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**THE PRIVATISATION OF COMMUNAL LANDS IN SPAIN (1750-1925):
AN ECONOMETRIC REVISION OF THE NEO-MALTHUSIAN THESIS**

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**The Privatisation of Communal Lands in Spain (1750-1925):
An Econometric Revision of the Neo-Malthusian Thesis (*)**

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SUMMARY

The main aim of this paper is to check one of the few existing theories regarding the factors that can explain the historical dissolution of collective rustic property, namely the Neo-Malthusian thesis which underlies the so-called “tragedy of the commons”. This old interpretative proposal, originating in the field of Biology, but rapidly adopted by Economy, not only continues to be explicitly present in some manuals of natural resources management, but also persists in those works that, from Economic and Social History, attempt to understand the reasons of the decline of communal systems in the Western world. Leaving aside the revision that, in the last decades, New Institutional Economy has advanced in this respect through the “property rights theory”, which is difficult to contrast, my paper tries to test the applicability of the Neo-Malthusian schema with the help of elementary econometric methods. The testing ground chosen for this purpose is the process of disintegration of communal lands which took place in Spain since the middle of the 18th century and, especially, the process of privatisation promoted by the Law of General Disentitlement of 1 May 1855. In no way does this analysis attempt to create a refined econometric model with which to explain the changes in collective patrimony during the last centuries. The inclusion in the test of other factors, different from the ones emphasised in the “tragedy of the commons”, suggests and advances some possible approaches to assemble an alternative theoretical schema, but does not endeavour to offer a global mechanical explanation.

Keywords: tragedy of the commons, Neo-Malthusian thesis, privatisation process, collective rustic patrimony, Spain, Extremadura, econometric methods

Journal of Economic Literature Classification System: D71, N54, N94, R14 and R23

RESUMEN

El principal objetivo de este documento es contrastar una de las pocas teorías existentes acerca de los factores que pueden explicar la disolución histórica de la propiedad rústica colectiva: la tesis neo-maltusiana que subyace tras la denominada “tragedia de los comunales”. Esta vieja propuesta interpretativa, nacida en el campo de la Biología pero rápidamente adoptada por la Economía, no sólo continúa estando presente en algunos manuales de gestión de recursos naturales, sino que también persiste en aquellos trabajos que, desde la Historia Económica y Social, intentan comprender las razones del declive de los sistemas comunales en el mundo occidental. Dejando al margen la revisión que durante las últimas décadas ha hecho al respecto la Nueva Economía Institucional a través de la “teoría de los derechos de propiedad”, difícil de contrastar en la práctica, mi trabajo intenta poner a prueba la aplicabilidad del esquema neo-maltusiano con la ayuda de métodos econométricos elementales. El campo de prueba elegido para ello es el proceso de desintegración de tierras comunales que tuvo lugar en España desde mediados del siglo XVIII y, especialmente, el proceso de privatización promovido por la Ley de Desamortización General de 1 de mayo de 1855. En ningún caso este análisis pretende crear un refinado modelo econométrico con el que explicar los cambios producidos en el patrimonio colectivo durante las últimas centurias. La inclusión en el test de otros factores, distintos a los subrayados en la “tragedia de los comunales”, sugiere y avanza algunas posibles vías para construir un esquema teórico alternativo, pero no trata de ofrecer una explicación mecánica global.

Palabras Clave: tragedia de los comunales, tesis neomaltusiana, proceso de privatización, patrimonio rústico colectivo, España, Extremadura, métodos econométricos

Sistema de Clasificación (Journal of Economic Literature): D71, N54, N94, R14 y R23

The Privatisation of Communal Lands in Spain (1750-1925): An Econometric Revision of the Neo-Malthusian Thesis¹

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I. The tragedy of the commons: the persistent inheritance of Malthus

In 1968, after some years of certain stagnation in the enduring discussion regarding the historical development of collective property², the biologist-geneticist Garrett Hardin, almost unconsciously, revived the controversy with the publication in *Science* of a small essay entitled “The Tragedy of the Commons”. The main objective of this article was not to analyse the determining factors of the survival or the dissolution of communal property. From his Darwinian academic vocation, Hardin used the question of the commons to criticise “the policy of laissez-faire in reproduction” that inspired the sexual education programmes advocated by the United Nations and other international organisations in those days. According to Hardin, “to couple the concept of freedom to breed with the belief that everyone born has an equal right to the commons is to lock the world into a tragic course of action”³.

The biologist maintained that the exploitation of collective surfaces in general and of communal lands in particular, supposedly shared by a multitude of individuals (“open to all”), inevitably leads to the exhaustion of natural resources. Every user, interpreted by Hardin as a rational maximizer who receives positive utility from his own exploitation and negative utility from overexploitation, tends to use up the commons and, by doing so, manages to increase his individual profit while sharing the costs of degradation among the rest of the community. This situation, directly related to the Prisoner’s Dilemma, may work out satisfactorily for centuries because war, poaching and disease (Malthus’s positive checks) keep the number of both men and beasts far below the capacity of the land. Finally, however, the day of reckoning comes. At this point, “the inherent logic of the commons remorselessly generates tragedy”⁴.

In view of this relentless logic, what should be done? In Hardin’s opinion, there are only two options: sell collective lands off as private property or keep them as public property, but allocating the right to access them. The first solution (privatisation) permits the incorporation of environmental costs into an overall framework of responsible management and, therefore, restricts the degradation. The second one (nationalisation) guarantees the controlled exploitation of public assets and, consequently, may avoid the exhaustion. No case can be made for the persistence of common management because, in a world governed by the principle of “dog eats dog”, individual decisions always lead to collective disaster.

¹ The preparation of this paper has been possible thanks to Alfonso Herranz and Miguel Vermehren. Without their generous help, neither the econometric exercises nor the language aspects would be the same. The faults of the work, however, are only responsibility of the author.

² For a good synthesis on this subject, see Sala (1996).

³ Hardin (1968: 1246).

⁴ Hardin (1968: 1244).

Accordingly, it is evident that the theoretical schema of Hardin's thesis relies on the disputed assumption which sustains that man is selfish by nature. From this perspective, the opposition to the "tragedy of the commons" is only part of a more combative line of thought that not only questions the historical validity of Neo-Malthusian approaches, but also rejects the veracity of the principles governing the idea of competitive individualism. Obviously, at the core of contemporary disapproval of Hardin's theory lie the sanctification of "homo economicus" and the motivational criteria which go with it in Neoclassical Economy⁵. What is at stake is, therefore, an old and complex polemic that, of course, transcends the objective of my work and which is difficult to clarify with empirical evidence.

The criticism of the freedom of use that Hardin attributes to the communal lands is much less problematic. In this respect, the principal error of "The Tragedy of the Commons" is to suppose that collective ownership means "open access" to the communal assets for all individuals ("open to all"), implicitly concluding that collective property is equivalent to no property⁶. This supposition, still present in many manuals of Economy, is plainly refuted by historical evidence, which demonstrates that exploitation of the communal assets in the past was rarely characterised by a total absence of restrictions⁷. In most cases, the rights of use were restricted to members of a defined community and were regulated by clearly understood institutional norms, which generally took into account the regeneration of natural resources. It is true that customary controls were not entirely able to avoid the existence of abuse in the use of the commons, but then neither has State regulation nor privatisation historically guaranteed the conservation of natural resources⁸.

The force of the empirical argument used by historical critics of the thesis of "open access" has become so evident that Hardin has had to revise his own theory, restricting the "tragedy of the commons" to a "tragedy of the unmanaged commons"⁹. In this revision, however, the biologist-geneticist continues to defend his earlier Malthusian principles. In essence, he sustains that collective property is justifiable only under conditions of low demographic and livestock density. As human population has increased, "the commons has had to be abandoned in one aspect after another"¹⁰.

⁵ See, among others, Martínez-Alier (1992) and Naredo (1996).

⁶ A theoretical revision of this error can be looked up in Aguilera (1991).

⁷ See, for example, Wade (1987) and Stevenson (1991).

⁸ Indeed, for some critics, it was precisely the process of "decommunalisation" which broke up the social fabric of many pre-industrial societies and caused sustainability problems in the rural world. This idea, which is grouped around the thesis of the "tragedy of enclosures", sustains that the user of a collective surface is not only and exclusively a self-centred "homo economicus" who inevitable exploits the medium at his neighbours' expense. In small communities, conflict co-exists with cooperation. These are not so much altruist forms of cooperation as mechanisms to limit competition. The implicit condition that governs the interaction between community members is that the greater the possibility of reprimand or censure, the greater the probability of collaboration. From this perspective, privatisation or nationalisation, rather than guaranteeing the conservation of resources, can lead to the "tragedy of the commons", from the moment they induce the forced violation of traditional norms of management and asset renewal. See, on this subject, the interpretations of Thompson (1976) (1991), McCay and Acherson (1987), Berkes (1989), Blaikie and Brookfield (1987), González de Molina (1991), McNeill (1992) or Neeson (1993) (1996).

⁹ Hardin (1994).

¹⁰ Hardin (1968: 1248).

It is precisely regarding the Malthusian component that the criticism has shown a more flexible stance. Among other reasons, because, beyond Hardin's ecological alarmism in connection with the collective use of natural resources, the demographic factor does seem to possess a certain relevance for the analysis of the survival or dissolution of common property. Both from an eco-socialist perspective (relationship between population growth and social sharing of productive resources)¹¹ and from the evolutionary focus of transaction costs in New Institutional Economy (relationship between the size of the group and capacity of negotiation)¹², Hardin may be partly right when he asserts that the commons are only viable in rural communities of a reduced scale.

For this point, the unfortunate assumption of "open access" does not invalidate the likely applicability of his thesis. Even if it is accepted that the right of entry to commons is historically restricted to members of a defined neighbourhood, it is equally possible to accept that the demographic growth of the community influences the quotas of exploitation of the surfaces traditionally assigned to collective use. Unless, of course, the traditional rules which control the communal system only guarantee the shared use to the original settlers of a specific neighbourhood and not to the given population at any point in time.

In Spain, the latter is the case only in the so-called *montes de varas* or *montes de voces* in Galicia, but it is not to be found in most of the traditional models of common exploitation. Before the liberal reform of the first half of the 19th century, the different forms of access that were established across the country were essentially based on neighbourhood rights. The constitution of a new family, the ownership of land in the municipality, the tenancy of a house in the village or the payment of municipal taxes were the type of circumstances that usually determined, in Spain, the form of use and access to collective rustic patrimony¹³. In view of this and in line with Hardin's theory, it seems logical to wonder if, in the Spanish case, the tendency to redefine common property inevitably emerged as soon as the hypothetical level of balance between population and livestock density and natural resources was surpassed¹⁴.

The main aim of my work is to attempt to verify this thesis by using the empirical evidence available for the privatisation of communal lands which took place in Spain since the middle of the 18th century putting liberal thinking into practice. The data recently collected by me for Extremadura, one of the region most affected by such a process, together with the figures published for other zones of Spain over the last years, permit to check Hardin's theory with basic econometric methods. Using these, I will not try to corroborate or to reject the general importance of density (population and livestock) in the historical development of property rights. My only objective is to check, with the help of econometrics, if the Spanish privatisation followed the path set out by "The Tragedy of the Commons". The reason is very simple: even though the same legal system was being applied in the whole of Spain since the middle of the 18th century, the privatisation process did not have a similar effect on all Spanish regions. Could population and livestock density be a determinant part of the difference?

¹¹ See, for instance, Sarkar (1993).

¹² Noorgard (1995).

¹³ Concerning this subject, see, Nieto (1964) and Mangas (1981).

¹⁴ Hardin (1968: 1244 and 1248).

II. The privatisation of public woodlands in Spain (1859-1925)

While the dissolution of communal lands in Spain is a long-term process which can be said to have begun at the same time as the Christian Reconquest (12th and 13th centuries), it is generally accepted today that the process of disintegration became general around the middle of the 18th century. The turning point in this development was the critical analysis of the Spanish Enlightenment regarding common property. However and despite the fact that some regions were targeted with special privatisation laws by the Monarchy since 1750, the redefinition of collective lands in Spain throughout the second half of the 18th century was more a spontaneous event than a regulated process conducted by the State. In fact, government control of privatisation did not begin to be a visible reality until the consolidation of the liberal régime in 1833. From that point on, legally speaking, all local communities were free to sell part of their patrimony with the purpose of reducing municipal debt. Nevertheless, though many villages made use of this possibility, the process of privatisation in Spain was only accelerated by the Law of General Disentitlement of 1 May 1855¹⁵.

In contrast with previous privatisation laws, this act, which was applied until 1924, not only authorized the partial sale of communal lands but, in fact, actually obliged Spanish municipalities to sell almost all of their rustic patrimony at public auction. The new liberal State only exempted from sale those lands of collective use in the strict sense of the expression (communal and gratuitous exploitation) and some old communal and municipal woodlands characterised by a specific ecological potentiality. The latter were, from then on, considered “woodlands of public utility” on account of their environmental value and were managed and, later, exploited by the Central Administration.

The main criterion for the exception of these surfaces (woodlands of public utility), to which liberal legislation added some other civil and State forests, was centred on the “dominant tree species”¹⁶. This idea, developed and extended by the embryonic Spanish forestry science since the middle of the 19th century, was founded on the not entirely correct assumption that the protective function of a woodland was conditioned by altitude and that it was altitude which determined the natural habitat of a tree species¹⁷. Such a disputed relationship, which was always present at the forest surveys made in Spain from 1855 on with the aim of establishing what woodlands to transfer into private hands and what ones to preserve from sale, must be taken into account because it can contribute to explain some of the results of my econometric exercises.

¹⁵ A critical review of the Spanish legislation in the matter of privatisation between 1750 and 1925 can be found in Jiménez Blanco (1996) and Linares (2002: 125-249).

¹⁶ Following this criterion, the forest expert initially classified three types of woodlands: to be exempted (fir, pine, juniper, lime, beech, chestnut, hazle, birch, alder, holly, common oak, gall oak and viburnum), possibly to be alienated (holm oak, cork tree and kermes oak) and woodlands to be privatised (ash, poplar, knotgrass, wild olive, terebinth, lentisc, broom, heather, arum, thyme and boxtree). Very soon, however, the budgetary necessities of the State substantially curtailed the conservationist tendencies of the first Spanish forest engineers. In 1862, the government disposed that only forest estates of more than 100 hectares, populated with pine, common oak or beech, would be exempted from sale because of their ecological value.

¹⁷ See Jiménez Blanco (1991: 253-254) and Gómez Mendoza (1992: 26-27).

Since the 1970s, Spanish historiography has tried to study the vast privatisation process triggered by the Law of General Disentitlement since 1855, making use of notarial registers or official notices of sale. Nevertheless, after many years of intense work in local, provincial and national archives, the results of this worthy attempt still leave a lot to be desired. We know in full detail how the transferences worked in some Spanish regions during certain periods, but we do not have comprehensive figures for the whole country. The absence of coordination and, above all, the enormous dispersion of original sources have prevented the immense effort of the last decades from being more beneficial¹⁸.

In recent times, this discouraging panorama has changed substantially. The renewed vitality that Forest History has acquired within Spanish Economic History since the middle of the 1980s has positively influenced the studies about the real effects of the Law of General Disentitlement¹⁹. The data which the Central Administration collected after 1855, in order to discern what lands to sell and what ones to preserve from public auction because of their gratuitous use or by virtue of their ecological value, give us a splendid statistical base to examine the Spanish privatisation process in aggregate figures. Although the task of reconstructing this process on a local scale is still in progress, we already have a first provincial quantitative approach thanks to the research published by Grupo de Estudios de Historia Rural (GEHR)²⁰.

This first statistical approximation is not free of problems. The original sources of GEHR's estimation are two general catalogues of public woodlands: the first one dating from 1859 and the second one produced in 1925. The surfaces which were included in them not only comprised old communal lands (*baldíos* and *comunes*) but also municipal (*propios* and *arbitrios*), civil (hospitals, schools, etc.) and State woodlands. Although the difference between communal and municipal assets is of no great consequence for this present research, the historical distinction between these and the remainder generates a small slant in the figures which is impossible to resolve for the purposes of my paper. Most of those civil and State woodlands were never exploited in common by Spanish rural communities and, therefore, their inclusion in the published data by GEHR overvalues somewhat the privatisation process that I am going to examine here. Fortunately, the slant is not substantial. According to catalogues of public woodlands, the surface occupied by civil and State forests in 1859 only represented 7.5 per cent of the total area of public woodlands. The rest of the catalogued surfaces all belonged to the villages (*propios*, *arbitrios*, *comunes* and *baldíos*).

As I pointed out before, the difference among these last categories does not pose too great a problem for my study. In fact, Spanish historiographical tradition suggests that they all derive from a shared root: communal land in the strict sense. The key to the historical distinction between them seems to be the greater or lesser control which municipalities exercised on them at different times. The word "propios" refers to assets with a limited and onerous utilisation which were regularly managed by local corporations to support the municipal budget. The term "arbitrios" usually applies to properties of collective and

¹⁸ See the historiographical revision of García Pérez (1995).

¹⁹ A critical review of the Spanish Forest History, from the field of Economic History, is found in Jiménez Blanco (2002).

²⁰ In particular, GEHR (1994).

gratuitous use which were temporally converted to onerous property so as to cover some financial emergency in the local accounts. The word “comunes” is employed to refer to possessions which were legally administered by municipalities but which were, in reality, assets of free and gratuitous utilisation by all of the neighbours. And, finally, the term “baldíos” normally designates grazing areas which were officially recognized as royal property but which were traditionally run by local corporations and exploited in common by one or more neighbouring communities²¹.

Despite this apparently clear differentiation, in practice it is very difficult to determine the exact status of a particular surface at different moments in time. As A. Nieto remarks, “the municipal patrimony, within all its diversity, remained only one (...): what today was exploited in common and freedom, tomorrow was rented to neighbours or to strangers (by means of a municipal tax) according to the momentary situation of the municipal accounts”²². This is the main reason why the figures that the Spanish catalogues of 1859 and 1925 offer for village woodlands do not affect the results of my tests substantially. Moreover, given that the greater or lesser dependence on local corporations denotes different levels of evolution between common and private property, I think that the use of these statistics contributes to improve the view of the Spanish privatisation process with regard to Hardin’s thesis.

But the problems of the primary sources do not stop there. As their very names indicate, the catalogues of 1859 and 1925 only took into account woodlands (pastures, woods and mixed surfaces of pastures, woods and intermittent crops) and not other types of communal, municipal, civil or State surfaces (croplands). Even though cultivated estates never represented the most important portion of collective assets in Spain as a whole, in many parts of the country these properties, above all the municipal ones, were the only remains of the old common patrimony by the middle of the 19th century. It is also important to take this aspect into account when considering the general results of my econometric estimations.

Likewise, it is necessary to bear in mind that not all of the village woodlands were included in the general catalogues of forests. Faced by the threat of public auction, many communities attempted and achieved to hide part of their rustic patrimony from the Central Administration²³. It is not easy to quantify this practice when the only sources available are the surveys of 1859 and 1925. The effort of reconstruction by contrasting numerous sources has been completed for Extremadura in my doctoral thesis but is impossible to achieve for all Spanish regions at the moment. One can only accept, therefore, the data published by GEHR as a first, but very useful, approximation to the privatisation process.

On the other hand, it must be pointed out that the chronology of these figures does not fully cover the contemporary privatisation of the Spanish collective patrimony. Even leaving aside the procedures previous to the middle of the 18th century, the latest research agrees that between 1750 and 1855, above all between 1808 and 1845, the process of privatisation, although less furthered by the State than during the period 1855-1925, reached a far from

²¹ See Nieto (1964), Cuadrado (1980), Mangas (1981) and Sánchez Salazar (1988).

²² Nieto (1964: 230).

²³ See Jiménez Blanco (1986), Balboa (1990), Manuel (1993), Moreno Fernández (1994), Montiel Molina (1995), Iriarte (1997) and Sabio (1997).

negligible rhythm in some areas of Spain²⁴. Furthermore, diverse evidences suggest that the period between 1855 (Law of General Disentitlement) and 1859 (First General Catalogue of Public Woodlands) was marked by an abundant number of hasty transfers of collective property²⁵, transfers that, regrettably, are not collected in the figures published by GEHR.

Finally, before proceeding to check Hardin's theory by using data of privatisation, it must be taking into account that the transfer into private hands was not the only form of redefinition of the collective rustic patrimony in Spain during the period under investigation. The "municipalisation" of old usages in non-privatised lands, the intrusion of State in the management of forests which had been exempted from sale or the ploughing of parcels in common properties contributed to modify traditional rights of access and use in collective assets without producing actual property changes²⁶. These other forms of redefinition are not collected in the figures available for Spain as a whole but they were considered by Hardin when he expounded his Neo-Malthusian theory in "The Tragedy of the Commons".

Under such circumstances, then, it might seem surprising to use the data published by GEHR with the purpose of checking the historical applicability of Hardin's thesis. However, there are two important arguments in their favour. First, these figures embody, at present, the only aggregated statistics for the redefinition process of communal property which took place in Spain as a whole since the middle of the 18th century. Second and more significant, the tests run for Extremadura with corrected data for the period 1750-1925 show that, in Neo-Malthusian terms, the local information available for this region behaves in the same way as the statistics published for all of Spain by GEHR.

II.1. The test

By using the figures published by GEHR (Table 1), it is very clear that the single legal framework (Law of General Disentitlement) did not produce the same effects in all Spanish regions²⁷. Privatisation was especially intense in the South of the country, both in provinces where public woodlands were still very important in relative terms in 1859 (Toledo, Cuenca, Murcia and Alicante) and in those where such properties were already reduced at the middle of the 19th century (Badajoz, Cáceres, Córdoba, Sevilla, Cádiz and Málaga). In the North, however, the figures reveal a clear distinction between Madrid, Ávila, Valladolid, Navarra, Zaragoza or Rioja and the remaining areas. In the former provinces, despite preserving a notable public patrimony at the end of the period, the property changes were very significant. In the rest of the North, privatisation was limited and, in some cases, almost imperceptible.

²⁴ See, for example, the works of Sánchez Salazar (1990), Otaegui (1991), Torre (1991), Fuentes Morcillo (1993) or Jiménez Blanco (1996)

²⁵ This is, at least, the conclusion of some authors like Artiaga (1991), Díez Espinosa (1993), Cabral (1995) or Jiménez Blanco (1996).

²⁶ The ploughing of communal lands, for instances, was an extensive practice in Navarra since the sixties of 19th century. See, in this respect, Iriarte (1997).

²⁷ The catalogues of public woodlands evaluated by GEHR provide data province by province, except for three aggregated groups: Baleares, Barcelona and Gerona; Córdoba, Huelva and Sevilla; La Coruña, Lugo, Orense and Pontevedra. No data is available for the three provinces of the Basque Country (Álava, Guipúzcoa and Vizcaya).

Table 1
Privatisation of public woodlands in Spain (1859-1925)

| Provinces | a | b | c | d | e | f | g | h | i | DEPENDENT VARIABLE |
|---------------------|----------------------|--------------------------|-------------|-------------------------|-------------|-------------------------|-------------|---|------------|--------------------|
| | Geographical Surface | Total Forest Area (1860) | b / a | Public Woodlands (1859) | d / a | Public Woodlands (1925) | f / a | Public Woodlands Privatised (1859-1925) | h / a | j |
| | Hectares | Hectares | % | Hectares | % | Hectares | % | Hectares | % | h / d |
| Albacete | 1,492,400 | 1,121,420 | 75.1 | 318,082 | 21.3 | 175,817 | 11.8 | 142,265 | 9.5 | 44.7 |
| Alicante | 561,700 | 347,808 | 61.9 | 141,667 | 25.2 | 64,375 | 11.5 | 77,292 | 13.8 | 54.6 |
| Almería | 877,500 | 645,208 | 73.5 | 168,393 | 19.2 | 94,750 | 10.8 | 73,643 | 8.4 | 43.7 |
| Ávila | 805,000 | 481,181 | 59.8 | 235,492 | 29.3 | 129,091 | 16.0 | 106,401 | 13.2 | 45.2 |
| Badajoz | 2,176,600 | 1,655,579 | 76.1 | 362,190 | 16.6 | 93,827 | 4.3 | 268,363 | 12.3 | 74.1 |
| Bal-Bar-Ger (1) | 1,863,000 | 1,063,008 | 57.1 | 63,522 | 3.4 | 60,260 | 3.2 | 3,262 | 0.2 | 5.1 |
| Burgos | 1,429,200 | 942,840 | 66.0 | 262,307 | 18.4 | 217,480 | 15.2 | 44,827 | 3.1 | 17.1 |
| Cáceres | 1,986,800 | 1,679,953 | 84.6 | 409,120 | 20.6 | 102,628 | 5.2 | 306,492 | 15.4 | 74.9 |
| Cádiz | 744,000 | 242,520 | 32.6 | 129,533 | 17.4 | 41,237 | 5.5 | 88,296 | 11.9 | 68.2 |
| Canarias | 744,700 | 471,395 | 63.3 | 193,875 | 26.0 | 94,290 | 12.7 | 99,585 | 13.4 | 51.4 |
| Castellón | 663,200 | 532,401 | 80.3 | 67,781 | 10.2 | 27,006 | 4.1 | 40,775 | 6.1 | 60.2 |
| Ciudad Real | 1,981,300 | 1,391,854 | 70.2 | 591,331 | 29.8 | 77,467 | 3.9 | 513,864 | 25.9 | 86.9 |
| Cór-Hue-Sev (2) | 3,793,500 | 2,285,161 | 60.2 | 398,370 | 10.5 | 118,709 | 3.1 | 279,661 | 7.4 | 70.2 |
| Cor-Lug-Ore-Pon (3) | 2,957,500 | 2,248,929 | 76.0 | 528,890 | 17.9 | 426,760 | 14.4 | 102,130 | 3.5 | 19.3 |
| Cuenca | 1,714,000 | 1,183,394 | 69.0 | 439,796 | 25.7 | 13,118 | 0.8 | 426,678 | 24.9 | 97.0 |
| Granada | 1,264,700 | 863,182 | 68.3 | 159,829 | 12.6 | 121,675 | 9.6 | 38,154 | 3.0 | 23.9 |
| Guadalajara | 1,221,400 | 935,458 | 76.6 | 178,423 | 14.6 | 147,832 | 12.1 | 30,591 | 2.5 | 17.1 |
| Huesca | 1,563,600 | 1,128,548 | 72.2 | 288,901 | 18.5 | 256,327 | 16.4 | 32,574 | 2.1 | 11.3 |
| Jaén | 1,349,600 | 704,514 | 52.2 | 401,659 | 29.8 | 226,284 | 16.8 | 175,375 | 13.0 | 43.7 |
| León | 1,558,100 | 1,030,248 | 66.1 | 655,400 | 42.1 | 623,285 | 40.0 | 32,115 | 2.1 | 4.9 |
| Lérida | 1,217,200 | 836,197 | 68.7 | 331,152 | 27.2 | 274,303 | 22.5 | 56,849 | 4.7 | 17.2 |
| Logroño | 504,500 | 322,950 | 64.0 | 189,508 | 37.6 | 134,302 | 26.6 | 55,206 | 10.9 | 29.1 |
| Madrid | 802,800 | 341,318 | 42.5 | 145,583 | 18.1 | 56,395 | 7.0 | 89,188 | 11.1 | 61.3 |
| Málaga | 730,600 | 334,261 | 45.8 | 165,994 | 22.7 | 61,698 | 8.4 | 104,296 | 14.3 | 62.8 |
| Murcia | 1,131,400 | 661,082 | 58.4 | 355,584 | 31.4 | 125,324 | 11.1 | 230,260 | 20.4 | 64.8 |
| Navarra | 1,039,100 | 755,137 | 72.7 | 592,708 | 57.0 | 458,230 | 44.1 | 134,478 | 12.9 | 22.7 |
| Oviedo | 1,060,400 | 836,744 | 78.9 | 408,601 | 38.5 | 339,422 | 32.0 | 69,179 | 6.5 | 16.9 |
| Palencia | 805,200 | 407,324 | 50.6 | 180,409 | 22.4 | 165,880 | 20.6 | 14,529 | 1.8 | 8.1 |
| Salamanca | 1,235,000 | 769,286 | 62.3 | 176,324 | 14.3 | 113,531 | 9.2 | 62,793 | 5.1 | 35.6 |
| Santander | 532,100 | 368,452 | 69.2 | 297,296 | 55.9 | 261,399 | 49.1 | 35,897 | 6.7 | 12.1 |
| Segovia | 692,100 | 393,524 | 56.9 | 124,006 | 17.9 | 105,149 | 15.2 | 18,857 | 2.7 | 15.2 |
| Soria | 1,030,600 | 676,343 | 65.6 | 158,876 | 15.4 | 150,794 | 14.6 | 8,082 | 0.8 | 5.1 |
| Tarragona | 630,300 | 304,942 | 48.4 | 52,160 | 8.3 | 49,308 | 7.8 | 2,852 | 0.5 | 5.5 |
| Teruel | 1,481,000 | 943,903 | 63.7 | 312,523 | 21.1 | 282,553 | 19.1 | 29,970 | 2.0 | 9.6 |
| Toledo | 1,537,000 | 861,834 | 56.1 | 406,036 | 26.4 | 74,294 | 4.8 | 331,742 | 21.6 | 81.7 |
| Valencia | 1,080,600 | 610,077 | 56.5 | 296,159 | 27.4 | 251,336 | 23.3 | 44,823 | 4.1 | 15.1 |
| Valladolid | 811,100 | 229,386 | 28.3 | 135,021 | 16.6 | 50,166 | 6.2 | 84,855 | 10.5 | 62.8 |
| Zamora | 1,056,100 | 663,026 | 62.8 | 98,442 | 9.3 | 58,801 | 5.6 | 39,641 | 3.8 | 40.3 |
| Zaragoza | 1,719,400 | 1,255,293 | 72.7 | 1,046,298 | 60.9 | 563,525 | 32.6 | 482,773 | 27.9 | 46.1 |
| SPAIN (4) | 49,789,311 | 32,525,680 | 65.3 | 11,467,241 | 23.0 | 6,838,628 | 13.7 | 4,762,481 | 9.6 | 41.5 |

- (1) Baleares, Barcelona and Gerona
(2) Córdoba, Huelva and Sevilla
(3) La Coruña, Lugo, Orense and Pontevedra (Galicia)
(4) There is no data for the three Basque provinces

SOURCES: GEHR (1994: 140-143).

In a first approximation to regional differences, GEHR focuses on the social features of each area and on the diverse historical development which generated them. In contrast to the assumptions traditionally adopted by Spanish historiography, this research group rejects as determining factors both the physical conditions and the greater or lesser agricultural vocation. Thus, for instance, the proportion of geographical surface occupied by all forest area of Badajoz and Cáceres in 1860 was very similar to the one detected in Navarra or Zaragoza; nevertheless, the percentage of public woodlands in 1859 was very different. Likewise, Baleares, Barcelona, Gerona and Tarragona had a total forest surface close to 50 per cent in 1860 but their public woodlands in 1859 did not reach 8 per cent of their respective provincial areas (Table 1: c and e).

This first impression, taken from a simple observation of the figures, can be reinforced by means of a basic exercise of multiple linear regressions. By using as a dependent variable the percentage of public woodlands that were privatised in each Spanish province during the period 1859-1925 with regard to the respective surface of public forest in 1859 (Table 1: j), I have tried to verify the connection existing between, on the one hand, the privatisation process and, on the other hand, the initial agrarian vocation and the physical environment. For the initial productive preference (agricultural, livestock or forest), I have employed, as GEHR does, the proportion of total forest area in 1860 relating to total geographical surface of each province (Table 1: c). For the physical setting, I have composed three distinct indices: altitude, humidity, and temperature (Appendix I: A, B and C)²⁸.

The hypothesis to test is based on the supposed agricultural motivation on which Spanish historiography has conventionally insisted to explain the privatisation process as a whole. According to this hypothetical motivation, it would be logical to think that the greater predominance of forest surface at the middle of the 19th century could reflect a reduced historical trend towards the privatisation of communal (public) woodland and, therefore, a greater degree of support for the maintenance of collective property since 1855 in reaction to the Law of General Disentitlement. From this point of view, the sign of the coefficient estimated for the first independent variable (percentage of total forest area in 1860 with regard to total geographical surface) should be, evidently, negative.

A similar direction should be shown by the second (altitude) and third explicative variables (humidity). Taking into account that a greater intensity of these two variables may give rise to a more diverse and dense vegetation and, therefore, can contribute to promote the multi-faceted use of the forest surface, it is logical to think that such an intensity can also slow down the privatisation process as understood by traditional historiography. Besides, the preponderance of altitude and the greater vegetation density, in terms of accessibility, may be considered as technical obstacles for the cultivation of privatised woodland surfaces²⁹.

²⁸ To build the altitude index (percentage of surface higher than 1,001 metres over geographical surface of each province), I have used the updated figures of INE (2001). For the humidity index, I have calculated the annual average of each Spanish province with the local data (precipitations/potential evapo-transpiration) given by Elías Castillo and Ruiz Beltrán (1977). With the figures collected by these same authors for the period 1931-1970, I have composed the temperature index (provincial annual average in centigrade degrees).

²⁹ In reality, to test the accessibility by means of a physical variable, it would be more advisable to employ slope as a parameter rather than altitude. However, in Spain, this type of data is available only in isolated form.

Exercise 1
Determining Factors for Spanish Privatisation (1859-1925)

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| Constant | 29.46 (0.75) | 52.83** (4.62) | 77.19** (7.26) | 76.02** (5.56) | 42.49** (3.28) | 36.79** (3.21) | 48.48 (0.95) |
| Altitude (%) | -0.57* (2.65) | | -0.85** (4.55) | -0.77** (4.13) | -0.55** (2.87) | -0.46** (2.70) | -0.47* (2.17) |
| Humidity Precip. / potential evapo-transp. | -17.02 (1.44) | | | | | | -7.61 (0.38) |
| Temperature (°C) | 2.05 (0.97) | | | | | | -1.18 (0.05) |
| Forest Surf. (1860) / Geo. Surface (%) | 0.14 (0.46) | | | | | | 0.09 (0.25) |
| Population Density (1860) (Inhabitant / Hectare) | | -9.33 (0.35) | -44.66* (1.96) | | | -45.69* (2.36) | -7.03 (0.13) |
| Livestock Density (1865) (Kg / Hectare) | | -0.18 (1.18) | -0.10 (0.84) | -1.19 (1.61) | | | 0.03 (0.16) |
| Population Growth (1787-1860) (%) | | | | -0.18 (1.09) | | | -0.17 (0.99) |
| Property Ranks (1956) (1-6) | | | | | 6.93** (3.17) | | 3.66 (0.91) |
| Urbanisation Rate (1860) (%) | | | | | | -0.04 (0.19) | 0.11 (0.32) |
| Population Distribution (1900) (Hectares / Settlement) | | | | | | 0.00** (3.76) | 0.00 (1.34) |
| Industrial Working Population (1860) (%) | | | | | | -0.92 (0.53) | -1.97 (0.72) |
| Adjusted R ² | 0.32 | 0.00 | 0.35 | 0.30 | 0.48 | 0.53 | 0.46 |
| F-Statistic | 5.46 | 0.95 | 7.90 | 6.56 | 13.03 | 11.82 | 3.1 |
| White Heteroskedasticity Test | 11.97 | 8.86 | 6.96 | 9.02 | 11.67 | 12.84 | 26.52 |

DEPENDENT VARIABLE: Surface of privatised public woodlands (1859-1925) relating to surface public woodlands (1859) (%)
Number of observations: 39

(t-statistic)

Significance Level:

* 5 % significance level

** 1 % significance level

Finally, according to conventional interpretation, the fourth variable (temperature) should give a positive sign in the proposed regression exercise: in theory, greater temperature produces lesser vegetation diversity and density, which in turn discourages multi-faceted use and promotes crop cultivation, all of which may support changes to property rights³⁰.

The results of the proposed hypothesis do not leave many doubts (Exercise 1: 1). The determination coefficient (Adjusted $R^2 = 0.32$) is too low to directly relate the Spanish privatisation of communal (public) woodland to the natural environment of each area and, even less, to provincial agrarian vocation. The signs are, certainly, the expected ones, but the significance levels are all irrelevant, except for altitude. In this case, however, it is difficult to know if the employed index denotes a real physical factor or works as a proxy of forest policy. Bearing in mind that the main criterion for the exception from privatisation of “woodlands of public utility” from 1855 was the “dominant tree species” and that altitude was the parameter chosen to put into effect such a principle, it would be too simplistic to regard altitude as a plain and innocent natural condition.

On the other hand, it would not be advisable either to overstate the explanatory strength of the political variant which underlies altitude and, from that, to consider all of the privatisation process to be a merely legal issue. If it were so, this indicator should be able to explain by itself the greater part of the property changes which are collected in the dependent variable, something that is statistically doubtful in the light of the first regression exercise. In my opinion, this test, as a whole, indicates that the initial agrarian preference has no relevance and the physical conditions only a limited importance for the comprehension of the marked provincial differences in the Spanish privatisation. In this sense, GEHR may be correct when it affirms that the intensity of this process was not conditioned by the productive vocation of each area or by the natural environment.

Without losing sight of this idea, I will proceed to test Hardin’s thesis. With this intent, I have prepared a new multiple linear regression by using as independent variables the existing data about population and livestock density at the starting point (1859). In first case (population density), I have employed the provincial information taken from Spanish Population Census of 1860 (Appendix I: D)³¹. In the second one (livestock density), I have had to utilize the data collected in the Spanish Livestock Census of 1865 (Appendix I: E)³².

As in all livestock surveys carried out in Spain before 1942, the census of 1865, which was the first statistical livestock register in the country, took into account young animals aged less than one year. This method is disputed for chronological comparative studies as stock numbers can change perceptibly depending on the season chosen to produce the survey. For the present paper, however, the major impediment to use the 1865 survey is the interval of time that passed since the production of the Catalogue of Public Woodlands of 1859. Given that the changes in property status of the first years of application of the Law of General Disentitlement could have been accompanied by changes in livestock holdings, it is difficult

³⁰ This last hypothesis would be deficient if the regression exercise did not also include other climatic variables like humidity. In fact, the optimal method would be to include an aridity index, but, unfortunately no aggregate data is available for Spain.

³¹ See, on this subject, the old, although still valid, analysis of Melón (1951).

³² See Cabo Alonso (1960) and GEHR (1985).

to establish the trend of the relationship, if indeed it existed, between privatisation and livestock density. In any case, as the register of 1865 is the closest to the starting point of the studied process, I will assume that this census is a valid indicator to test Hardin's thesis³³.

According to it, the signs expected for the two considered independent variables (population density and livestock density) should be positive. The hypothesis to check is that there is a linear and direct relationship between pressure on the land and the privatisation process; in other words, whether a greater initial population and livestock density could be, by itself, a determining factor in the transformation of common (public) property into private property. What do Spanish statistics tell us about this subject?

Consistent with the result of the new equation (Exercise 1: 2), it is difficult, if not impossible, to assert that there is a clear relationship between the process of privatisation and demographic or livestock density. What is more, contrary to all expectations, the signs of the estimated coefficients are not positive but negative. That is to say that, according to this new exercise, if any linear connection existed between density and property changes in Spain, which is not easy to believe in the light of the adjusted determination coefficient, it would be inverse rather than direct.

Although the possibility of this negative association casts doubt on the explanatory strength of Hardin's proposal for the Spanish case, it seems clear that, in order to check the validity of the Neo-Malthusian thesis, it is, at least, necessary to introduce an agro-climatic variable into the analysis to weight the density with the productive aptitude of each region. By doing so, demographic pressure and livestock capacity would probably acquire a greater depth of meaning and the supposed relationship between density and privatisation would be more representative. In this guise, there is also an approximation to the idea commonly found in traditional historiography that, in pre-industrial societies, the density is closely related to natural conditions. From this perspective, then, without rejecting Hardin's theory outright, there would be a chance to complement it with some of the available physical indicators.

In spite of the fact that this paper is not the most adequate place to re-formulate the assumption which underlies "The Tragedy of the Commons" and even though the relationship between privatisation and natural environment as such has already been questioned, I have re-tested this possibility by adding to the terms of the second equation the independent variable whose coefficient was significant in the first one: altitude. Likewise, with the aim of checking the Neo-Malthusian thesis by means of dynamic parameters rather than by static ones, such as the starting density, I have built a new demographic variable: the percentage variation of population size in each province between 1787 and 1860³⁴ (Appendix I: F). The statistical effect of this additional parameter in the multiple linear regression is collated in the fourth equation. Unfortunately, I have not been able to also include a dynamic variable for livestock because, apart from the already mentioned problems that the old Spanish livestock registers pose in non cross-section studies, the only information available for the most of the country before 1865 was published exclusively at regional and not at provincial level³⁵.

³³ To homogenize the information given by Livestock Census of 1865 (number of heads by species), I have made use of the equivalences of live weight for each species as calculated by Flores de Lemus (1951: 156).

³⁴ The population data of 1787 come from the so-called Census of Floridablanca, published by INE (1981).

³⁵ See notes 47 and 50.

In any case, the improvement of the determination coefficients thanks to the addition of the new variables is not significant enough to confirm Hardin's thesis. The inclusion of demographic growth into the analysis (Exercise 1: 4) certainly improves the adjusted R^2 of the second equation, but, far from supporting the explicatory capability of the population factor, which again shows a negative sign, contributes to increase the significance level of altitude itself. However, the combination of density at the starting point and the physical parameters (Exercise 1: 3), not only improves the determination coefficient, but also enhances the significance level of altitude and demographic pressure. Even so, the R^2 continues to offer a relatively low value and, of course, all independent variables persist with negative signs.

With the data set employed here, then, the Neo-Malthusian thesis that underlies "The Tragedy of the Commons", still prevailing in many works about disintegration of communal systems, has no statistical support. This does not imply that the redefinition of collective property in any part of the world has never been related to the demographic or livestock pressure on the land. In fact, if livestock density is ruled out, the third equation seems to show that, to some extent, there is a relationship, though minor and indirect, between population density and the privatisation process. But, how can its unexpected sign be explained?

Although it is not easy to answer this question, I would even go so far as to say that the incidence of population density in Spain is more related to the historical structure of land property and, therefore, to the social and political evolution of each region than to the privatisation itself. Moreover, I would argue that what the third equation reflects is, in reality, the likely relationship between, on the one hand, the different prevailing systems of access, distribution, tenancy and control of the land and, on the other hand, the subsequent privatisation process. In this sense, for instance, it would be coherent to think that a predominance of large landholdings, together with a rigidity of leasehold arrangements and the technical possibility of concentrating several uses within the same exploitation (crops, grazing and forestry) could not only embody an obstacle to the growth of population density, but also represent the main support of small groups of local power with political capacity to promote and control the process of privatisation. In contrast, a preponderance of small property, a flexible land market and the chance to supplement household income with the gratuitous exploitation of collective rustic patrimony could act, historically speaking, not only as an encouragement to demographic expansion, but also as an important stimulus to a reduced social differentiation while contributing to the protection of the communal system against privatisation. These two examples, however, do not take into account other possibly relevant factors such as the different systems of inheritance, the diverse forms of land tenancy, the agrarian technology available or the fiscal pressure on rustic property³⁶.

³⁶ Some instances from Northern Europe question the linear dissolution of communal systems as a consequence of population growth. In areas with agricultural vocation and with hereditary partition of land, the demographic expansion in the 12th and 13th centuries, rather than promoting the disintegration of the commons, encouraged the reform of the prevailing systems of exploitation in order to avoid the problems produced by widely dispersed family land plots. The total productive surface was then divided into three rotation areas in which every household had its own plot. Many communities, above all those with lesser social differentiation and lesser manorial fiscal pressure, thus introduced a system of temporal re-distribution of the land which aimed to adapt domestic unit resources to changes in family size and, at the same time, to balance income opportunities in order to equalize the fiscal capacity of each household. For more details, see Sala (1998: 34-39).

Unfortunately, the explanatory strength of each and every of the variables that shape the complex property structure in Spain cannot be statistically checked at moment. Not even the degree of predominance of large or small property holdings can be quantified for the country as a whole until the 1960s. It was only then that the first rustic property cadastre was finally concluded after almost six decades in the making. For previous periods, apart from some cadastral advances of the 1930s corresponding to the southern half of Spain, the scarce data available on this subject are local or, at best, provincial samples, but never aggregate figures for the whole the country. This void prevents me not only from testing the relationship between population density and land distribution, but also, and more importantly, from checking if the different established property systems can explain the distinct intensity which the privatisation process achieved in Spain between 1859 and 1925.

Nonetheless, with the purpose of smoothing the way for subsequent investigation, I have attempted to superficially test this hypothetical connection by using as an independent variable the partial data about small landowners that E. Malefakis (1982: 121-122) took from a farming survey of 1956 (Appendix I: G)³⁷. This addition (Exercise 1: 5) certainly improves the adjusted coefficient ($R^2 = 0.48$). The new variable is significant in the multiple regression and the sign of its coefficient is as expected. With this result, it is possible to suppose that the lower the proportion of small landowners, the greater the intensity of the privatisation. However, such a supposition remains no more than a provisional confirmation of the hypothesis put forward. The determination coefficient estimated in the new equation continues to be relatively low and the data of 1956 are not accurate enough as well as being too far removed in time from the process under investigation. My test only suggests that, in order to clarify the historical dissolution of collective property, institutional factors, like the prevailing land distribution system, may be much more important than demographic variables, such as “The Tragedy of the Commons” understood them.

It must be remarked that the sources employed here to reconstruct the process of dissolution of collective lands in Spain are not free of problems. The slant in the figures generated by the inclusion of civil and State forests, the absence of data concerning privatised croplands, the impossibility to discount the practice of concealment and the very chronology of the reconstruction are all distorting circumstances which call for prudence. Equally, it must be considered that, in the Spanish case, privatisation was not the only form of dissolution of the commons. The “municipalisation” of usages, the intrusion of the Central Administration in the management of forests which were exempted from public auction or the ploughing of lands in common properties contributed to modify traditional rights of access and use in collective patrimonies without producing actual property changes per se³⁸. Given that these other forms of redefinition are not collected in my estimations, it would be dishonest to reject Hardin’s thesis outright by using data which do not cover all the likely variants of the process described by him.

³⁷ The property ranks (1-6), established with the support of such data, have been taken from Sánchez Alonso (1995: 300-301). A lower rank means a greater percentage of small landowners with regard to the total working agrarian male population.

³⁸ The ploughing of communal lands, for instances, was an extensive practice in Navarra since the sixties of 19th century. See, in this respect, Iriarte (1997).

Leaving Hardin aside, I have tried to check one of the most suggestive proposal concerning the possible determining factors of the crisis of the commons: the one put forward by R.B. Noorgard. Although this author, too, insists on the size of the community as an aspect to be considered in order to explain the redefinition of collective property in pre-industrial societies, the basis of his thesis is not demographic density as such, but the capacity of negotiation of the users of the commons. Noorgard's initial proposal, which is taken from *New Institutional Economy*, maintains that the rise of the number of users in small rural communities can impede (or render more expensive) the consensus among them and, therefore, interfere with the defence of the communal system. Consequently, his focus is not so much placed on the changes in demographic density themselves, but rather on the change of scale of the scenario where decisions are usually taken. According to Noorgard's conclusions, this modification of scale becomes more dangerous to the continuity of collective property as the distance between the place of communal production and the points of consumption decreases³⁹.

This last proposal, directly connected to the changes in market size, is the most valuable for the intentions of this paper because it is the only one that can be checked with the data available for Spain. In this sense, even though the main explanatory factor in Noorgard's thesis is the distance between the rural and the urban world, something which is difficult to measure at provincial level, it appears reasonable to make use of an urbanisation rate and an index of the geographical distribution of population as proxies for this factor.

In the first case (urbanisation rate), it would seem advisable to employ the Spanish Population Census of 1887 which collected data by settlements. However, given that there are almost thirty years of difference between this census and the production of the first public woodlands survey, I prefer to use the figures of the Census of 1860⁴⁰. The main problem that this survey poses is that it does not compute the population by settlements but by municipal districts. This can give rise to an overvaluation of the urbanisation rate in those areas where the dispersion of the population is a predominant feature. In spite of this, the proximity to the starting point of the process under analysis recommends the use of the urbanisation coefficients taken from the data of 1860 (Appendix I: H)⁴¹.

For the geographical distribution of population, I have divided the total surface of each province by the number of settlements in the province as defined by the Spanish Nomenclator of 1900 (Appendix I: I). The purpose of this simple index is to have a measure for the type of habitat (scattered or concentrated) prevalent in the different regions of Spain. Evidently, the form of human establishment is not a measure for the distance between rural and urban world, but, in pre-industrial societies, can work out as a good indicator of the degree of exposure to market forces. In this way, it seems logical to think that a dispersed community is less open to the market than a concentrated one and therefore, according to Noorgard's proposal, more inclined to preserve common property. From this point of view, the expected sign for the my index of geographical distribution of population would clearly be positive.

³⁹ See Noorgard (1995).

⁴⁰ Both the urbanisation rates of 1860 and 1887 have been calculated and published by Luna (1988: 62-65).

⁴¹ However, I have also tested the explanatory capacity of the 1887 census rates and the difference with regard to the data of 1860 is not significant for the purposes of this paper.

In addition to this index, I have decided to incorporate into the new estimation another independent variable: the proportion of industrial workforce with regard to the total population of 1860 (Appendix I: J). The idea behind this inclusion is that the industrial population rate can be a relatively valid indicator for the degree of economic development and, at the same time, in keeping with Noorgard's theory, a possible proxy for market size. Obviously, this rate, as occurs with all working population coefficients derived from nineteenth-century Spanish censi, poses serious problems when it is employed as an authentic index of provincial economic development, but much less so when used as an approximate indicator of market maturity. For my purposes, it is only applied as a complement to the urbanisation rate and the population geographical distribution index. In this configuration, the expected sign for the industrial workforce coefficient, like for the urban variable and the indicator of habitat, would evidently be positive: the greater the proportion of industrial population, the greater the market development and, therefore, the greater the encouragement to convert common (public) property into private property.

The result of the econometric test (Exercise 1: 6) leaves much to be desired regarding this last aspect. The sign of the coefficient for the third variable is not the expected one and its significance level is null. It is therefore clear that, at least for Spain, the relative weight of the industrial working population does not play a role when the main object is to try to understand the determining factors of the privatisation process.

The greater or lesser level of urbanisation does not seem to have a substantial influence on this process either. In the new estimation, the significance level of the urban variable is also null. Besides and contrary to expectation, the sign of its coefficient is negative. In the light of such results it is difficult to accept that the different degree of urbanisation could determine the different degree of development with was achieved in Spain by the privatisation of communal lands between 1859 and 1925.

Nevertheless, as a result of the new estimation, Noorgard's thesis cannot be excluded. In fact, the significance level shown by the index of geographical distribution of population and the improvement that the determination coefficient experiences before its inclusion (Adjusted $R^2 = 0.53$) with regard to the econometric check of Hardin's theory (Exercise 1: 2) seem to indicate that, even though property right changes are related to factors of much greater complexity than have been analysed here, a greater exposure to the market, via concentration of population, could contribute to the dissolution of collective patrimony.

But the distribution of population is not only an indicator of the degree of exposure to the market forces. The greater or lesser dispersion of population could be also considered as a sign of the level of social differentiation in the rural world: it seems coherent to suppose that scattered communities are more internally balanced in terms of economic power or capacity for political decision than concentrated ones. In this sense and in view of the new estimation, I agree with Noorgard when he points out isolation as an important encouragement for the social consensus that, in many ways, is necessary for the survival of collective property. However, the determination coefficient given by the sixth equation, though even it is clearly the highest of the present exercise, is not significant enough to emphatically affirm that the form of human establishment is a totally decisive factor in the privatisation process which took place in Spain after the Law of General Disentitlement.

This, then, is the final conclusion of my first exercise. None of the variables checked here demonstrates sufficient weight to establish a global explanatory model of the Spanish privatisation process. From my point of view, this already says much. On the one hand, given the results of my estimations, it seems difficult to continue maintaining Hardin's demographic thesis, either implicitly or explicitly, without serious reservations. The greater intensity of the privatisation, at least in Spain during the period 1859-1925, bears no relationship to greater livestock or population density. If any connection is to be construed, then the relationship would be inverse, but in no case direct. On the other hand, but closely linked to this last point, the first regression exercise demonstrates that the factors that could really explain the diversity of the privatisation process in the Spanish case may underlie or affect the factors examined, but they have not all been tested here. In this sense, the institutional and social aspects (forest policy, land sharing, property distribution, tenancy models, inheritance systems, fiscal pressure, capacity of political negotiation or social differentiation among others) are destined to be factors of greater weight in a consistent clarification of the crisis of the communal system. In addition to them, my exercise suggests that there are external factors, such as the urbanisation process or the irruption of the market in the rural world, which could complement the general explanation but cannot, by themselves, account for the process of privatisation of communal (public) lands in Spain between 1859 and 1925⁴².

III. The redefinition of collective property in Extremadura (1750-1925)

Extremadura (Badajoz and Cáceres) was one of the Spanish regions most affected by the consequences of the Law of General Disentitlement in relative terms (Table 1: j). However, as the proportion of public woodlands of 1859 relating to the geographical surface suggests (Table 1: e), the dissolution of communal lands in the region was already much advanced by the middle of the 19th century. In effect, my doctoral thesis reveals that, between 1750 and 1855, the privatisation of the forest spaces traditionally assigned to collective use (pastures, woods and mixed surfaces of pastures, woods and intermittent crops), without reaching the impetus of the subsequent process, was indeed considerable. Almost 30 per cent of total communal and municipal woodland surface transferred to private hands between 1750 and 1925 was privatised during the phase 1750-1855 (Table 2: k). This notable proportion, estimated by employing different sources to which I briefly refer below, permits to test Hardin's thesis, not only within a broader timeframe, but also in a context in which State intervention was less decisive with reference to the privatisation model itself⁴³.

⁴² It must be considered that the process of integration of a national market in Spain, above all with regard to agrarian products, began to be a visible reality since the middle of the 19th century, coinciding with the appearance of the first railways. Unfortunately, the provincial data available on this subject are not comprehensive enough to incorporate them into a multiple linear regression exercise. However, for the future, in order to test the real applicability of Noorgard's thesis concerning the distance between the place of communal production and the points of consumption, it would be desirable to obtain some type of measure for this process of integration. In this manner, perhaps market forces would become more representative statistically speaking.

⁴³ For an approach to this context, see, among others, Sánchez Salazar (1990), Otaegui (1991), Torre (1991), Fuentes Morcillo (1993), Jiménez Blanco (1996) and Linares (2002).

Even though the Spanish Monarchy provided Extremadura with flexible legal instruments regarding the redefinition of collective property in the second half of the 18th century and although the nascent liberal State authorized the sale of part of the old communal patrimony at different moments of the first half of the 19th century, the privatisation process previous to 1855 was basically defined by local requirements and by the absence of specific rules about how and what to privatise. So much so that during the period in which the legal framework gave the rural community a greater facility to access to the full property of communal lands (1834-1840), the transfers in the region were less important in absolute terms than in those other stages during which State imposed more restrictive norms (1840-1845) or in which the State was not even present (1808-1814). Besides, in contrast to what occurred after 1855, participation in this non-regulated process was limited almost exclusively to the inhabitants of the townships where the lands to be privatised were located. The change in property status was not generally preceded by public auctions, but by municipal adjudications or, at best, local distributions in which eligibility was determined by residence in the very neighbourhood. This does not imply, in any way, that the privatisation process in Extremadura between 1750 and 1855 was a socially balanced process. In truth, as was to happen later also, local power groups (large property owners with influence in the municipal corporations) were to reap the greatest benefit from the whole procedure⁴⁴.

In the present paper, my interest in such a process is not related to the social differences it could promote but, in keeping to the objectives set out, to the different factors which can explain it. To be exact, the main interest centres on the possibility of testing them by using privatisation data that are much more suited to the purpose of this work (collective patrimony and not public property) and which cover a more extensive period of time. As with the figures for Spain as a whole, the point of departure for these data is the forest information collected by the Central Administration starting 1859 to determine the public surfaces to be sold. This general information, contrasted and corrected with sources of local character, has been examined woodland by woodland and projected backwards by employing as references various surveys carried out by the State in Extremadura around the middle of the 19th century as well as the information which the Monarchy gathered from the villages of the region between 1750 and 1755 to create the so-called *Catastro del Marqués de la Ensenada*⁴⁵.

The result of such evaluation is a rigorous local assessment of all of the communal and municipal forest surfaces that were transferred to private hands in Extremadura from the middle of the 18th century until 1925. This estimation possesses some additional advantages over the data published for Spain as a whole: while excluding civil and State properties, it includes sales of the confused period 1855-1859 and corrects to a great extent the error contained in the overall Spanish figures due to the concealment practised by towns to avoid the action of the Law of General Disentitlement. Besides, given that in Extremadura the redefinition of common property preponderantly took the form of privatisation, the statistical reconstruction of this process smoothes the distorting effect of those other forms of dissolution of collective patrimony which cannot be quantified for the Spanish case.

⁴⁴ See Linares (2002: 286-378).

⁴⁵ The reconstruction method is exhaustively explained in Linares (2002: 251-285).

Table 2
Privatisation of communal and municipal woodlands in Extremadura (1750-1925)

| Judicial Districts | a | b | c | d | e | f | g | Dependent Variables | | | k | l |
|------------------------|----------------------|---|---|---|---|---|---|------------------------------|-------------|-------------|---------------------------|---------------------------|
| | Geographical Surface | Communal and Municipal Woodlands (1750) | Communal and Municipal Woodlands (1855) | Communal and Municipal Woodlands (1925) | b - c | c - d | b - d | Percentages of Privatisation | | | e / g | f / g |
| | | | | | Communal and Municipal Woodlands Privatised (1750-1855) | Communal and Municipal Woodlands Privatised (1855-1925) | Communal and Municipal Woodlands Privatised (1750-1925) | h | i | j | e / g | f / g |
| | | | | | (1750-1855) / 1750 | (1855-1925) / 1855 | (1750-1925) / 1750 | e / b | f / c | g / b | (1750-1855) / (1750-1925) | (1855-1925) / (1750-1925) |
| Hectares | Hectares | Hectares | Hectares | Hectares | Hectares | Hectares | Hectares | % | % | % | % | % |
| Alburquerque | 130,027 | 62,288 | 46,592 | 42,776 | 15,696 | 3,816 | 19,512 | 25.2 | 8.2 | 31.3 | 80.4 | 19.6 |
| Almendralejo | 147,571 | 36,445 | 23,453 | 79 | 12,992 | 23,374 | 36,366 | 35.6 | 99.7 | 99.8 | 35.7 | 64.3 |
| Badajoz | 161,863 | 81,884 | 12,392 | 96 | 69,492 | 12,296 | 81,788 | 84.9 | 99.2 | 99.9 | 85.0 | 15.0 |
| Castuera | 211,112 | 59,208 | 24,936 | 1,714 | 34,272 | 23,222 | 57,494 | 57.9 | 93.1 | 97.1 | 59.6 | 40.4 |
| Don Benito | 108,725 | 38,442 | 29,899 | 906 | 8,543 | 28,993 | 37,536 | 22.2 | 97.0 | 97.6 | 22.8 | 77.2 |
| Fregenal | 91,582 | 20,239 | 16,219 | 175 | 4,020 | 16,044 | 20,064 | 19.9 | 98.9 | 99.1 | 20.0 | 80.0 |
| Fuente de Cantos | 143,137 | 53,736 | 41,050 | 916 | 12,686 | 40,134 | 52,820 | 23.6 | 97.8 | 98.3 | 24.0 | 76.0 |
| Herrera del Duque | 192,185 | 94,959 | 94,218 | 41,861 | 741 | 52,357 | 53,098 | 0.8 | 55.6 | 55.9 | 1.4 | 98.6 |
| Jerez | 130,159 | 27,816 | 15,987 | 3,379 | 11,829 | 12,608 | 24,437 | 42.5 | 78.9 | 87.9 | 48.4 | 51.6 |
| Llerena | 237,264 | 65,169 | 56,363 | 5,823 | 8,806 | 50,540 | 59,346 | 13.5 | 89.7 | 91.1 | 14.8 | 85.2 |
| Mérida | 189,524 | 53,422 | 33,385 | 1,492 | 20,037 | 31,893 | 51,930 | 37.5 | 95.5 | 97.2 | 38.6 | 61.4 |
| Olivenza | 143,055 | 60,838 | 52,133 | 512 | 8,705 | 51,621 | 60,326 | 14.3 | 99.0 | 99.2 | 14.4 | 85.6 |
| Puebla de Alcocer | 144,343 | 30,405 | 25,239 | 2,361 | 5,166 | 22,878 | 28,044 | 17.0 | 90.6 | 92.2 | 18.4 | 81.6 |
| Villanueva | 73,573 | 14,344 | 12,076 | 1,486 | 2,268 | 10,590 | 12,858 | 15.8 | 87.7 | 89.6 | 17.6 | 82.4 |
| Zafra | 73,109 | 21,221 | 11,825 | 645 | 9,396 | 11,180 | 20,576 | 44.3 | 94.5 | 97.0 | 45.7 | 54.3 |
| BADAJOS (Prov.) | 2,177,229 | 720,416 | 495,767 | 104,221 | 224,649 | 391,546 | 616,195 | 31.2 | 79.0 | 85.5 | 36.5 | 63.5 |
| Alcántara | 137,591 | 30,269 | 23,404 | 3,966 | 6,865 | 19,438 | 26,303 | 22.7 | 83.1 | 86.9 | 26.1 | 73.9 |
| Cáceres | 223,481 | 50,709 | 44,115 | 4,202 | 6,594 | 39,913 | 46,507 | 13.0 | 90.5 | 91.7 | 14.2 | 85.8 |
| Coria | 106,542 | 41,605 | 29,695 | 7,276 | 11,910 | 22,419 | 34,329 | 28.6 | 75.5 | 82.5 | 34.7 | 65.3 |
| Garrovillas | 124,861 | 45,689 | 37,934 | 9,872 | 7,755 | 28,062 | 35,817 | 17.0 | 74.0 | 78.4 | 21.7 | 78.3 |
| Hervás | 137,765 | 63,939 | 63,042 | 45,105 | 897 | 17,937 | 18,834 | 1.4 | 28.5 | 29.5 | 4.8 | 95.2 |
| Hoyos | 106,664 | 44,907 | 16,770 | 7,143 | 28,137 | 9,627 | 37,764 | 62.7 | 57.4 | 84.1 | 74.5 | 25.5 |
| Jarandilla | 89,390 | 59,869 | 49,536 | 25,101 | 10,333 | 24,435 | 34,768 | 17.3 | 49.3 | 58.1 | 29.7 | 70.3 |
| Logrosán | 241,534 | 133,056 | 106,005 | 9,368 | 27,051 | 96,637 | 123,688 | 20.3 | 91.2 | 93.0 | 21.9 | 78.1 |
| Montánchez | 72,256 | 54,041 | 49,701 | 4,538 | 4,340 | 45,163 | 49,503 | 8.0 | 90.9 | 91.6 | 8.8 | 91.2 |
| Navalmoral | 227,750 | 83,984 | 72,598 | 8,948 | 11,386 | 63,650 | 75,036 | 13.6 | 87.7 | 89.3 | 15.2 | 84.8 |
| Plasencia | 188,319 | 60,132 | 38,188 | 15,240 | 21,944 | 22,948 | 44,892 | 36.5 | 60.1 | 74.7 | 48.9 | 51.1 |
| Trujillo | 199,974 | 136,071 | 128,142 | 5,734 | 7,929 | 122,408 | 130,337 | 5.8 | 95.5 | 95.8 | 6.1 | 93.9 |
| Valencia de A. | 123,868 | 30,754 | 19,414 | 1,807 | 11,340 | 17,607 | 28,947 | 36.9 | 90.7 | 94.1 | 39.2 | 60.8 |
| CÁCERES (Prov.) | 1,979,995 | 835,025 | 678,544 | 148,300 | 156,481 | 530,244 | 686,725 | 18.7 | 78.1 | 82.2 | 22.8 | 77.2 |
| EXTREMADURA | 4,157,224 | 1,555,441 | 1,174,311 | 252,521 | 381,130 | 921,790 | 1,302,920 | 24.5 | 78.5 | 83.8 | 29.3 | 70.7 |

SOURCES: Linares (2002: 287-293).

This local reconstruction, grouped for the present paper by judicial districts⁴⁶, constitutes the statistical base for the three dependent variables of my next multiple linear regressions. The first one involves the percentage of privatised communal and municipal woodlands between 1750 and 1925 with regard to total communal and municipal forest surface of 1750 (Table 2: h). The second one consists of the proportion of privatised communal and municipal woodlands between 1750 and 1855 compared to the total existing communal and municipal surface in 1750 (Table 2: i). The third one contains the percentage of privatised communal and municipal woodlands between 1855 and 1925 over the total communal and municipal forest surface of 1855 (Table 2: j). The object of this triple division is not only to find out if Hardin's thesis can make sense in the long term or at a local level, but also to discover if its greater or lesser applicability could be related to the greater or lesser extent of State intervention in the privatisation process.

Concerning the complementary information that is required to check this procedure in Extremadura, the data available are somewhat less varied than for Spain as a whole. In this case, it is impossible to make use of consistent local statistics related to the agrarian vocation or to the land property structure. In compensation, the *Catastro del Marqués de la Ensenada* collected a generous amount of local information about population, livestock, urbanisation and working population for the middle of the 18th century. Thanks to such records, I have been able to construct, at district level, four different variables for the middle of the 18th century: population density, livestock density, urbanisation rate and industrial working population coefficient (Appendix II: E, F, G, and H)⁴⁷.

Together with these indicators, I have also prepared four independent variables for the moment in which the Law of General Disentitlement decreed the property transfers: population density, livestock density, urbanisation rate and industrial working population coefficient (Appendix II: I, J, K, and L)⁴⁸. Finally, according to peculiarities introduced by certain physical variables and by the type of human habitat in the first regression exercise, I have endeavoured to assemble three indicators of altitude, humidity and temperature and an index for the geographical distribution of population (Appendix II: A, B, C and D)⁴⁹.

⁴⁶ This is the only supra-local unit for which some official surveys of the 19th century collected information about population, livestock or working population.

⁴⁷ These data are not statistical figures in the strict sense but quantitative approximations based on local enquiries. However, their validity for regional studies has been recognised in multiple occasions by Spanish historiography. It must be noted that, while population, livestock and urbanisation data were directly collected by me for my doctoral thesis, the figures of industrial workforce have been taken from the local reconstruction of Melón Jiménez (1996: 83-91) by using the records contained in the *Mapas or Estados Generales del Catastro del Marqués de la Ensenada*.

⁴⁸ To construct the urbanisation rates in the case of Extremadura, I have made use of more flexible criteria than those employed for Spain as a whole (municipalities with more than 5,000 inhabitants) in order to achieve a minimum degree of representation in all of the districts that compose the region. The measure selected for the middle of the 18th century is a population over 2,000 inhabitants; while for middle of 19th century, municipalities with more than 2,500 inhabitants are selected.

⁴⁹ In this case, the altitude indicator has not been built in the same manner as for the Spanish index. At district level, the only information available on this subject in Extremadura is the average altitude over the sea level. This information is very different to the used one for Spain and can change, in one way or another, the relative importance which that variable delivered in the Spanish estimations (Exercise 1).

Based on these variables and following the criteria used in the first estimation, I have carried out three econometric exercises (Exercises 2.a., 2.b. and 2.c.), one for each of the phases into which the privatisation process has been divided in order to examine the case of Extremadura (1750-1925, 1750-1855 and 1855-1925). In the third one (1855-1925), I have also included as independent variables three additional indicators: the population growth between 1750 and 1860, the livestock increase during the period 1750-1865 and the percentage of privatised communal and municipal forest surface between 1750 and 1855 with regard to communal and municipal woodlands in 1750.

As in the Spanish case, the two first variables (Appendix II: M and N) have the aim of testing the Neo-Malthusian theory not by means of static parameters, such as the starting density, but by dynamic ones⁵⁰. For the third variable (Table 2: h) the objective is entirely different. The main purpose of its inclusion is to know if the privatisation process which took place in Extremadura after the Law of General Disentitlement could have been determined by the very property changes of the stage previous to 1855. According to the authors who consider Spanish privatisation a mere result of State intervention, the hypothetical relationship between both processes should be negative. If the sign of such a link in my estimations were the expected one, it would be coherent to agree with these authors that State action was crucial: in areas where transfers were scarce during the stage 1750-1855, the Law of General Disentitlement would promote the privatisation process from 1855 on, while in districts where property changes were significant between 1750 and 1855, this act would have a reduced effect because the most valuable part of the municipal forest patrimony had already been disposed of before 1855. Let us see what the coefficients say.

The first and the most important conclusion arising from the estimated coefficients in Exercise 2 with regard to the main objective of this paper is that, when using data on a smaller scale, Hardin's Neo-Malthusian thesis is not statistically borne out in the long term either. Not even by applying dynamic variables or by combining the static ones with physical parameters, can the population pressure or the livestock capacity in Extremadura achieve acceptable levels of significance to permit their consideration as possible explanatory factors of the process of privatisation before or after the Law of General Disentitlement. Statistically speaking, no relationship exists between the demographic or livestock growth and the redefinition of communal and municipal property in the region from the middle of the 18th century until 1925. Hardin was, therefore, not only wrong when he identified common property with no property ("open to all"), but also when he went on to assert that the "tragedy of the commons" was directly and inexorably related to population or livestock pressure over the land⁵¹.

⁵⁰ Although, as I pointed out in the second part of this paper, the livestock registers in Spain pose serious problems in non cross-section studies, the contrast between the data of 1750 and the figures of 1865 has already been satisfactorily tested, at a regional scale, by García Sanz (1994).

⁵¹ The only peculiarity worth mentioning for Exercise 2 when compared to Exercise 1 is the sign of the coefficients related to population and livestock in the three new estimations. In contrast with Spain as a whole, population density or demographic growth generally present positive signs in the case of Extremadura. The livestock coefficients, however, do not offer too much regularity. For the period 1750-1855, livestock density presents signs opposite to the phases 1750-1925 and 1855-1925 but similar to the ones which livestock growth offers for this last phase. While I have no consistent explanation for such changes, the statistical significance of these indicators in all the estimations is nil.

Exercise 2.a.

Determining factors for the privatisation process in Extremadura (1750-1925)

| Variables | 1 | 2 | 3 | 4 | 6 |
|--|--------------------|-------------------|--------------------|-------------------|--------------------|
| Constant | 94.55* (2.37) | 73.88** (6.84) | 102.88 (7.02) | 107.39 (5.79) | 85.66 (1.76) |
| Altitude (m) | 0.04 (1.36) | | | | 0.05 (1.48) |
| Humidity (Precip. / potential e-transp.) | -47.78** (3.12) | | -34.54** (2.64) | -37.79* (2.62) | -64.03** (2.99) |
| Temperature (°C) | 0.65 (0.30) | | | | 0.44 (0.18) |
| Population Density (1750) (Inhabitant / Hectare) | | -111.09 (1.01) | 40.40 (0.35) | | 24.51 (0.19) |
| Livestock Density (1750) (Kg / Hectare) | | 0.52 (1.62) | 0.11 (0.34) | | 0.19 (0.45) |
| Population Distribution (1900) (Hectare / Settlement) | | | | -0.00 (0.84) | -0.00 (0.19) |
| Urbanisation Rate (1750) (%) | | | | 0.07 (0.42) | -0.12 (0.48) |
| Industrial Working Population (1750) (%) | | | | 3.77 (0.97) | 6.01 (1.43) |
| Adjusted R ² | 0.22 | 0.02 | 0.21 | 0.17 | 0.16 |
| F-Statistic | 3.68 | 1.38 | 3.46 | 2.43 | 1.68 |
| White Heteroskedasticity Test | 4.73 | 2.72 | 4.51 | 23.04 | 12.76 |

DEPENDENT VARIABLE: Surface of privatised communal and municipal woodlands (1750-1925) relating to surface communal and municipal woodlands (1750)

Number of observations: 28

(t-statistic)

Significance Level:

* 5 % significance level

** 1 % significance level

Exercise 2.b.

Determining factors for the privatisation process in Extremadura (1750-1855)

| Variables | 1 | 2 | 3 | 4 |
|--|-------------------|-----------------|-----------------|------------------|
| Constant | 110.93* (2.47) | 22.62 (2.00) | 9.57 (0.75) | 83.69 (1.83) |
| Altitude (m) | -0.04 (1.32) | | | -0.03 (1.04) |
| Humidity (Precip. / potential e-transp.) | 4.56 (0.26) | | | 1.10 (0.05) |
| Temperature (°C) | -4.26 (1.74) | | | -4.16 (1.86) |
| Population Density (1750) (Inhabitant / Hectare) | | 97.99 (0.85) | | 194.36 (1.66) |
| Livestock Density (1750) (Kg / Hectare) | | -0.18 (0.54) | | -0.18 (0.44) |
| Population Distribution (1900) (Hectare / Settlement) | | | 0.00* (2.11) | 0.00** (2.77) |
| Urbanisation Rate (1750) (%) | | | -0.01 (0.48) | -0.16 (0.65) |
| Industrial Working Population (1750) (%) | | | 1.81 (0.48) | -0.95 (0.24) |
| Adjusted R ² | 0.03 | 0.02 | 0.17 | 0.27 |
| F-Statistic | 1.30 | 0.38 | 2.94 | 2.25 |
| White Heteroskedasticity Test | 7.34 | 0.99 | 4.78 | 16.58 |

DEPENDENT VARIABLE: Surface of communal and municipal woodlands privatised (1750-1855) relating to surface communal and municipal woodlands (1750)

Number of observations: 28

(t-statistic)

Significance Level:

* 5 % significance level

** 1 % significance level

Exercise 2.c.

Determining factors for the privatisation process in Extremadura (1855-1925)

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--|--------------------|------------------|-------------------|--------------------|--------------------|--------------------|--------------------|-------------------|-------------------|
| Constant | 94.51* (2.06) | 48.01 (2.62) | 70.32** (7.33) | 107.12** (4.25) | 118.74** (6.32) | 13.39** (8.93) | 122.60** (4.47) | 89.79 (1.43) | 90.74 (1.41) |
| Altitude (m) | 0.04 (1.28) | | | | | | | 0.06 (1.32) | 0.06 (1.51) |
| Humidity (Precip / potent. e-t.) | -59.81** (3.39) | | | -44.68** (3.01) | -44.31** (2.88) | -44.11** (3.42) | -46.29* (2.50) | -81.44* (2.64) | -80.11* (2.72) |
| Temperature (°C) | 0.91 (0.36) | | | | | | | 2.39 (0.77) | 2.41 (0.80) |
| Population Density (1860) (Inh / Hec) | | -79.41 (0.72) | | 54.19 (0.51) | | | | 104.24 (0.86) | |
| Livestock Density (1865) (Kg / Hec) | | 0.74 (1.48) | | 0.00 (0.01) | | | | 0.33 (0.52) | |
| Population Growth (1750-1860) (%) | | | 0.32 (1.67) | | 0.02 (0.14) | | | | 0.11 (0.48) |
| Livestock Growth (1750-1865) (%) | | | -0.12 (0.87) | | -0.07 (0.61) | | | | -0.18 (1.13) |
| Privatised Communal and Municipal W. Surf. (1750-1855) (%) | | | | | | 0.13 (0.72) | | 0.32 (1.11) | 0.43 (1.66) |
| Population Distribution (1900) (Hectare / Settlement) | | | | | | | -0.00 (0.45) | -0.00 (0.32) | -0.00 (0.62) |
| Urbanisation Rate (1860) (%) | | | | | | | 0.07 (0.33) | -0.12 (0.38) | -0.23 (0.72) |
| Industrial Working Pop. (1860) (%) | | | | | | | -0.95 (0.56) | -0.99 (0.46) | -0.90 (0.45) |
| Adjusted R ² | 0.28 | 0.03 | 0.03 | 0.27 | 0.25 | 0.28 | 0.22 | 0.18 | 0.21 |
| F-Statistic | 4.65 | 1.55 | 1.44 | 4.39 | 4.03 | 6.38 | 3.00 | 1.69 | 1.80 |
| W. Heteroskedasticity Test | 3.69 | 1.89 | 3.32 | 3.62 | 4.73 | 1.67 | 15.62 | 15.43 | 16.45 |

DEPENDENT VARIABLE: Surface of communal and municipal woodlands privatised (1855-1925) relating to communal and municipal woodland surface (1855)

Number of observations: 28

(t-statistic)

Significance Level:

* 5 % significance level

** 1 % significance level

On the other hand, leaving aside the Neo-Malthusian principles once and for all, my second exercise, too, reveals that the physical conditions have a much slighter impact in the districts than at provincial level. This affirmation, based on the determination coefficients of the three new estimations (never higher than 0.28) and perfectly comprehensible given the greater environmental homogeneity that exists among neighbouring areas, is accompanied, in the case of Extremadura, by an important difference with regard to the natural variables that appear to influence the Spanish privatisation. In Extremadura, humidity and not altitude is the only physical factor to acquire statistical relevance, at least in the second phase of the process of redefinition (1855-1925) and, by extension, taking into account the greater relative weight of this stage within the process of privatisation as a whole, during the period 1750-1925.

As in Spain, however, the importance of humidity in Extremadura also seems to hide behind a political variant: the legal exemption of public woodlands populated by selected tree species since the Law of General Disentitlement. If this were not so, it would be difficult to understand why this variable is not statistically significant between 1750 and 1855. From my point of view, humidity only achieves relevance in the phase 1855-1925 because its positive impact on the vegetation permitted to preserve part of the communal and municipal patrimony from auction. In this sense, State intervention (forest policy), rather than forcing the property changes, could be hindering indiscriminate privatisation.

In any case, the trends for this issue seem to have been already internally established in Extremadura before the Law of General Disentitlement. This is, at least, the impression that I gain from the coefficients which the percentage of privatised communal and municipal surface between 1750 and 1855 gives in the third estimation (Exercise 2.c.). Even though these coefficients are not significant, their positive sign invites to think that the process of privatisation of the old collective property since 1855 followed the same path as the preceding one: wherever the redefinition was important before the Law of General Disentitlement, it continued to be important after 1855. From this perspective and without forgetting, of course, the total absence of linear relationship among the data available in Extremadura to measure the relative incidence from one process and another, it would be recommendable not to overvalue the capacity of the Spanish State to impose, by decree, the dissolution of the collective system. Ultimately, the greater or lesser intensity of property transfers depended on multiple and, sometimes, hardly measurable local factors that the Law of General Disentitlement could stimulate in one way or another but not generate by itself.

Finally, taking up again the theses of Noorgard, it is necessary to refer to the almost imperceptible incidence of the urbanisation rates and the industrial workforce coefficients on the process of privatisation in Extremadura between 1750 and 1925. I suspect, nonetheless, that the statistical lack of meaning of these variables, above all of the urbanisation rates, is closely related to the uncertain value of the criteria that I have employed to construct them: municipalities with more than 2,000 inhabitants in 1750 and municipalities with more than 2,500 inhabitants in 1860. The use of these criteria in Extremadura was dictated by the need to achieve a minimum level of representation in each and every of the districts that comprise the region. Their application, however, undervalues, in relative terms, the importance of the towns located in the Southern province of Badajoz and overvalues the magnitude of the few urban centres in the Northern province of Cáceres.

These demographic concentrations should, in no case, be considered as focuses for the surrounding countryside, as the limited industrial working population rates demonstrate when compared to other Spanish provinces (Appendix I: J). In reality, the main destinations for the agrarian surplus were historically situated outside of the region, in Madrid and Sevilla. So, in order to test Noorgard's suggestive proposal more precisely, it would be desirable to employ a refined measure of the physical distance between such urban concentrations and each of the districts of Extremadura, a task which has been quite impossible to complete for this paper but which I do not rule out for future research⁵².

Equally, the construction of an index of geographical distribution of population for the region has not given the expected result either. Whereas in Spain as a whole the forms of habitat demonstrated to have a certain relevance in order to explain the privatisation process occurred after 1855, in Extremadura the impact of this factor only seems to have been relatively significant during the stage 1750-1855. Moreover, in contrast with the Spanish case, the sign of the coefficients estimated for the populating index of Extremadura for 1855-1925 and, by extension, in the period 1750-1925 is not positive but negative. I have no consistent explanation for these differences, much less so when the form of habitat is used as a possible proxy for social differentiation. I think, however, that the changing performance of this variable in the case of Extremadura could be related to the dissimilarities in the models of privatisation which were developed in the region before and after 1855.

As I pointed out above, the participation in the privatisation previous to the Law of General Disentitlement was basically limited to the inhabitants of the townships where the lands to be privatised were located. This would explain the level of significance and the sign (positive) of the coefficients given by the population distribution index for 1750-1855: in a process of local character, the isolation could have worked as an encouragement for the social consensus and for the survival of collective property. On the contrary, the privatisation subsequent to the Law of General Disentitlement was defined in Extremadura not only by public auction, but also by the marked participation of outsiders to the region, specially the flourishing bourgeoisie of the country's capital⁵³. Under such circumstances, it is possible to think that, after 1855, the greater or lesser concentration of the population and, by extension, the greater or lesser social differentiation at local level became irrelevant variables in the privatisation process.

As to the rest, the new estimations completely confirm the general conclusions already indicated in the second part of the present paper. By employing the available data, it is not possible to create an econometric model to explain the property changes in the collective patrimony in Extremadura since the middle of the 18th century. In fact, as the adjusted determination coefficients show, no linear relationship exists between the privatisation occurred in the region and the different parameters which have been checked here as independent variables. These indicators can only elucidate, by exclusion, a small part of the vast process of privatisation which took place in Extremadura during the period 1750-1925 (above all the inapplicability of the Hardin's thesis), but cannot explain it by themselves.

⁵² See note 42.

⁵³ See, on this subject, García Pérez (1994).

Again, the shadow of the missing pieces hangs over the checked samples and casts doubt on the possibility of testing with measurable data the complexity of a process in which multiple factors seem to have intervened. Additionally, a comprehensive explanation calls for social and political variables among the rest of the possible justifications. It is precisely here where traditional historiography, New Institutional Economy and the more recent eco-social history have more to say. Only they and not the Neo-Malthusian assumptions put forward by Hardin in “The Tragedy of the Commons” will advance the knowledge of the historical dissolution of collective property.

CONCLUSIONS

In spite of the justified disapproval which Hardin’s theory has received from criticism regarding the freedom of use that this author attributed to collective lands, the Neo-Malthusian thesis which is behind “The Tragedy of the Commons” has not only been usually adopted by the critics but indeed continues to persist in the works that, from the field of Economic and Social History, try to comprehend the reasons for the decline of traditional collective systems. In essence, this thesis, sometimes used almost involuntarily, is very simple: as soon as the level of balance between population and livestock density and natural resources is surpassed, the tendency to redefine common property inevitably emerges in one way or another. Perhaps the base of its widespread popularity precisely lies in its great simplicity.

The main objective of my paper has just been to check the demographic assumption of Hardin, with the help of econometrics, by employing the empirical evidence available for Spain in general and for Extremadura in particular with reference to the privatisation process which took place in the country from the middle of the 18th century until 1925. And the results of my estimations (multiple linear regressions) do not leave many doubts about the limited functionality of the Neo-Malthusian principles developed in “The Tragedy of the Commons” when employed to explain property changes in the rural world.

In the Spanish case, the estimations made by using the data available for the period 1859-1925, published by GEHR and concerning the privatisation process which the public woodlands suffered as a consequence of the Law of General Disentitlement of 1855, reveal that the provincial differences in this process were not determined by the starting population or livestock density. Moreover, contrary to what Hardin maintained, the limited statistical relationship existing between the demographic variables and the property changes occurred in Spain since the middle of the 19th century does not seem to have been positive but negative: the greater the population and livestock density, the lesser the degree of privatisation. This unexpected direction and its scarce statistical importance, reaffirmed even by weighting the effects of the demographic variables with environmental indicators, minimize the capability of the Neo-Malthusian thesis to explain the dissolution of the old communal patrimony.

With the figures used for Spain as a whole, however, some further precision is required. On the one hand, it is convenient not to forget that the data employed here not only include communal lands, but also municipal, civil and State properties. On the other hand, it

is necessary to take into account that the major State intervention in the process which these figures cover can slant the explanatory potentiality of the econometric estimations to a certain extent. Finally, it must be remembered that privatisation was not the only form of dissolution of the common system in the Spanish case. Other forms of individualisation contributed to modify traditional rights of access and use to collective rustic patrimony without producing property changes.

The data available for Extremadura, which only cover the communal and municipal woodlands in the period comprised between 1750 and 1925, permit to correct the defects of the Spanish figures in order to test Hardin's Neo-Malthusian theory more accurately. But, even reducing the political slant which the Law of General Disentitlement may have introduced in the privatisation process and smoothing the distorting effect of those other forms of dissolution of collective rustic patrimony, the econometric estimations continue to discredit the applicability of "The Tragedy of the Commons". In fact, while for Spain as a whole the coefficients given by demographic pressure, though negative, seem to be at least significant, for Extremadura the relationship between the privatisation process and population or livestock variables is statistically non-existent. In no case, therefore, can the Neo-Malthusian postulations employed by Hardin to explain the disintegration of collective property be used by themselves to attempt to understand the real reasons for the privatisation of the communal lands in Spain since the middle of the 18th century.

Beyond Hardin's thesis, the natural conditions do not seem to be determining factors either for the comprehension of the property changes occurring in the country between 1750 and 1925. It is certain that altitude could be a statistically valuable variable in the privatisation subsequent to the Law of General Disentitlement. The problem is that, as altitude was used by the State forest policy as a reference to decide what woodlands to sell and what woodlands to preserve, it is difficult to know if the action of this variable at provincial level had a merely political component or, in truth, was a physical action. In this sense, the coefficients obtained for the different phases into which the privatisation process has been divided to test the case of Extremadura reveal that the environmental settings, this time humidity but not altitude, only had certain significance after 1855. From this perspective, the political facet of natural conditions seems to gain importance at the expense of their physical import, even though, statistically speaking, such variables cannot explain by themselves the property changes occurred in Spain neither before the Law of General Disentitlement nor after 1855.

A similar conclusion is drawn from the econometric exercises carried out to test Noorgard's theories. Neither the urbanisation rates nor the percentages of industrial working population show statistical relevance to explain the privatisation process since the middle of the 18th century. Only the index of geographical distribution of population seems to give a part of reason to Noorgard when he points out the contact with the urban world as a destabilising factor for the survival of the common property system. What is more, the impact of this variable in the redefinition of communal lands, more visible at provincial level than at local scale, could involve a social variant which should not be disregarded for future research. At present, the available data merely suggest that the forms of habitat had some type of influence on the privatisation process in Spain between 1750 and 1925. In econometric terms, however, their incidence is not significant enough so as to explain it by themselves.

In reality, none of the variables tested here with the help of simple econometric methods demonstrates sufficient weight to establish an global and mechanical explanatory model of the privatisation process. Apart from seriously questioning Hardin's Neo-Malthusian thesis, which was my main objective, the regression exercises of the present paper only reveal that the factors that could really explain the property changes in the Spanish case have not all been checked here. It is true that, in the examination of the demographic assumption established by Hardin to explain the crisis of the commons, other more refined variables such as property distribution, forms of habitat or, even, the environmental setting have played a role. Some of them have even demonstrated to have a potential explanatory strength worth examining in future research. However, for this purpose I think it will be necessary to concentrate on the institutional, social and technical aspects: not only on the distribution of property but also on land sharing, tenancy models, inheritance systems, fiscal pressure, capacity of political negotiation or social differentiation among others. In my opinion, these hardly quantifiable variables and not Hardin's demographic ones are destined to be the explanatory factors of greater weight in a consistent clarification of the historical dissolution of the communal system.

APPENDIX I

Independent Variables: Determining Factors for Spanish Privatisation

| Provinces | A | B | C | D | E | F | G | H | I | J |
|---------------------|-------------|-------------|-------------|-----------------------|----------------------|-------------------------------------|-----------------------------|--------------------------------|--------------------------------------|-------------------------------------|
| | Altitude | Humidity | Temper. | P. Density (1860). | L. Density (1860) | Population Growth (1787-1860) | Property Ranks (1956) | Urbanisation Rate (1860) | Population Distribution (1900) | Industrial Population (1860). |
| | % | Pp. / p.e. | °C | Inh/Hec | Kg/Hec | % | (1-6) | % | Hec/Settlement | % |
| Albacete | 17.5 | 0.55 | 14.4 | 0.14 | 21.10 | 53.36 | 5 | 30.9 | 6,663 | 5.2 |
| Alicante | 0.0 | 0.50 | 16.7 | 0.70 | 41.88 | 54.98 | 4 | 49.6 | 4,760 | 9.7 |
| Almería | 30.6 | 0.47 | 15.9 | 0.36 | 36.76 | 95.85 | 4 | 52.3 | 6,094 | 4.9 |
| Ávila | 61.4 | 1.24 | 12.0 | 0.21 | 86.50 | 41.80 | 3 | 4.0 | 1,998 | 4.8 |
| Badajoz | 0.0 | 0.69 | 16.3 | 0.19 | 99.30 | 82.57 | 5 | 36.0 | 12,092 | 6.3 |
| Bal-Bar-Ger (1) | 11.9 | 0.96 | 14.1 | 0.70 | 56.79 | 81.08 | 4 | 40.1 | 2,075 | 14.1 |
| Burgos | 23.6 | 0.96 | 10.9 | 0.24 | 66.01 | 40.03 | 1 | 7.6 | 1,244 | 4.4 |
| Cáceres | 3.5 | 1.00 | 15.6 | 0.15 | 49.26 | 49.66 | 5 | 11.6 | 8,348 | 5.1 |
| Cádiz | 0.0 | 0.98 | 17.3 | 0.54 | 99.51 | 31.25 | 6 | 81.4 | 13,778 | 12.8 |
| Canarias | 21.1 | 0.50 | 17.9 | 0.32 | 35.15 | 40.02 | 3 | 23.8 | 2,069 | 4.8 |
| Castellón | 13.7 | 0.74 | 14.7 | 0.40 | 47.69 | 71.55 | 1 | 37.0 | 4,069 | 5.0 |
| Ciudad Real | 2.4 | 0.63 | 14.5 | 0.13 | 24.18 | 44.64 | 5 | 42.7 | 14,897 | 6.2 |
| Cór-Hue-Sev (2) | 0.0 | 0.76 | 17.3 | 0.27 | 58.08 | 50.42 | 5 | 59.4 | 9,097 | 8.3 |
| Cor-Lug-Ore-Pon (3) | 19.1 | 2.05 | 12.7 | 0.61 | 141.93 | 32.75 | 1 | 6.3 | 186 | 4.6 |
| Cuenca | 11.6 | 0.97 | 11.9 | 0.13 | 29.66 | 11.30 | 3 | 3.2 | 4,925 | 4.8 |
| Granada | 51.6 | 0.59 | 15.9 | 0.35 | 38.91 | 64.10 | 5 | 42.3 | 4,566 | 7.8 |
| Guadalajara | 58.8 | 0.89 | 11.8 | 0.17 | 40.33 | 25.33 | 1 | 3.8 | 2,571 | 5.2 |
| Huesca | 29.5 | 1.21 | 12.3 | 0.17 | 37.50 | 61.96 | 1 | 9.4 | 1,992 | 4.6 |
| Jaén | 20.2 | 0.80 | 15.8 | 0.27 | 36.11 | 86.79 | 5 | 49.9 | 8,821 | 5.0 |
| León | 50.1 | 1.31 | 10.4 | 0.22 | 83.81 | 43.02 | 1 | 6.2 | 1,132 | 4.7 |
| Lérida | 24.7 | 1.13 | 11.6 | 0.26 | 41.61 | 100.90 | 2 | 6.2 | 1,640 | 4.5 |
| Logroño | 32.1 | 0.72 | 12.3 | 0.35 | 62.09 | 44.19 | 3 | 17.4 | 171 | 6.5 |
| Madrid | 21.8 | 0.81 | 12.8 | 0.61 | 64.73 | 68.33 | 5 | 65.7 | 3,700 | 15.6 |
| Málaga | 2.0 | 0.83 | 16.8 | 0.61 | 60.86 | 80.96 | 5 | 53.2 | 5,753 | 8.4 |
| Murcia | 10.0 | 0.78 | 16.8 | 0.34 | 32.65 | 48.97 | 5 | 85.3 | 10,285 | 7.0 |
| Navarra | 7.7 | 1.11 | 13.1 | 0.29 | 75.52 | 33.51 | 4 | 14.0 | 1,495 | 6.1 |
| Oviedo | 23.4 | 1.64 | 12.7 | 0.51 | 140.71 | 53.21 | 1 | 11.2 | 355 | 5.0 |
| Palencia | 23.8 | 1.09 | 10.1 | 0.23 | 60.98 | 21.64 | 4 | 7.0 | 3,816 | 7.3 |
| Salamanca | 5.3 | 0.91 | 12.6 | 0.21 | 78.44 | 39.40 | 4 | 12.3 | 2,490 | 7.4 |
| Santander | 19.0 | 1.79 | 12.9 | 0.41 | 120.22 | 46.78 | 1 | 17.1 | 718 | 5.9 |
| Segovia | 41.3 | 0.80 | 11.8 | 0.21 | 73.06 | 11.21 | 3 | 6.9 | 2,000 | 7.2 |
| Soria | 70.8 | 1.14 | 9.6 | 0.15 | 56.91 | 29.94 | 1 | 3.9 | 1,945 | 3.7 |
| Tarragona | 2.4 | 0.68 | 15.2 | 0.51 | 27.60 | 71.93 | 3 | 29.3 | 2,552 | 8.0 |
| Teruel | 61.9 | 0.58 | 12.7 | 0.16 | 41.76 | 24.15 | 1 | 7.5 | 4,970 | 5.3 |
| Toledo | 3.0 | 0.59 | 14.9 | 0.21 | 46.70 | 28.17 | 5 | 16.0 | 6,923 | 6.1 |
| Valencia | 6.0 | 0.62 | 15.6 | 0.57 | 37.28 | 53.43 | 3 | 38.7 | 3,044 | 10.0 |
| Valladolid | 0.0 | 0.65 | 11.7 | 0.30 | 50.24 | 39.87 | 5 | 19.6 | 3,181 | 8.6 |
| Zamora | 9.0 | 1.21 | 11.3 | 0.24 | 73.42 | 62.27 | 1 | 4.9 | 2,121 | 4.3 |
| Zaragoza | 6.4 | 0.59 | 13.7 | 0.23 | 35.85 | 44.97 | 4 | 25.1 | 5,096 | 5.4 |
| SPAIN (4) | 20.4 | 0.91 | 13.8 | 0.32 | 59.26 | 50.33 | 3 | 26.6 | 1,378 | 6.7 |

(1) Baleares, Barcelona and Gerona (2) Córdoba, Huelva and Sevilla (3) La Coruña, Lugo, Orense and Pontevedra (Galicia) (4) There is no data for Basque provinces

- A. Altitude index: percentage of surface higher than 1,001 metres over the total geographical surface
Sources: INE (2001)
- B. Humidity index: precipitations/potential evapo-transpiration (annual average)
Sources: Elías Castillo and Ruiz Beltrán (1977)
- C. Temperature index: annual average temperature (centigrade degrees)
Sources: Elías Castillo and Ruiz Beltrán (1977)
- D. Population density (1860): inhabitants/total hectares of geographical surface
Sources: Junta General de Estadística (1863) and INE (2001)
- E. Livestock density (1865): kilogramme of live weight/total hectares of geographical surface
Sources: Junta General de Estadística (1868) and Flores de Lemus (1951)
- F. Population growth (1787-1860): percentage variation of total population
Sources: INE (1981) and Junta General de Estadística (1863)
- G. Property ranks (1956): ranks of percentages of small landowners with regard to the total agrarian working masculine population (1-6)
Sources: Sánchez Alonso (1995)
- H. Urbanisation rate (1860): percentage of population in municipalities with more than 5,000 inhabitants with regard to the total provincial population
Sources: Luna (1988)
- I. Populating Distribution (1900): total hectares of geographical surface/number of settlement
Sources: INE (2001) and Dirección General del Instituto Geográfico y Estadístico (1904)
- J. Industrial working population rate (1860): percentage of industrial working population with regard to the total provincial population
Sources: Junta General de Estadística (1863)

APPENDIX II
Independent Variables: Determining Factors for Privatisation in Extremadura

| Judicial Districts | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---------------------------|------------|-------------|-------------|---------------|----------------------------|--------------|-------------|------------|----------------------------|--------------|-------------|------------|-------------|-------------|
| | Altitude | Humidity | Temper. | Pop. | Middle of 18 th | | | | Middle of 19 th | | | | Growth | |
| | | | | Dist. | P. Density | L. Density | Urbanisat. | Ind. Pop. | P. Density | L. Density | Urbanisat. | Ind. Pop. | Population | Livestock |
| | m | Pp/p.e. | °C | Hec/Settl. | Inh/Hec | Kg/Hec | % | % | Inh/Hec | Kg/Hec | % | % | % | % |
| Alburquerque | 475 | 0.78 | 15.5 | 21,671 | 0.11 | 37.88 | 76.1 | 2.1 | 0.15 | 61.52 | 75.6 | 6.7 | 38.1 | 62.4 |
| Almendralejo | 330 | 0.56 | 16.5 | 9,838 | 0.15 | 57.56 | 75.0 | 1.5 | 0.25 | 79.43 | 81.8 | 5.4 | 67.3 | 38.0 |
| Badajoz | 230 | 0.58 | 16.6 | 53,954 | 0.11 | 47.51 | 98.6 | 4.4 | 0.16 | 54.22 | 88.5 | 10.5 | 41.3 | 14.1 |
| Castuera | 475 | 0.57 | 9.2 | 14,074 | 0.09 | 37.14 | 64.0 | 2.3 | 0.16 | 66.04 | 76.5 | 3.3 | 81.5 | 77.8 |
| Don Benito | 330 | 0.56 | 15.8 | 12,081 | 0.12 | 40.83 | 84.7 | 1.7 | 0.23 | 73.03 | 79.6 | 8.1 | 90.5 | 78.9 |
| Fregenal de la Sierra | 690 | 1.13 | 14.8 | 11,448 | 0.19 | 83.71 | 75.9 | 2.1 | 0.29 | 83.46 | 81.7 | 3.7 | 57.6 | -0.3 |
| Fuente de Cantos | 690 | 0.72 | 15.4 | 11,928 | 0.12 | 64.45 | 73.2 | 1.3 | 0.19 | 79.66 | 73.5 | 5.0 | 57.1 | 23.6 |
| Herrera del Duque | 475 | 0.84 | 16.4 | 14,783 | 0.06 | 26.80 | 48.3 | 1.6 | 0.10 | 45.88 | 53.5 | 2.6 | 71.2 | 71.2 |
| Jerez de los Caballeros | 475 | 0.82 | 16.5 | 13,016 | 0.17 | 76.74 | 83.5 | 2.4 | 0.21 | 76.54 | 81.8 | 4.9 | 23.2 | -0.3 |
| Llerena | 580 | 0.69 | 14.6 | 11,863 | 0.12 | 52.14 | 52.4 | 2.5 | 0.15 | 60.18 | 55.9 | 5.4 | 22.9 | 15.4 |
| Mérida | 230 | 0.59 | 17.0 | 7,897 | 0.11 | 45.31 | 40.4 | 1.9 | 0.18 | 59.37 | 51.8 | 5.5 | 58.6 | 31.0 |
| Olivenza | 330 | 0.62 | 17.5 | 10,218 | 0.11 | 46.20 | 59.6 | 1.7 | 0.16 | 80.47 | 65.8 | 11.2 | 54.2 | 74.2 |
| Puebla de Alcocer | 475 | 0.69 | 17.1 | 10,310 | 0.08 | 34.38 | 17.6 | 1.1 | 0.13 | 62.55 | 46.9 | 3.9 | 67.0 | 81.9 |
| Villanueva de la Serena | 400 | 0.50 | 17.4 | 10,510 | 0.15 | 74.73 | 67.1 | 1.4 | 0.30 | 89.56 | 85.0 | 13.6 | 100.0 | 19.8 |
| Zafra | 475 | 0.72 | 15.4 | 7,311 | 0.30 | 82.60 | 64.5 | 3.0 | 0.41 | 93.19 | 80.8 | 6.6 | 35.2 | 12.8 |
| BADAJOZ (Province) | 444 | 0.69 | 15.7 | 12,096 | 0.13 | 53.87 | 65.4 | 2.1 | 0.20 | 71.01 | 71.9 | 6.4 | 57.7 | 40.0 |
| Alcántara | 350 | 0.72 | 14.0 | 17,199 | 0.11 | 63.28 | 89.9 | 3.8 | 0.14 | 51.01 | 88.8 | 4.7 | 27.3 | -19.4 |
| Cáceres | 475 | 0.64 | 16.1 | 22,348 | 0.10 | 41.24 | 75.0 | 3.9 | 0.14 | 46.22 | 82.4 | 7.8 | 48.8 | 12.1 |
| Coría | 275 | 0.68 | 17.6 | 5,919 | 0.13 | 48.58 | 21.7 | 3.7 | 0.18 | 66.89 | 37.7 | 5.3 | 41.8 | 37.7 |
| Garrovillas | 330 | 0.85 | 16.5 | 10,405 | 0.13 | 37.70 | 50.3 | 3.3 | 0.14 | 47.97 | 42.7 | 7.9 | 11.4 | 27.2 |
| Hervás | 475 | 1.37 | 14.2 | 4,751 | 0.12 | 39.36 | 13.5 | 2.4 | 0.19 | 47.50 | 14.9 | 5.9 | 52.1 | 20.7 |
| Hoyos | 750 | 1.54 | 14.2 | 5,926 | 0.15 | 29.62 | 11.9 | 2.9 | 0.20 | 52.98 | 11.6 | 4.9 | 31.2 | 78.9 |
| Jarandilla | 850 | 1.62 | 14.2 | 4,966 | 0.21 | 55.08 | 27.1 | 3.3 | 0.22 | 67.38 | 20.8 | 3.2 | 5.8 | 22.3 |
| Logrosán | 580 | 0.93 | 15.6 | 14,208 | 0.07 | 21.72 | 16.9 | 3.3 | 0.09 | 40.63 | 50.5 | 3.5 | 31.3 | 87.1 |
| Montánchez | 475 | 0.78 | 15.8 | 5,161 | 0.22 | 72.38 | 40.8 | 1.9 | 0.28 | 78.94 | 42.2 | 4.7 | 25.5 | 9.1 |
| Navalmoral de la Mata | 400 | 0.97 | 16.2 | 6,902 | 0.09 | 27.58 | 33.1 | 4.9 | 0.10 | 35.97 | 8.5 | 4.2 | 16.3 | 30.4 |
| Plasencia | 475 | 1.13 | 15.9 | 7,533 | 0.12 | 47.55 | 40.4 | 3.4 | 0.15 | 47.45 | 46.7 | 5.4 | 21.6 | -0.2 |
| Trujillo | 580 | 0.78 | 16.4 | 9,090 | 0.09 | 43.42 | 49.9 | 2.9 | 0.15 | 51.36 | 49.5 | 3.9 | 55.6 | 18.3 |
| Valencia de Alcántara | 400 | 0.73 | 16.1 | 15,484 | 0.08 | 26.49 | 35.8 | 2.6 | 0.12 | 50.64 | 46.2 | 3.6 | 44.8 | 91.1 |
| CÁCERES (Province) | 493 | 0.98 | 15.6 | 8,534 | 0.13 | 42.62 | 38.9 | 3.2 | 0.16 | 52.69 | 41.7 | 5.0 | 31.8 | 31.9 |
| EXTREMADURA | 469 | 0.83 | 15.6 | 1,798 | 0.13 | 48.24 | 52.2 | 2.7 | 0.18 | 61.85 | 56.8 | 4.7 | 44.8 | 36.0 |

- A. Altitude index: average altitude over the sea level (metres)
Sources: Junta de Extremadura (2000)
- B. Humidity index: annual average humidity (precipitations/potential evapo-transpiration)
Sources: Elías Castillo and Ruiz Beltrán (1977)
- C. Temperature index: annual average temperature (centigrade degrees)
Sources: Elías Castillo and Ruiz Beltrán (1977)
- D. Population distribution (1900): total hectares of geographical surface/number of settlements
Sources: Junta de Extremadura (2000) and Dirección General del Instituto Geográfico y Estadístico (1904)
- E. Population density (1750): inhabitants/total hectares of geographical surface
Sources: Linares (2002)
- F. Livestock density (1750): kilogramme of live weight/total hectares of geographical surface
Sources: Linares (2002)
- G. Urbanisation rate (1750): percentage of population in municipalities with more than 2,000 inhabitants over the total population
Sources: Linares (2002)
- H. Industrial working population (1750): percentage of industrial working population with regard to the total population
Sources: Melón Jiménez (1996)
- I. Population density (1860): inhabitants/total hectares of geographical surface
Sources: Linares (2002)
- J. Livestock density (1865): kilogramme of live weight/total hectares of geographical surface
Sources: Linares (2002)
- K. Urbanisation rate (1860): percentage of population in municipalities with more than 2,500 inhabitants over the total population
Sources: Junta General de Estadística (1863)
- L. Industrial working population rate (1860): percentage of industrial working population with regard to the total population
Sources: Junta General de Estadística (1863).
- M. Population growth (1750-1860): percentage variation of total population
Sources: Linares (2002)
- N. Livestock growth (1750-1865): percentage variation of total live weight
Sources: Linares (2002)

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