but one for each type of livestock, so to get four different measures of ownership rates. Our preferred measure is the ownership rate of cattle, since this is the type of livestock that is mostly used in agriculture: hence it should be a good proxy for the share of land owners. Where there are few cattle owners relatively to adult men, landless individuals should count for a relatively large fraction of the working population. On the other hand where cattle ownership is more diffuse, we should observe a relatively large number of land owners.[7] In our analysis we also

[5] To account for this we use information from Ministerio de Administraciones Públicas (2008). We drop approximately 100 districts, while our sample consists of 374 units. Testing for any statistical difference in average men's literacy - measured in 1887 - between the selected and unselected districts, we cannot reject the null hypothesis of no statistical difference between the two samples.

[6] The measures of ownership inequality we use are the shares of medium-large livestock owners and the Gini index.

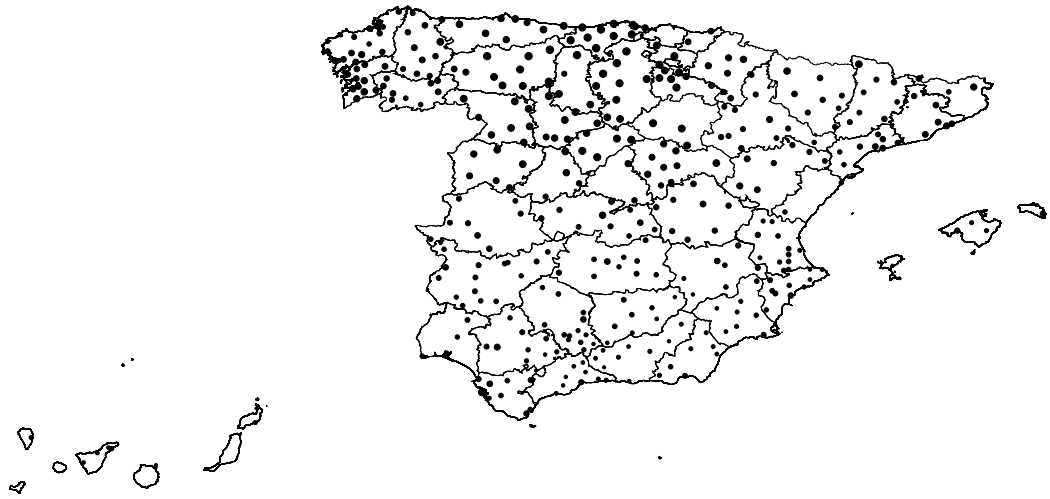
[7] Unfortunately, to our knowledge, no data on land ownership is available for Spain in

Table 1 - Livestock Census of 1865

Distribution of each type across activities	Consumption	Agriculture	Machines	Transport	Reproduction
Cattle	0.07	0.56	0	0.03	0.34
Mules	0	0.62	0.01	0.26	0.1
Donkeys	0	0.48	0	0.37	0.14
Horses	0	0.35	0.01	0.31	0.33
Distribution of each type in agriculture	Cattle	Mules	Donkeys	Horses	
Agriculture	0.43	0.27	0.23	0.07	
Ownership size	Cattle	Mules	Donkeys	Horses	
Per owner, average	4.8	1.9	1.4	1.8	

Note: data collected from the livestock census of 1865.

Figure 1 - Men's Literacy in 1887



Note: Larger Dots Stand for Higher Literacy Levels

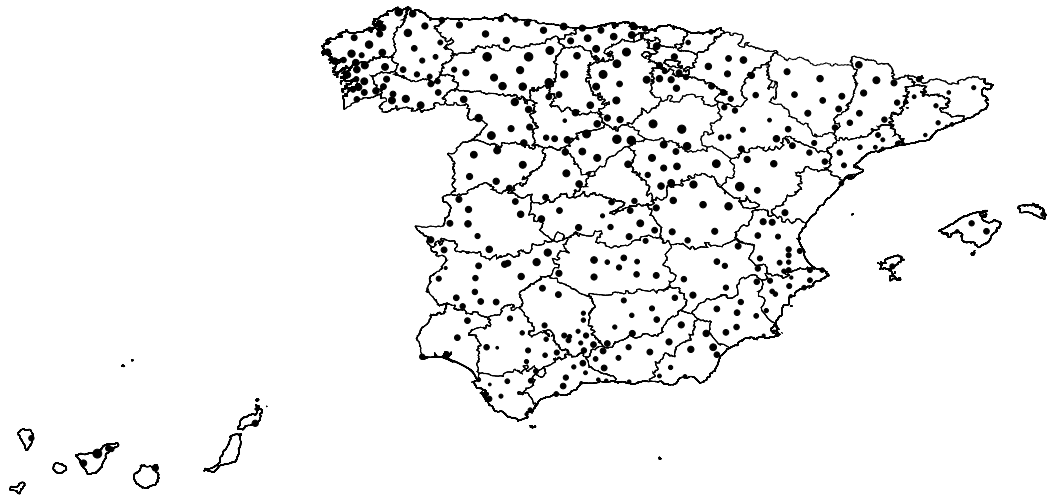
include ownership rates of other types of livestock to allow for the possibility that these other types act as substitutes for cattle in agricultural work. To assess the association between ownership rates and education, we use - as a measure of educational attainment - literacy rates for men aged 21-40 in 1887.[8] Figures 1 and 2 show the levels of men's literacy and ownership rates across Spain for the districts in our sample.

We control for several factors that might be important in explaining dif-

the late 19th century. Data on land ownership is available for 27 (out of 49) provinces in 1924. We use these data to check whether livestock ownership is a good proxy for land ownership.

[8] We choose to use men's literacy because it should depend to a lower extent - compared to women's education - on cultural factors, the latter being particularly difficult to account for in a cross-section.

Figure 2 - Ownership in Late 19th Century



Note: Larger Dots Stand for Higher Ownership Rates

ferent literacy rates across districts, all measured in 1887. The dependence on agriculture is captured by the share of men aged 21-40 working in the primary sector. The development of the industrial sector is measured by the share of adult men aged 21-40 that work in industry, where the latter includes manufacturing and mining.[9] As a proxy for the urban environment we use the fraction of individuals living in towns with more than 20000 inhabitants and in the capital city of each province. In addition we use a dummy variable that takes value one for districts where the capital of each province is located. This would control for the role of administrative and public jobs opportunities on stimulating the demand for human capital (at least in terms of literacy and numeracy) and consequently school attendance. We use a measure of temporary men's migration to capture the role of work-related seasonal migration: following Becker et al. (2010) this is defined as the difference between married males and married females, divided by married females.

We also control for the latitude and longitude of (the main city of) each district. Latitude and longitude are two exogenous measures that are correlated with geographical and climatic conditions, which affect agricultural productivity. Since agriculture was the main economic activity in the historical period under analysis (74% of adult men were employed in agriculture in our sample), their inclusion helps to capture not only differences in agricultural productivity but also in income. Province dummies are used to

[9] The disaggregation available regarding occupations does not allow to distinguish between manufacturing and mining. Transportation and trade sectors are not included in industry. Due to the definition of industry some districts (precisely 16) are characterised by 0 shares. Very low shares of industrial employment should identify extremely rural environments: of course this depends to some extent on the definition of the industry sector, but it is in line with the low industrial development that characterised Spain in 1887 (the average share in industry in our sample is 0.02).

control for fixed province-level characteristics. Finally, to account for spatial correlation we include a spatially lagged dependent variable (spatial lag model) or a spatial error component (spatial error model).

Table 2 displays the variables and their sources. Table 3 includes some descriptive statistics that characterize the sample. Table 4 shows pairwise correlations between the main variables.

Table 2 - Main Variables and Data Sources

Share of literate men (21-40)	Author's computation using population census (1887)
Livestock ownership rates	Author's computation using livestock census (1865) and population census (1860).
Share in agriculture, men (21-40)	Author's computation using population census (1887)
Share in industry, men (21-40)	Author's computation using population census (1887)
Share urban	Author's computation using population census (1887)
Temporary men's migration	Author's computation using population census (1887)
Teachers per child (6-15)	Author's computation using population census (1887)
Latitude and longitude	http://www.businessintelligence.info/docs /listado-longitud-latitud-municipios-espana.xls

Table 3 - Descriptive Statistics: District Level Data

	Mean	Std. dev.	Min	Max
Population	34846.82	18640.79	7410	184070
Share of literate men (aged 21-40)	0.50	0.19	0.17	0.95
Ownership rate	0.16	0.06	0	0.39
Ownership rate (cattle)	0.19	0.23	0	0.91
Ownership rate (mules)	0.14	0.10	0	0.56
Ownership rate (horses)	0.09	0.06	0	0.42
Ownership rate (donkeys)	0.23	0.14	0	0.61
Share in agriculture, men (aged 21-40)	0.74	0.13	0.19	0.93
Share in industry, men (aged 21-40)	0.02	0.03	0	0.25
Share urban	0.08	0.22	0	1
Temporary men's migration	0	0.23	-0.3	4.37
Teachers per child (aged 6-15)	0.01	0.00	0.00	0.03

Note: data on 374 Spanish districts in late 19th century.

Table 4 - Correlations: District Level Data

	Men's literacy	Ownership rate	Ownership rate (cattle)	Share in agriculture	Share in industry	Share urban	Teachers per child	Latitude
Men's literacy	1							
Ownership rate	0.425***	1						
Ownership rate (cattle)	0.520***	0.570***	1					
Share in agriculture	-0.131**	0.499***	0.124**	1				
Share in industry	-0.012	-0.250***	-0.126**	-0.499***	1			
Share urban	0.067	-0.382***	-0.110**	-0.543***	0.106**	1		
Teachers per child	0.684***	0.165***	0.108**	-0.285***	0.049	0.287***	1	
Latitude	0.657***	0.294***	0.484***	0.014	-0.049	-0.098*	0.380***	1

Note: correlations obtained using data on 374 Spanish districts in late 19th century.

3.2 *Empirical Strategy*

The association between literacy and ownership rates is characterised as follows:

$$educ = own\,rate\,\gamma_1 + X\,\gamma_2 + \psi$$

where $educ$ is the share of literate men (aged 21-40) in each district, $own\ rate$ is our measure of (livestock) ownership rates in each district and X includes district-level control variables. We show that the correlation between the ownership rate of the type of livestock mostly used in agriculture and literacy rates is robust to the inclusion of a large set of factors that are important in explaining educational levels. Given the available data, we cannot identify a variable that could be used - in an instrumental variable strategy - as a valid instrument for ownership rates. Hence, our analysis is to be interpreted as providing evidence of a robust association (i.e. conditional correlation) between ownership and literacy rates. To account for spatial correlation, we estimate spatial lag and error models.[10]

The spatial lag model is defined as follows:

$$educ = \rho W educ + own\,rate\,\gamma_1 + X\,\gamma_2 + \psi$$

where W is the spatial weight matrix and W$educ$ is the spatially lagged dependent variable.[11]

Instead the spatial error model includes a spatial component in the error term:

$$educ = own\,rate\,\gamma_1 + X\,\gamma_2 + \mu \qquad \mu = \lambda W \mu + \epsilon$$

where Wμ is the spatially lagged error term.

[10] Spatial lag and error models are estimated using the STATA command *spmlreg* (Jeanty 2010).

[11] The inverse distance spatial weights matrix is computed using latitude and longitude of the main city of each district.

4 Ownership and Literacy Rates: Empirical Evidence

4.1 Ownership and Literacy Rates: OLS

We start our analysis by looking at the association between our general measure of ownership rates and men's literacy across Spanish districts in the late 19th century. As mentioned above our aim is to show that the correlation between ownership and literacy rates is robust to the inclusion of a large set of relevant regressors. Table 5 displays the results from estimating Equation 1 by OLS. We progressively include several control variables to capture forces relevant in shaping educational attainments. Among these we include the dependence on agriculture and the development of the industrial sector: the former displays the expected negative and significant correlation with literacy while the latter does not show any significant association with education.[12] Urbanization and hosting the capital of a province is positively associated to literacy while areas where men's temporary migration is higher tend to have lower levels of education. Geographical controls - latitude and longitude - are significantly related to literacy rates, with Northern and Western areas displaying higher literacy levels. We notice that across all specifications there is a positive association between ownership and literacy rates: this suggests that where there were many livestock (land) owners relatively to adult men, demand for education tended to be higher. Table 6 presents a similar exercise to that carried out in Table 5, but distinguishing four different measures (one for each type of livestock) of ownership rates. First, we notice that by using these disaggregated measures, the explanatory power of the regressions increases. Second, for three types of livestock (cattle, mules, and horses) the positive conditional correlation with literacy rates is strong and significant in all specifications. Table 7 presents alternative specifications that also include province dummies. These help to control for some of the spatial correlation and are important to control for fixed province-level characteristics. The main conclusion we draw is that the ownership rate of cattle, the type of livestock mostly associ-

[12] The average share of men employed in industry in our sample is 0.02. This reflects an extremely low industrial development. Further, mining - which is included in industry - is not likely to increase the demand for education (we cannot distinguish between manufacturing and mining). Also, in the first stage of industrialization, an eventual increase in child labour would tend to reduce school attendance: for example, Camps (2003) argues that this was the case in Catalonia. This is a possible explanation for the negative but not significant correlation with literacy that we find in our sample. An increase in education due to higher technological progress and returns to human capital would be a complementary mechanism to the one we explore here, but it's likely to have played a more important role later on. In fact, Spain experienced the onset of the fertility transition and a broad reformation of the schooling system in the first two decades of the 20th century.

ated with agricultural work, is robust to the inclusion of province dummies. Other things equal, a one-standard-deviation-increase in the ownership rate of cattle is associated on average with a 0.034 increase in the literacy rate (Table 7, column 6). The ownership rate of mules, the second most used type in agriculture, also displays a positive and significant correlation, with the exception of the case in which standard errors are clustered at the province-level. We now proceed by estimating spatial lag and error models to fully account for the presence of spatial correlation.

4.2 Controlling for Spatial Correlation

Literacy might be also driven by a diffusion process, where the spread of new attitudes towards schooling could play an important role. Hence, after the introduction of compulsory schooling in 1857, the willingness to invest in education might have gone through a process of adaptation. We proceed by estimating spatial lag (Equation 2) and error (Equation 3) models (Table 8).[13] Among the two, the spatial error model seems more appropriate in this context. This is because the spread of cultural attitudes towards education is omitted in our empirical model, not education itself.[14] The inclusion of a spatially lagged dependent variable does not alter our previous results (Columns 1-4). The ownership rate of the type of livestock mostly used in agriculture (i.e. cattle) is significantly and positively correlated with literacy. The ownership rate of mules is also positive and significant in all specifications. We obtain similar results by estimating spatial error models (Columns 5-8). The ownership rates of cattle, mules and horses are significantly and positively associated to literacy rates. When including province dummies (Columns 6 and 8) the spatial error component (λ) is no longer significant, suggesting some redundancy between the two.[15] The spatial components (ρ and λ) are positive and significant in six out of eight specifications, confirming the appropriateness of their inclusion.

[13] Spatial lag and error models are estimated via MLE. Similar results (not reported here) are obtained using OLS.

[14] For completeness we include also the spatial lag model.

[15] We prefer to use spatial error and lag components to capture spatial correlation because it seems more reasonable to assume the existence of stronger spatial effects between districts across a border (i.e. contiguous but belonging to different provinces) rather than between districts relatively far away but belonging to the same province. The former are ignored by province dummies.

Table 5 - Ownership and Literacy Rates Across Spanish Districts in Late 19th Century: OLS

Dependent variable	Men's literacy						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ownership rate	1.306***	2.008***	2.052***	2.023***	2.020***	1.996***	1.250***
	[0.169]	[0.189]	[0.189]	[0.191]	[0.191]	[0.192]	[0.128]
Share in agriculture (men, aged 21-40)		-0.679***	-0.611***	-0.575***	-0.644***	-0.643***	-0.429***
		[0.086]	[0.095]	[0.097]	[0.096]	[0.097]	[0.083]
Share urban			0.085*	0.034	0.028	0.025	0.059
			[0.043]	[0.050]	[0.048]	[0.048]	[0.041]
Province's capital (dummy)				0.067**	0.057*	0.058*	0.051*
				[0.031]	[0.031]	[0.031]	[0.028]
Share in industry (men, aged 21-40)					-0.404	-0.391	-0.068
					[0.294]	[0.294]	[0.218]
Temporary male migration						-0.052***	-0.012
						[0.008]	[0.011]
Latitude							0.042***
							[0.003]
Longitude							-0.008***
							[0.002]
Constant	0.287***	0.672***	0.607***	0.583***	0.643***	0.646***	-1.102***
	[0.029]	[0.052]	[0.064]	[0.065]	[0.068]	[0.068]	[0.146]
N	374	374	374	374	374	374	374
R^2	0.181	0.338	0.344	0.35	0.35	0.358	0.618

Note: the method of estimation is ordinary least squares (OLS). The dependent variable is men's literacy, that is the share of men aged 21-40 that can read and write. The ownership rate is defined as the ratio between the average number of livestock owners (of cattle, mules, donkeys and horses) in 1865 and the number of adult men in 1860. Robust standard errors are reported in parentheses. ***, **,* denote statistical significance at 1% , 5% and 10% levels, respectively.

Table 6 - Ownership and Literacy Rates Across Spanish Districts in Late 19th Century: OLS. Disaggregated Measures

Dependent variable	Men's literacy						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ownership rate (cattle)	0.456***	0.580***	0.590***	0.585***	0.581***	0.579***	0.287***
	[0.052]	[0.055]	[0.055]	[0.055]	[0.055]	[0.055]	[0.056]
Ownership rate (mules)	0.451***	0.646***	0.659***	0.647***	0.648***	0.644***	0.428***
	[0.099]	[0.106]	[0.106]	[0.106]	[0.106]	[0.107]	[0.081]
Ownership rate (horses)	0.306*	0.430***	0.434***	0.413***	0.423***	0.425***	0.402***
	[0.170]	[0.155]	[0.155]	[0.155]	[0.154]	[0.154]	[0.149]
Ownership rate (donkeys)	-0.088	0.110	0.123	0.108	0.108	0.110	0.231***
	[0.080]	[0.082]	[0.083]	[0.083]	[0.083]	[0.083]	[0.063]
Share in agriculture (men, aged 21-40)		-0.572***	-0.516***	-0.467***	-0.511***	-0.512***	-0.439***
		[0.086]	[0.092]	[0.093]	[0.098]	[0.098]	[0.086]
Share urban			0.071*	0.005	0.001	0.001	0.058
			[0.040]	[0.045]	[0.044]	[0.044]	[0.040]
Province's capital (dummy)				0.087***	0.080***	0.080***	0.049*
				[0.030]	[0.031]	[0.031]	[0.028]
Share in industry (men, aged 21-40)					-0.255	-0.253	-0.090
					[0.257]	[0.258]	[0.217]
Temporary male migration						-0.012	-0.009
						[0.023]	[0.010]
Latitude							0.042***
							[0.004]
Longitude							-0.008**
							[0.003]
Constant	0.343***	0.656***	0.602***	0.570***	0.608***	0.609***	-1.096***
	[0.028]	[0.050]	[0.060]	[0.059]	[0.066]	[0.066]	[0.176]
N	374	374	374	374	374	374	374
R^2	0.325	0.431	0.435	0.445	0.446	0.446	0.623

Note: the method of estimation is ordinary least squares (OLS). The dependent variable is men's literacy, that is the share of men aged 21-40 that can read and write. The ownership rate of cattle, mules, donkeys and horses is defined as the ratio between the number of owners of each type of livestock in 1865 and the number of adult men in 1860. Robust standard errors are reported in parentheses. ***, **,* denote statistical significance at 1% , 5% and 10% levels, respectively.

Table 7 - Ownership and Literacy Rates Across Spanish Districts in Late 19th Century: OLS. Robustness Checks

Dependent variable	Men's literacy						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ownership rate (cattle)	0.161***	0.276***	0.246***	0.287***	0.113**	0.147**	0.113*
	[0.061]	[0.058]	[0.057]	[0.056]	[0.056]	[0.070]	[0.061]
Ownership rate (mules)		0.568***	0.525***	0.428***	0.130*		0.130
		[0.073]	[0.075]	[0.081]	[0.078]		[0.101]
Ownership rate (horses)			0.392**	0.402***	0.140		0.140
			[0.154]	[0.149]	[0.112]		[0.144]
Ownership rate (donkeys)				0.231***	-0.173***		-0.173*
				[0.063]	[0.061]		[0.096]
Share in agriculture (men, aged 21-40)	-0.174**	-0.336***	-0.370***	-0.439***	-0.242***	-0.236**	-0.242**
	[0.079]	[0.084]	[0.083]	[0.086]	[0.080]	[0.094]	[0.107]
Share urban	-0.006	0.028	0.034	0.058	0.033	0.046	0.033
	[0.036]	[0.039]	[0.038]	[0.040]	[0.026]	[0.031]	[0.031]
Share in industry (men, aged 21-40)	0.017	-0.007	-0.097	-0.090	-0.105	-0.015	-0.105
	[0.187]	[0.206]	[0.202]	[0.217]	[0.183]	[0.162]	[0.178]
Temporary male migration	-0.015*	0.004	-0.001	-0.009	-0.029***	-0.036***	-0.029***
	[0.008]	[0.015]	[0.012]	[0.010]	[0.011]	[0.010]	[0.010]
Province's capital (dummy)	0.085***	0.068**	0.060**	0.049*	0.030	0.032	0.030
	[0.028]	[0.029]	[0.028]	[0.028]	[0.018]	[0.020]	[0.019]
Latitude	0.043***	0.041***	0.040***	0.042***	0.041***	0.047**	0.041**
	[0.005]	[0.004]	[0.004]	[0.004]	[0.015]	[0.020]	[0.019]
Longitude	-0.007**	-0.010***	-0.008**	-0.008**	-0.000	-0.003	-0.000
	[0.004]	[0.003]	[0.003]	[0.003]	[0.010]	[0.014]	[0.014]
Constant	-1.154***	-1.074***	-1.014***	-1.096***	-0.851	-1.130	-0.851
	[0.192]	[0.178]	[0.174]	[0.176]	[0.648]	[0.856]	[0.814]
N	374	374	374	374	374	374	374
R^2	0.537	0.592	0.606	0.623	0.870	0.863	0.870
Province dummies	no	no	no	no	yes	yes	yes

Note: the method of estimation is ordinary least squares (OLS). The dependent variable is men's literacy, that is the share of men aged 21-40 that can read and write. The ownership rate of cattle, mules, donkeys and horses is defined as the ratio between the number of owners of each type of livestock in 1865 and the number of adult men in 1860. Robust standard errors are reported in parentheses. In columns 6 and 7 standard errors are clustered at the province level. ***, **,* denote statistical significance at 1% , 5% and 10% levels, respectively.

Table 8 - Ownership and Literacy Rates Across Spanish Districts in Late 19th Century: MLE. Spatial Correlation

Dependent variable	Men's literacy							
Model	Spatial lag (1)	Spatial lag (2)	Spatial lag (3)	Spatial lag (4)	Spatial error (5)	Spatial error (6)	Spatial error (7)	Spatial error (8)
Ownership rate (cattle)	0.121***	0.144***	0.205***	0.107**	0.188***	0.145***	0.244***	0.111**
	[0.047]	[0.047]	[0.045]	[0.048]	[0.045]	[0.042]	[0.046]	[0.045]
Ownership rate (mules)			0.305***	0.123*			0.329***	0.128*
			[0.069]	[0.069]			[0.077]	[0.072]
Ownership rate (horses)			0.358***	0.144			0.273***	0.138*
			[0.121]	[0.099]			[0.096]	[0.083]
Ownership rate (donkeys)			0.158***	-0.178***			0.118**	-0.173***
			[0.051]	[0.052]			[0.054]	[0.049]
Share in agriculture (men, aged 21-40)	-0.156**	-0.230***	-0.351***	-0.235***	-0.217***	-0.237***	-0.371***	-0.243***
	[0.065]	[0.064]	[0.070]	[0.070]	[0.066]	[0.054]	[0.067]	[0.056]
Province's capital (dummy)	0.069***	0.035**	0.042*	0.032*	0.048*	0.031*	0.036	0.029
	[0.023]	[0.017]	[0.023]	[0.017]	[0.026]	[0.019]	[0.025]	[0.018]
Share urban	0.020	0.048**	0.066*	0.035	0.028	0.046*	0.059*	0.032
	[0.031]	[0.024]	[0.034]	[0.023]	[0.036]	[0.026]	[0.034]	[0.026]
Share in industry (men, aged 21-40)	0.024	-0.019	-0.069	-0.110	-0.081	-0.016	-0.136	-0.104
	[0.159]	[0.157]	[0.176]	[0.161]	[0.204]	[0.156]	[0.195]	[0.154]
Temporary male migration	-0.023***	-0.042***	-0.019***	-0.035***	-0.031	-0.037**	-0.025	-0.029*
	[0.006]	[0.011]	[0.006]	[0.010]	[0.024]	[0.017]	[0.023]	[0.017]
Latitude	0.022***	0.025*	0.020***	0.018	0.039***	0.048***	0.040***	0.041***
	[0.003]	[0.014]	[0.003]	[0.014]	[0.004]	[0.014]	[0.004]	[0.014]
Longitude	-0.002	-0.000	-0.003	0.002	-0.009***	-0.002	-0.011***	0.000
	[0.003]	[0.008]	[0.003]	[0.008]	[0.003]	[0.008]	[0.003]	[0.008]
Constant	-0.787***	-0.715	-0.732***	-0.429	-1.175**	-1.146*	-1.109***	-0.862
	[0.137]	[0.605]	[0.133]	[0.583]	[0.494]	[0.617]	[0.373]	[0.605]
ρ	0.986***	0.870***	0.984***	0.882***				
λ					0.987***	0.387	0.984***	0.299
N	374	374	374	374	374	374	374	374
Province dummies	no	yes	no	yes	no	yes	no	yes

Note: the method of estimation is maximum-likelihood (MLE). The dependent variable is men's literacy, that is the share of men aged 21-40 that can read and write. The ownership rate of cattle, mules, donkeys and horses is defined as the ratio between the number of owners of each type of livestock in 1865 and the number of adult men in 1860. Standard errors, reported in parentheses, are robust only for spatial lag models. ***, **,* denote statistical significance at 1% , 5% and 10% levels, respectively.

4.3 Ownership Rate and Local Support to Education

As supply of schooling services should match the demand for education, we test whether the ownership rate is positively associated with a measure of local support to education, that is, the number of teachers per child.[16] Estimation results are reported in Table 9 which includes the baseline model together with the spatial lag and error models, all including province dummies.

Overall we notice that the ownership rate of the type of livestock mostly used in agriculture (i.e. cattle) is positively related to our measure of local support to education across all specifications. Other things equal, a one-standard-deviation-increase in ownership rate of cattle is on average associated with a 0.001 increase in the number of teachers per child (Table 9, Column 2). Similarly to Table 8, the inclusion of the province dummies together with the spatial error component seems redundant: for example Column 8 where λ turns negative and significant.

5 Province-Level Analysis

In this section we provide some supportive evidence that a demand channel might be more relevant - to explain the correlation that we have documented - than the supply side channel highlighted by the recent literature. We exploit province-level data to support two claims. First, we provide evidence that livestock (ownership) inequality is a good proxy for land (ownership) inequality, thus suggesting that livestock ownership can be used as a proxy for land ownership. Second, we show that across Spanish provinces the positive correlation between ownership and literacy rates is stronger and more robust than the negative correlation between ownership inequality and literacy rates.[17] In order to check whether livestock inequality is a good proxy for land inequality, we look at the correlation between the share of medium-large livestock owners in 1865 and the share of medium-large land owners in 1924 for 27 (out of 49) provinces.

[16] Supply and demand of schooling would tend in general to equilibrium. However, in this historical context we can expect discrepancies at given points in time between the supply and the demand sides. Further, individuals willing to learn how to read and write, in the absence of formal schools, might do so with the help, for example, of other literate family members.

[17] Inequality in livestock ownership is measured with the Gini index and alternative specifications of the share of medium-large livestock owners. Since we have information on the number of livestock owners for different ranges of ownership (e.g. number of owners of 3 to 5 heads), in computing the Gini Index we assume that owners within each range are uniformly distributed.

Table 9 - Ownership Rate and Local Support to Education Across Spanish Districts in Late 19th Century

Dependent variable	Teachers per child					
Estimation	OLS	OLS	MLE	MLE	MLE	MLE
Model			Spatial lag	Spatial lag	Spatial error	Spatial error
	(1)	(2)	(3)	(4)	(5)	(6)
Ownership diffusion (cattle)	0.005***	0.004**	0.005***	0.005***	0.006***	0.005***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.002]
Ownership diffusion (mules)		0.004		0.004		0.005**
		[0.003]		[0.002]		[0.002]
Ownership diffusion (horses)		0.004		0.004		0.004
		[0.003]		[0.002]		[0.003]
Ownership diffusion (donkeys)		-0.005**		-0.005***		-0.005***
		[0.002]		[0.002]		[0.002]
Share in agriculture (men, aged 21-40)	-0.008***	-0.008***	-0.008***	-0.008***	-0.007***	-0.008***
	[0.003]	[0.003]	[0.002]	[0.003]	[0.002]	[0.002]
Province's capital (dummy)	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Share urban	0.002**	0.002*	0.002**	0.002**	0.002***	0.002**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Share in industry (men, aged 21-40)	-0.004	-0.006	-0.004	-0.006	-0.003	-0.006
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
Latitude	0.002***	0.001***	0.001***	0.001**	0.002***	0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Longitude	-0.001**	-0.001*	-0.001**	-0.001**	-0.001***	-0.001**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Constant	-0.047**	-0.039*	-0.043**	-0.036*	-0.046**	-0.037*
	[0.022]	[0.021]	[0.020]	[0.020]	[0.020]	[0.020]
ρ			0.580**	0.566**		
λ					-0.894	-1.113**
N	374	374	374	374	374	374
R^2	0.789	0.796				
Province dummies	yes	yes	yes	yes	yes	yes

Note: the methods of estimation are OLS and MLE. The dependent variable is the number of teachers per child. The ownership rate of cattle, mules, donkeys and horses is defined as the ratio between the number of owners of each type of livestock in 1865 and the number of adult men in 1860. Standard errors, reported in parentheses, are robust only for OLS and spatial lag models. ***, **,* denote statistical significance at 1% , 5% and 10% levels, respectively.

Average mules, donkeys, horses and cattle per owner are 1.9, 1.4, 1.8 and 4.8 units, respectively (see Table 1). Hence, to capture medium-large livestock owners a lower bound of five (Livestock inequality 1) or ten (Livestock inequality 2) units is used. Land ownership inequality is measured as the share of land owners with more than 50 hectares of land in 1924. Despite the sixty year gap since 1865, the correlation between this measure and those constructed using livestock owners is high (0.7), as shown in Table 10 and Figure 3.

In addition, we note that the correlation between the ownership rate and the share of medium-large land (or livestock) owners is negative and significant. In fact, in areas where the number of owners is relatively high, we expect a relatively lower share of large owners. Regarding the second aim of our province-level analysis, we start by looking at the simple correlation between ownership rate and inequality measures on the one hand and men's literacy on the other (Figures 4 to 7). The main conclusion we draw is that the positive correlation between ownership and literacy rates is higher - and not driven by few outliers - than the negative correlation between ownership inequality and literacy rates.

To further test the relative importance of these different indices we run a horse-race between them using a basic set of controls (Table 11). This horse-race helps us to gauge the relative importance of the demand (captured by the ownership rate) and supply (captured by the Gini index and the share of medium-large owners) channels. The substantial difference in the model's explanatory power across specifications confirms the impression drawn from Figures 4 to 7. While ownership rates display a strong positive correlation with literacy rates, the inequality measures do not. This result suggests the importance of the demand channel linked to livestock/land ownership: that is, being an owner - independently of the size of the ownership - increased the incentives to acquire human capital in the form of literacy (and/or to promote their acquisition). On the other hand, there is less robust evidence in favour of the supply side channel working through a detrimental effect due to the presence of large livestock/land owners.

Table 10 - Livestock and Land Ownership Inequality: Province-Level Correlations

	Land inequality	Livestock inequality 1	Livestock inequality 2	Gini index (livestock)	Ownership rate (livestock)
Land inequality	1				
Livestock inequality 1	0.744***	1			
Livestock inequality 2	0.738***	0.869***	1		
Gini index (livestock)	0.775***	0.912***	0.897***	1	
Ownership rate (livestock)	-0.357*	-0.2979**	-0.412***	-0.264*	1

Note: pairwise correlations are obtained using data on 49 Spanish provinces, with the exception of those involving land inequality which is available only for 27 provinces.

Figure 3 - Livestock and Land Ownership Inequality

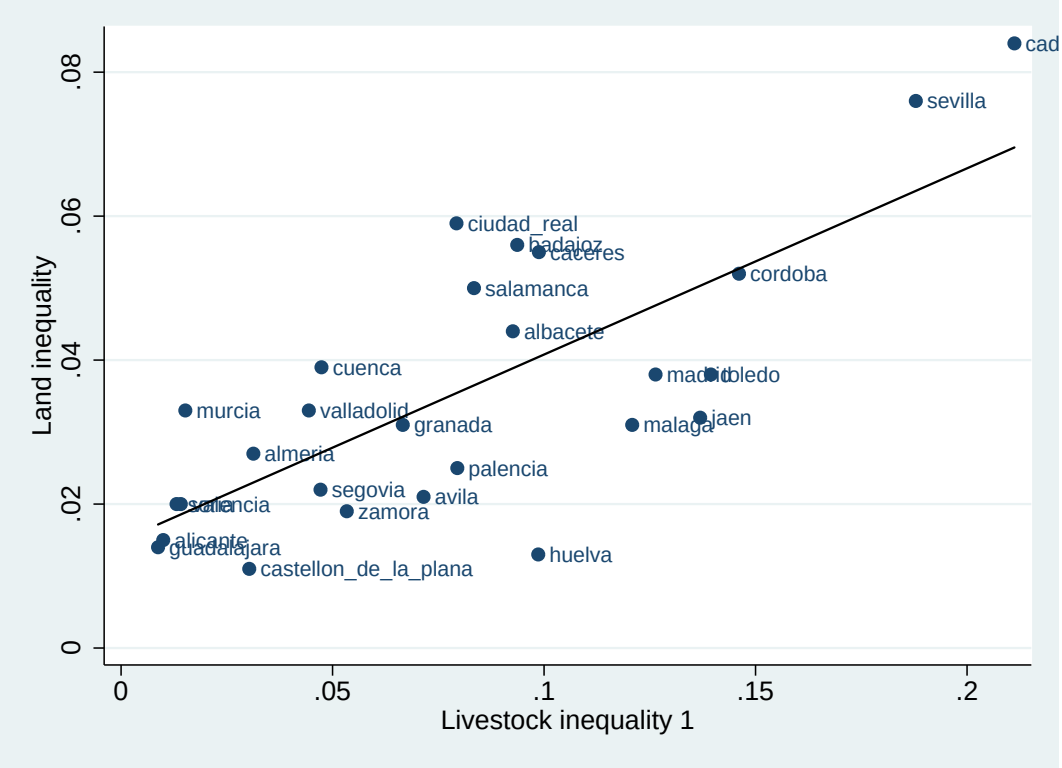


Figure 4 - Ownerhip and Literacy Rates: Province-Level Data

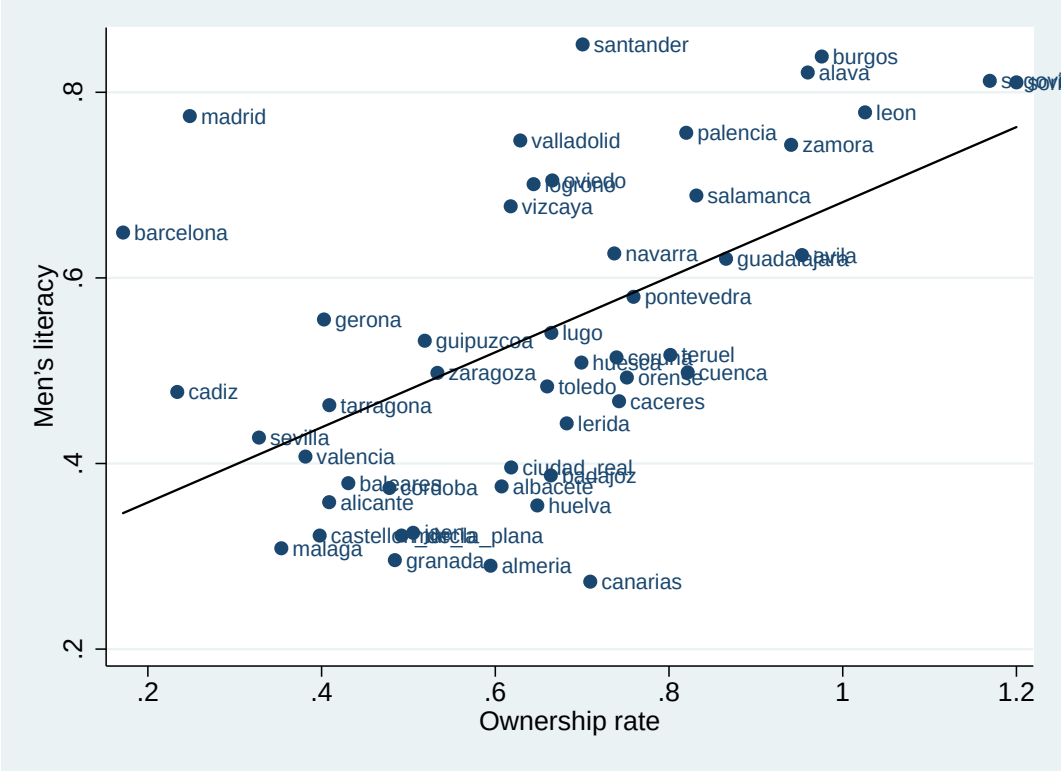


Figure 5 - Livestock Inequality and Literacy: Province-Level Data

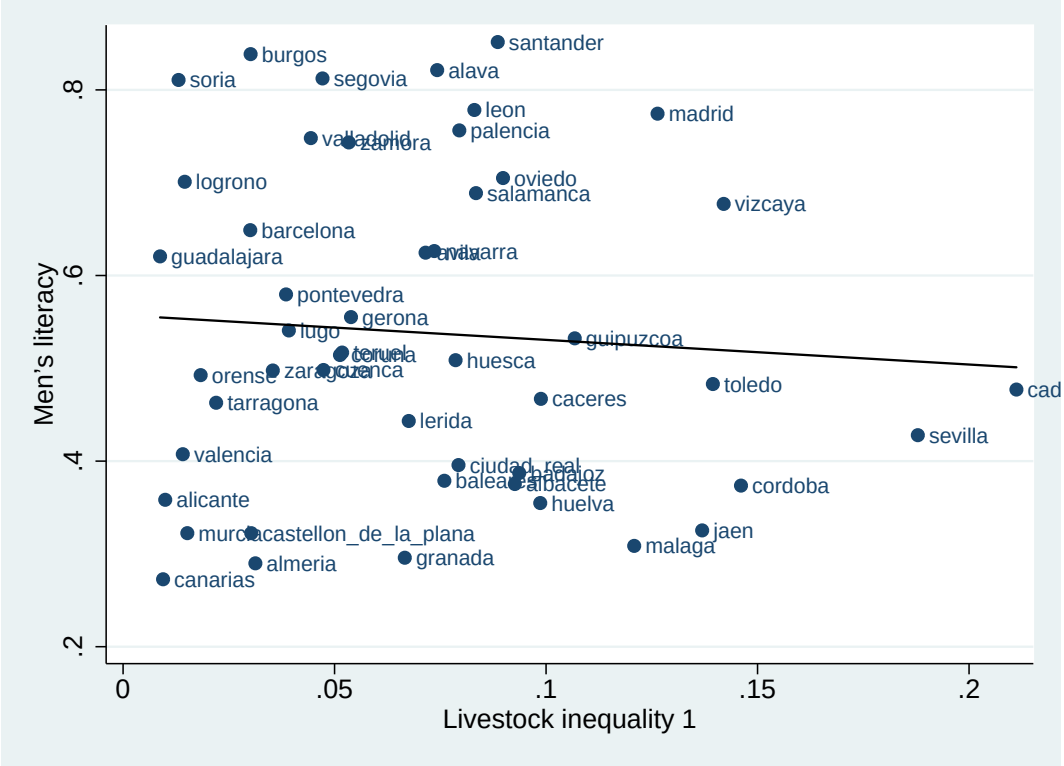


Figure 6 - Livestock Inequality and Literacy: Province-Level Data

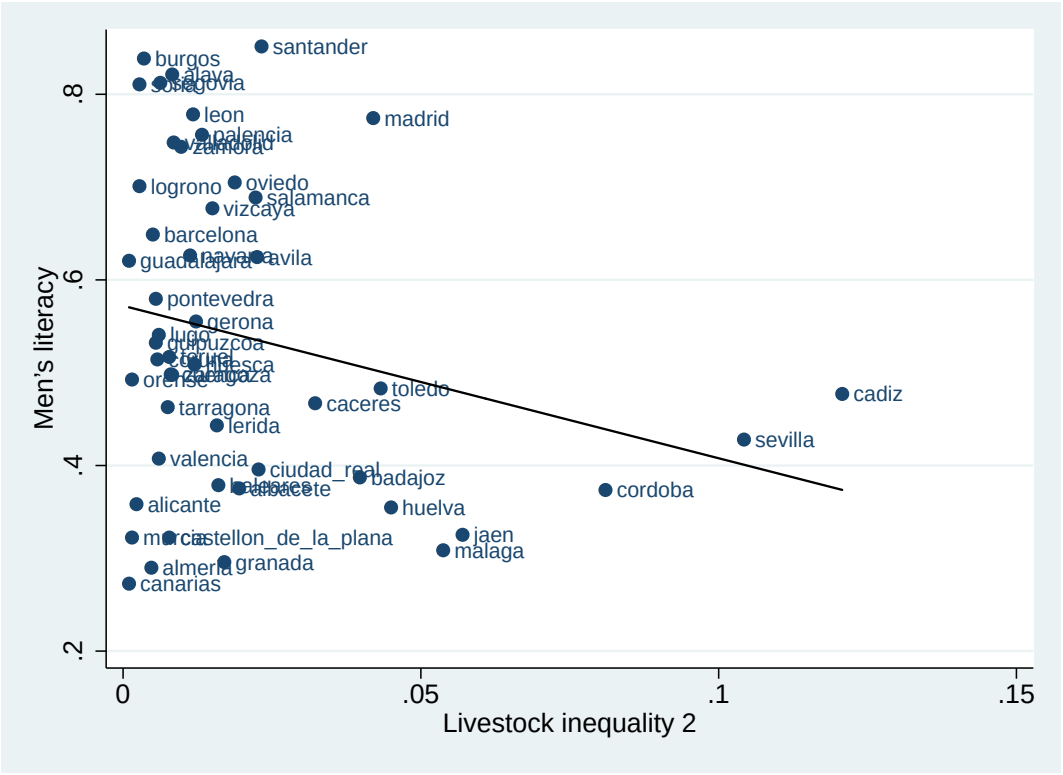


Figure 7 - Livestock Inequality (Gini) and Literacy: Province-Level Data

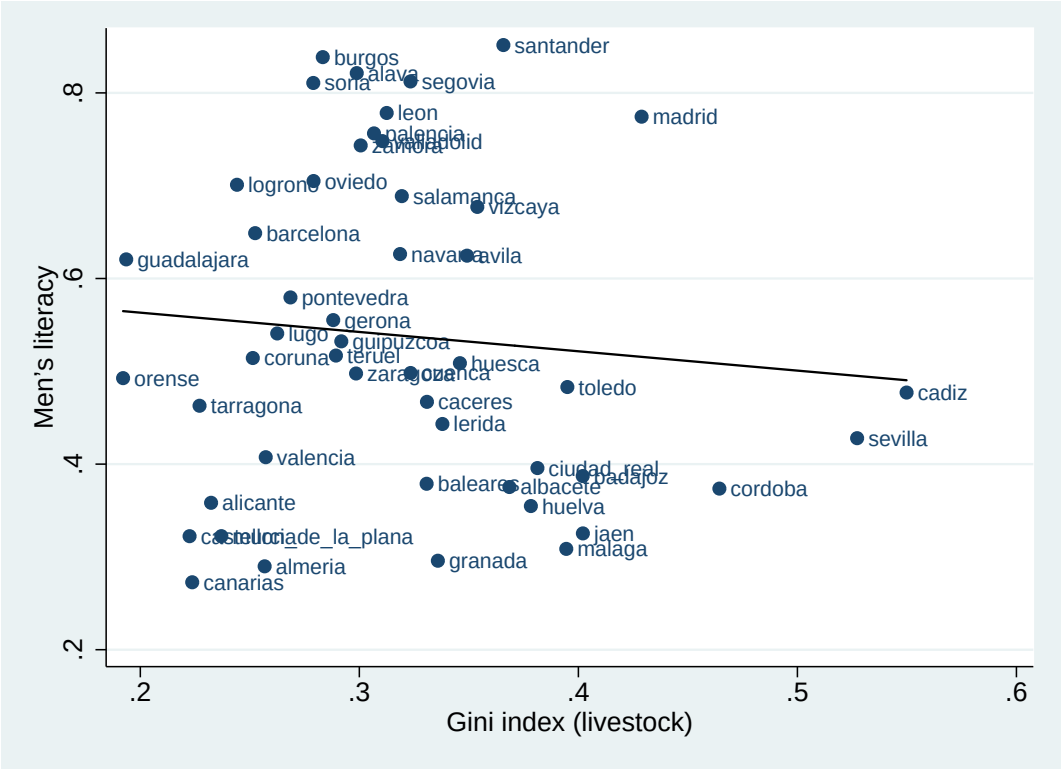


Table 11 - Ownership and Literacy Rates Across Spanish Provinces in Late 19th Century: OLS

Dependent variable	Men's literacy								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ownership rate (livestock)	1.618***						2.913***	2.860***	2.891***
	[0.405]						[0.294]	[0.315]	[0.286]
Ownership rate (cattle)		0.475***							
		[0.110]							
Livestock inequality 1			-0.265				0.005		
			[0.468]				[0.330]		
Livestock inequality 2				-1.643**				-0.300	
				[0.684]				[0.623]	
Land inequality					-1.438				
					[1.369]				
Gini (livestock)						-0.208			-0.094
						[0.270]			[0.198]
Share in agriculture (men)							-0.982***	-0.989***	-1.005***
							[0.330]	[0.330]	[0.326]
Share in industry (men)							-0.711	-0.752	-0.758*
							[0.445]	[0.448]	[0.450]
Share urban							0.184	0.189	0.183
							[0.240]	[0.246]	[0.242]
Constant	0.277***	0.448***	0.557***	0.572***	0.549***	0.605***	0.725**	0.745***	0.775***
	[0.076]	[0.028]	[0.044]	[0.031]	[0.075]	[0.092]	[0.276]	[0.267]	[0.275]
N	49	49	49	49	27	49	49	49	49
R^2	0.293	0.292	0.005	0.059	0.023	0.008	0.587	0.588	0.588

Note: the method of estimation is OLS. The dependent variable is men's literacy, that is the share of men aged 21-40 that can read and write. The ownership rate is defined as the ratio between the average number of livestock owners (of cattle, mules, donkeys and horses) in 1865 and the number of adult men in 1860. The ownership rate of cattle is defined as the ratio between the number of owners of cattle in 1865 and the number of adult men in 1860. Livestock inequality 1 (2) is the average share of livestock owners wit more than 5 (10) units of livestock. Land inequality is the share of land owners with more than 50 hectares of land in 1924. Land ownership inequality is measured as the share of land owners with more than 50 hectares of land in 1924. Robust standard errors are reported in parentheses. ***, **,* denote statistical significance at 1% , 5% and 10% levels, respectively.

6 Conclusion

This paper studies the association between ownership structure and literacy across Spanish districts in the late 19th century. We find a strong positive correlation between the ownership rate of the type of livestock mostly used in agriculture and the literacy rate, which is robust to controlling for a large set of potential explanatory factors including spatial effects. Also, ownership of the second type of livestock mostly used in agriculture is positively and significantly correlated with literacy in most regressions. This result suggests that the structure of (livestock/land) ownership was important in shaping literacy rates. In our district level analysis, we cannot distinguish whether this correlation is due to demand and/or supply channels. Using a province-level analysis, we run a horse-race suggesting that the demand-side channel might be more relevant. That is, being a livestock/land owner - independently of the size of the ownership - increased the incentives to acquire human capital in the form of literacy.

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Appendix

Table 12 - Districts Included in the District-Level Analysis

District	Province	District	Province
Aguilar	Cordoba	Atienza	Guadalajara
Alba de tormes	Salamanca	Avila	Avila
Albacete	Albacete	Aviles	Oviedo
Albaida	Valencia	Ayamonte	Huelva
Albarracin	Teruel	Ayora	Valencia
Alberique	Valencia	Badajoz	Badajoz
Alburquerque	Badajoz	Baena	Cordoba
Alcala la real	Jaen	Baeza	Jaen
Alcanices	Zamora	Balaguer	Lerida
Alcaniz	Teruel	Baltanas	Palencia
Alcantara	Caceres	Bande	Orense
Alcaraz	Albacete	Barbastro	Huesca
Alcazar de san juan	Ciudad real	Baza	Granada
Alfaro	Logroño	Becerrea	Lugo
Algeciras	Cadiz	Bejar	Salamanca
Alhama	Granada	Belchite	Zaragoza
Alicante	Alicante	Belmonte	Cuenca
Almaden	Ciudad real	Belmonte	Oviedo
Almagro	Ciudad real	Belorado	Burgos
Almansa	Albacete	Benabarre	Huesca
Almazan	Soria	Benavente	Zamora
Almendralejo	Badajoz	Berga	Barcelona
Almeria	Almeria	Berja	Almeria
Almodovar del campo	Ciudad real	Bermillo de sayago	Zamora
Almunia de dona godina	Zaragoza	Betanzos	La Coruña
Alora	Malaga	Boltana	Huesca
Amurrio	Alava	Borja	Zaragoza
Antequera	Malaga	Brihuega	Guadalajara
Aoiz	Navarra	Bujalance	Cordoba
Aracena	Huelva	Burgo de osma	Soria
Aranda de duero	Burgos	Burgos	Burgos
Archidona	Malaga	Cabra	Cordoba
Arcos de la frontera	Cadiz	Cabuerniga	Santander
Arenas san pedro	Avila	Caceres	Caceres
Arenys de mar	Barcelona	Cadiz	Cadiz
Arevalo	Avila	Calahorra	Logroño
Arrecife	Canarias	Calamocha	Teruel
Arzua	La Coruña	Calatayud	Zaragoza
Astorga	Leon	Caldas	Pontevedra
Ateca	Zaragoza	Callosa de ensarria	Alicante

Table 12 Continued - Districts Included in the District-Level Analysis

District	Province	District	Province
Cambados	Pontevedra	Denia	Alicante
Canete	Cuenca	Don benito	Badajoz
Cangas de onis	Oviedo	Ecija	Sevilla
Caniza	Pontevedra	Egea de los caballeros	Zaragoza
Canjayar	Almeria	Enguera	Valencia
Caravaca	Murcia	Estella	Navarra
Carballino	Orense	Estepa	Sevilla
Carballo	La Coruña	Estrada	Pontevedra
Carlet	Valencia	Falset	Tarragona
Cartagena	Murcia	Ferrol	La Coruña
Casas ibanez	Albacete	Fonsagrada	Lugo
Caspe	Zaragoza	Fraga	Huesca
Castro del rio	Cordoba	Frechilla	Palencia
Castro urdiales	Santander	Fregenal de la sierra	Badajoz
Castrogeriz	Burgos	Fuente de cantos	Badajoz
Castuera	Badajoz	Fuentesauco	Zamora
Cazalla de la sierra	Sevilla	Gandesa	Tarragona
Cazorla	Jaen	Garrovillas	Caceres
Cebreros	Avila	Gigueras	Gerona
Celanova	Orense	Gijon	Oviedo
Cervera	Palencia	Ginzo	Orense
Cervera	Lerida	Granollers	Barcelona
Chantada	Lugo	Grazalema	Cadiz
Chelva	Valencia	Guadalajara	Guadalajara
Chiclana de la frontera	Cadiz	Guadix	Granada
Chinchilla	Albacete	Guia	Canarias
Chinchon	Madrid	Haro	Logroño
Chiva	Valencia	Herrera del duque	Badajoz
Cieza	Murcia	Hijar	Teruel
Cifuentes	Guadalajara	Hinojosa duque	Cordoba
Ciudad real	Ciudad real	Hoyos	Caceres
Ciudad rodrigo	Salamanca	Huelma	Jaen
Cogolludo	Guadalajara	Huelva	Huelva
Coin	Malaga	Huercal overa	Almeria
Colmenar	Malaga	Huesca	Huesca
Corcubion	La Coruña	Huescar	Granada
Cuellar	Segovia	Huete	Cuenca
Cuenca	Cuenca	Ibiza	Baleares
Daimiel	Ciudad real	Illescas	Toledo
Daroca	Zaragoza	Inca	Baleares

Table 12 Continued - Districts Included in the District-Level Analysis

District	Province	District	Province
Infantes	Ciudad real	Medina del campo	Valladolid
Iznalloz	Granada	Medina sidonia	Cadiz
Jaca	Huesca	Medinaceli	Soria
Jaen	Jaen	Mellin	Albacete
Jarandilla	Caceres	Merida	Badajoz
Jativa	Valencia	Miranda de ebro	Burgos
Jerez de la frontera	Cadiz	Molina	Guadalajara
Jerez de los caballeros	Badajoz	Mondonedo	Lugo
Jijona	Alicante	Monforte	Lugo
La Coruña	La Coruña	Monovar	Alicante
La baneza	Leon	Montalban	Teruel
La carolina	Jaen	Montanchez	Caceres
Laguardia	Alava	Montblanch	Tarragona
Laguna	Canarias	Montefrio	Granada
Lalin	Pontevedra	Montilla	Cordoba
Laredo	Santander	Montoro	Cordoba
Laroda	Albacete	Moron	Sevilla
Ledesma	Salamanca	Motilla del palancar	Cuenca
Lena	Oviedo	Motril	Granada
Leon	Leon	Mula	Murcia
Lerida	Lerida	Murcia	Murcia
Lerma	Burgos	Murias de paredes	Leon
Lillo	Toledo	Muros	La Coruña
Llanes	Oviedo	Najera	Logroño
Llerena	Badajoz	Nava del rey	Valladolid
Logrono	Logroño	Navahermosa	Toledo
Loja	Granada	Navalmoral de la mata	Caceres
Lora del rio	Sevilla	Negreira	La Coruña
Lorca	Murcia	Novelda	Alicante
Luarca	Oviedo	Noya	La Coruña
Lucena	Cordoba	Ocana	Toledo
Lugo	Lugo	Olivenza	Badajoz
Madridejos	Toledo	Olmedo	Valladolid
Mahon	Baleares	Olot	Gerona
Malaga	Malaga	Olvera	Cadiz
Manacor	Baleares	Onteniente	Valencia
Manzanares	Ciudad real	Orcera	Jaen
Marbella	Malaga	Ordenes	La Coruña
Marchena	Sevilla	Orgaz	Toledo
Mataro	Barcelona	Orihuela	Alicante

Table 12 Continued - Districts Included in the District-Level Analysis

District	Province	District	Province
Orotava	Canarias	Roa	Burgos
Ortigueira	La Coruña	Rute	Cordoba
Osuna	Sevilla	S. domingo de la calzada	Logroño
Padron	La Coruña	Sacedon	Guadalajara
Palma	Baleares	Sahagun	Leon
Palmas	Canarias	Saldana	Palencia
Pamplona	Navarra	San clemente	Cuenca
Pastrana	Guadalajara	San felio de llobregat	Barcelona
Pego	Alicante	San roque	Cadiz
Penafiel	Valladolid	San sebastian	Guipuzcoa
Piedrabuena	Ciudad real	San vicente de la barquera	Santander
Pina	Zaragoza	Sanlucar de barrameda	Cadiz
Ponferrada	Leon	Sanlucar la mayor	Sevilla
Pontevedra	Pontevedra	Santa cruz de la palma	Canarias
Posadas	Cordoba	Santa cruz de tenerife	Canarias
Potes	Santander	Santa maria de nieva	Segovia
Pozoblanco	Cordoba	Santafe	Granada
Priego	Cuenca	Santander	Santander
Priego de cordoba	Cordoba	Santiago	La Coruña
Puebla de alcocer	Badajoz	Santona	Santander
Puebla de sanabria	Zamora	Sarinena	Huesca
Puebla de trives	Orense	Sarria	Lugo
Puente del arzobispo	Toledo	Sedano	Burgos
Puenteareas	Pontevedra	Segovia	Segovia
Puentedeume	La Coruña	Seo de urgel	Lerida
Puigcerda	Gerona	Sepulveda	Segovia
Punte cadelas	Pontevedra	Sequeros	Salamanca
Purchena	Almeria	Sevilla	Sevilla
Quintanar de la orden	Toledo	Siguenza	Guadalajara
Quiroga	Lugo	Solsona	Lerida
Ramales	Santander	Sort	Lerida
Rambla	Cordoba	Sos	Zaragoza
Redondela	Pontevedra	Sueca	Valencia
Reinosa	Santander	Tafalla	Navarra
Requena	Valencia	Talavera de la reina	Toledo
Reus	Tarragona	Tamarite	Huesca
Riano	Leon	Tarancon	Cuenca
Riaza	Segovia	Tarazona	Zaragoza
Ribadavia	Orense	Tarragona	Tarragona
Ribadeo	Lugo	Teruel	Teruel

Table 12 Continued - Districts Included in the District-Level Analysis

District	Province	District	Province
Toledo	Toledo	Villar del arzobispo	Valencia
Toro	Zamora	Villarcayo	Burgos
Torrecilla en cameros	Logroño	Villaviciosa	Oviedo
Torrelaguna	Madrid	Villena	Alicante
Torrelavega	Santander	Vinaroz	Castellon
Torrox	Malaga	Vitigudino	Salamanca
Tortosa	Tarragona	Vitoria	Alava
Totana	Murcia	Viver	Castellon
Tremp	Lerida	Vivero	Lugo
Tudela	Navarra	Yecla	Murcia
Tuy	Pontevedra	Yeste	Albacete
Valdeorras	Orense	Zafra	Badajoz
Valdepenas	Ciudad real	Zamora	Zamora
Valderrobres	Teruel	Zaragoza	Zaragoza
Valencia de alcantara	Caceres		
Valencia de don juan	Leon		
Valladolid	Valladolid		
Valls	Tarragona		
Valoria la buena	Valladolid		
Valverde del camino	Huelva		
Vecilla	Leon		
Velez malaga	Malaga		
Velez rubio	Almeria		
Vendrell	Tarragona		
Vera	Almeria		
Vergara	Guipuzcoa		
Verin	Orense		
Viana	Orense		
Vich	Barcelona		
Viella	Lerida		
Vigo	Pontevedra		
Villacarriedo	Santander		
Villacarrillo	Jaen		
Villadiego	Burgos		
Villafranca del bierzo	Leon		
Villajoyosa	Alicante		
Villalba	Lugo		
Villalon	Valladolid		
Villalpando	Zamora		
Villanueva de la serena	Badajoz		