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José-Antonio Espín-Sánchez, Salvador Gil-Guirado,
W. Daniel Giraldo-Paez, Chris Vickers

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Labor Income Inequality in Pre-Industrial Mediterranean Spain: the city of Murcia in the 18th Century*

José-Antonio Espín-Sánchez

Yale University

W. Daniel Giraldo-Paez

Yale University

Salvador Gil-Guirado

Universidad de Alicante

Chris Vickers

Auburn University

Abstract

Information about the income distribution in pre-industrial societies is sparse. We analyze labor income inequality in 18th century Murcia, a city in Mediterranean Spain. The historical income distribution of this region is relatively unknown, despite it having one of the highest urbanization rates in Europe in the pre-industrial era. We first use a census conducted in the 1750s which collected information on income and occupation. We then use this income information to conduct analyses of the income distribution in the 1730s and 1780s using censuses with information about the occupational distribution. We find large changes in the distribution of occupations across the censuses. We show that our results on inequality are sensitive to assumptions regarding household composition and within-occupation distribution of income, but not to the definition of household income.

JEL Codes: D31, J31, N33

Keywords: Income Inequality; Spain; Murcia; Pre-Industrial Economies

*Espín-Sánchez: jose-antonio.espin-sanchez@yale.edu. Gil-Guirado: salvagil.guirado@ua.es. Giraldo-Paez: william.giraldo@yale.edu. Vickers: czvickers@auburn.edu.

1 Introduction

Studies of pre-industrial inequality, since the seminal work of van Zanden (1995), rely on a variety of idiosyncratic data sources, including the ratio of wages to land rents, the distribution of occupational status, and property tax registers. As Lindert (2014) notes, while information on wealth can greatly advance our understanding of inequality, ultimately wealth inequality is less important than the inequality of a person's total lifetime resources. For most people, individual labor earnings are much more important determinants of resource availability than capital, at least excluding human capital. Despite its clear advantages as a measure of welfare, information about the distribution of income in pre-industrial economies is sparse. The history of income distribution is important not only to understand the effects of the current growth in inequality, but also to explain the causes and origin of pre-industrial economic growth. Both theoretical and empirical work has postulated a causal link between industrialization and inequality (Kuznets, 1955), and new evidence from various regions and times has renewed interest in this question (Alfani, 2017).

In this paper, we first compute labor income distribution measures directly using records in the *Ensenada* cadastre of 1755 from the city of Murcia, Spain, in the 18th century. The *Ensenada* is particularly notable for including information about income across the entirety of the population, rather than real estate wealth, which is concentrated in the upper income brackets. Over 3,000 households are included in the survey. Moreover, the *Ensenada* contained information about the family structure of taxpayers, including their marital status and number of children. We use this information to study the effects of household composition and multiple occupations on calculated inequality. We then extend the analysis in time by using the *Milicias* registry of 1734 and the *Floridablanca* census of 1786. All three sources contain information about the occupation of the head of household. The

Ensenada cadastre covered all of Castile and the census of *Floridablanca* the entire nation, whereas the *Milicias* was one of a long series of local registries in Murcia, similar to many local censuses in other cities in the Spanish Empire (Chacón Jiménez, 1991). Because the information about incomes is imputed from occupations from these years, this paper also examines the effects of various assumptions on the income distribution for calculated inequality.

Most studies on inequality on pre-industrial Spain focus on cities on the interior of Castile, such as Nicolini and Ramos Palencia (2016b), who use the 1755 *Ensenada* cadastre to study inequality in Palencia. As shown by Correas (1988) and de Vries (1984), the economic situation on the Mediterranean coast was very different from that in Castile. Reher (1990, p. 46) notes that “the arc from Cadiz to Valencia was one of the most densely urbanized regions in Europe. Only England and Wales, and then only in 1850, had higher levels of urbanization.”¹ In contrast to the decline of the interior of Spain, the region of Murcia remained an urbanized economy, increasingly so throughout the 18th century.² During the 17th, 18th and 19th centuries, the cities in the interior of Castile lost their most qualified human assets to the Mediterranean periphery. Thus, during this period, the interior regions of Castile, with the exception of Madrid and Seville, tended to ruralize and continued to maintain their agrarian-based economy. While the interior experienced demographic stagnation, the maritime periphery grew in population (Camps i Cura, 1993), as can be seen in Figure 1. The city of Murcia as well as other Mediterranean cities were

¹Though data issues make exact comparisons difficult, Murcia was certainly one of the most highly urbanized (towns over 10,000 people) regions in Europe in the 19th century. de Vries (1984, Table 3.7) gives a figure in 1800 of 11.1% urbanization for Spain as a whole, much less than the highest value of 28.8% in the Netherlands. However, Reher (1990, Table 2.4), who reports a similar urbanization figure of 14.7% for Spain as a whole in 1787, reports Valencia and Murcia at 34.3%. Accounting for the differences in Spain between the two sources of 3.6%, the urbanization rate for Valencia and Murcia would be 30.7%, still the highest in Europe.

²Alvarez-Nogal and Prados De La Escosura (2007, Table 7) report an urbanization rate (towns over 5,000 people) of 24.7% for the region of Murcia in 1750, and 53.5% in 1787. Old Castile and Leon, the region including Palencia, instead is recorded with urbanization rates of 4.5% and 6.2% in these respective years.

not “agro-towns,” but rather dynamic cities engaged in trade with each other and with the major European trading centers such as Genoa, Marseille, London and Amsterdam. Population growth is reported to be more than twice as high, at an annual rate of 0.68% in Murcia versus 0.32% in Old Castile and Leon (Álvarez-Nogal and Prados De La Escosura, 2007, Table 7). The reason for this over-representation of the stagnant interior in prior work is the selection in the survival of the archival documents.³ There has generally been a positive association elsewhere in Europe between increases in urbanization and increases in inequality, although Alfani and Tullio (2019) find that this association might not be as strong as previously thought.

First, we find a Gini coefficient of 0.51 (for labor income) in the city of Murcia, lower than the figure of 0.58 (for labor and capital income) for the city of Palencia in Nicolini and Ramos Palencia (2016b, Table 3).⁴ Along with documenting the Gini from this source in Murcia, we take advantage of the information in the *Ensenada* to analyze the effects of different sources of labor income inequality. In particular, we consider information from secondary occupations for the head of household as well as employment of other household members. To our knowledge, this information about secondary occupations is not available in the *Ensenada* in all regions of Spain, allowing us to study a dimension of inequality for which information is in general extremely sparse (see Appendix A for details.).

³For example, cities in the Mediterranean coast were subject to bombing from foreign navies, such as Alicante in the early 1700s during the War of Spanish succession. In contrast, cities in the interior were spared. Fortunately, the city of Murcia is close to the Mediterranean, on the Segura riverside, but far enough to the coast so as not to suffer from foreign bombing. Of the Mediterranean provinces of Castile, the household level records of the *Ensenada* registries from Huelva, Cadiz, Seville, Malaga, and Granada, have all been lost (Nicolini and Ramos Palencia, 2016b). This means that data on Mediterranean Castile is only available for the city of Murcia. See the Appendix A for details on the sources and their survival.

⁴Nicolini and Ramos Palencia (2016b) include data from people in the military as well as for households with female heads. Armario Sánchez (1993) reports a Gini coefficient for land ownership of 0.783 for the Kingdom of Murcia and 0.598 for the city of Murcia, using the *Ensenada* Cadastre. The lower inequality for the city is a product of irrigation agriculture in the city, which requires much smaller optimal land size than dry agriculture, common in most of the kingdom. This could also explain why Murcia was more equal than cities in the interior of Castile (Pérez Picazo and Lemeunier, 1987). See also Nicolini and Ramos Palencia (2016a) for comparing income and wealth inequality.

We find that although secondary occupations are not uncommon, their inclusion or exclusion makes virtually no difference to calculated Ginis in Murcia. This contrasts with Saito (2015), who finds that the inclusion of by-employment is crucial to construct accurate social tables for 19th century Japan. The income from other members of the household is also largely irrelevant. However, the calculated Ginis do change when adjusting for the size of the household, as higher income households also have more individuals in them.

Second, we use new sources to extend the analysis over a longer time period. Although of these three censuses only the *Ensenada* cadastre contains the actual recorded incomes, we can use this information to impute income by occupation for the other censuses, as in Milanovic et al. (2011). Modalsli (2015) shows that the use of social tables can bias income inequality estimates downward if the estimates are not adjusted for the within group dispersion; however, with the estimates from the *Ensenada* cadastre, we can compute this variance directly and adjust the income inequality estimates for the earlier and later periods. Moreover, we can use the information on the whole within-occupation distribution of income, not just the variance, to perform robustness checks on several inequality measures. The most striking feature of these estimates is the possible drop in the Gini coefficient over time, as the city of Murcia grows and the area becomes increasingly urbanized. When we assume that the distribution of income within-occupation is log-normal, as suggested by Modalsli (2015), we find a large fall in the Gini coefficient from 0.558 to 0.473 from 1755 to 1786.⁵ This change is entirely missed if one computes the Gini coefficient based on the mean salaries of various occupations, in which case the Gini is virtually unchanged over those years. We perform a sensitivity analysis to show how the results vary with within-group dispersion. Moreover, this is the first paper that uses quantile bounds (Manski, 1990) to impute income by occupation and analyze inequality. The bulk of these imputa-

⁵Note the calculation using this technique gives a higher Gini in 1755 than we observe directly (0.558 vs 0.511).

tion methods suggest a decrease in inequality from 1734 to 1786, although without further assumptions the bounds on inequality for 1734 and 1786 are wide. Because these are imputation methods, we interpret the results as evidence against a generalized increase in inequality, rather than strong evidence for a decline.

Following the famous hypothesis of Kuznets (1955) regarding the long-run trend in income inequality, a large literature has developed trying to quantify the timing of the increase in income inequality usually associated with industrialization. As noted by Milanovic et al. (2011), information about the income distribution for pre-industrial economies worldwide is limited. Their calculation of Gini coefficients contains only twelve observed societies from before 1800. Of the six observations from the 18th century, only one, the survey of Old Castile from the *Ensenada* cadastre, uses actual income data, with the others relying on estimated income based on social tables or housing rents. This analysis was on data from the towns of Paredes, Palencia, Frechilla, Villarramiel and Villalpando in the interior of Castile, an area of economic stagnation at the time. Our study thus calculates pre-industrial inequality from an area that, while in the same present country as prior work, was experiencing radically different and substantially more modern economic conditions than the interior.

There is a growing literature studying the relation between inequality and economic growth. This relation is particularly interesting for Europe in the eve of the industrial revolution. van Zanden (1995) uses property tax records from Holland and finds an increase in inequality from 1561 and 1732, but relatively little change between 1732 and 1808. The absolute level of inequality he found was higher than that in Great Britain despite the dominance of large landholders in Britain; van Zanden (1995) attributes this difference to the higher levels of urbanization and a wealthy bourgeoisie. He posits the existence of a “super Kuznets curve” based on the increase in inequality during a period of positive growth in a

pre-industrial period. Alfani (2017) finds a gradual increase in wealth inequality over the pre-industrial period in the southern Low Countries, with the change concentrated in the 18th century when focusing on the richest households. Alfani and Ammannati (2017) find a nearly continuous rise in inequality in Tuscany over the centuries prior to 1800. Similarly, Ryckbosch (2016) finds an increase in inequality in Flanders and Brabant prior to and during industrialization. Alfani and Ryckbosch (2016), comparing two regions each in Northern and Southern Europe, find the fastest growing (the Northern Low Countries) experienced the *least* amount of growth in inequality from 1650 to 1750, and the declining region of Tuscany the sharpest increase, with the stagnant regions of the Piedmont and Southern Low Countries between these. Lindert (2000) reviews the evidence for different starting points for the increase in (nominal) income inequality in the United Kingdom, with various dates in the 19th century generally proposed, though he suggests a large increase in inequality in *real* terms over the 18th century. Allen (2005) argues for a decline in income inequality over the late 18th century in the United Kingdom, with a sharp increase in inequality from 1800 to 1840 as industrialization proceeds. Closer to our setting, García-Montero (2015) finds an increase in wealth inequality over the 18th century from small cities and towns in Catalonia, after centuries of relative stagnation.

Recent literature (Alfani, 2015; Alfani and Ammannati, 2017) has shown that the late modern increase in inequality was by no means confined to areas experiencing positive economic growth. To further complicate the issue, the rise in inequality was not universal across Europe. Santiago-Caballero (2011) uses agricultural tithe (*tazmías*) records and finds a decrease in income inequality in the interior Spanish province of Guadalajara over the last third of the 18th century, which he attributes to a land reform. Work on the long-run distribution of income in Spain using the ratio of land rent to wages suggests a rise in inequality in Spain between the 1730s and 1800s (Álvarez-Nogal and Prados De La Escosura,

2013). Estimates for the magnitude and even direction of changes in income inequality in Spain over the 18th century are thus highly dependent on the particular source of information about income as well as the geographic area from which the data are gathered.

2 Data and Background

In this section, we discuss the historical background of Murcia as well as the data sources we use.

2.1 Geographical Endowment

The city of Murcia was founded by Abderraman II, emir of Cordoba, in 825 AD with the goal of serving as an administrative center to exploit the fertile lands along the Segura River. Following Ros Sempere and García Martín (2012, p. 294), we can distinguish three phases in the city's growth: (i) from the foundation of the city to the surrender of the city to the Prince Alfonso of Castile (later known as King Alfonso X, the *Wise*) in 1237, a period of growth in which Murcia become the last capital of a unified Al-Andalus under Ibn Hud; (ii) from the 13th century until c. 1700, a period with little demographic growth; (iii) from 1700 onward the city begins growing outside the city walls. Notice that the data we use for this paper refers to the city proper, that is, to the parishes within the city walls. The population figures in Figure 1 refer to the total population of the metropolitan area, including the population outside the city walls.

Murcia is located in southeastern Spain, one of the driest regions in Europe. Droughts are recurrent and happen once every four or five years, with negative effects on the harvests. Lemeunier (1990, p. 136) argues that there are three elements that generate subsistence crises in southeastern Spain during the pre-industrial era, resulting in strict control of trading and distribution of cereals: (i) the dry and volatile weather; (ii) the crop mix,

with many small farms and orchards and systematic deficits of cereals; (iii) the political system with a rent-seeking elite focused on exports. Notice that these elements, while making the population vulnerable to weather and trade shocks, are characteristic of more specialized, efficient, and modern economies.⁶

In the non-irrigated lands surrounding the city, the main crops were, as in most Mediterranean towns: barley, wheat, grapes, and olives, produced for local consumption. In the irrigated orchards, there was a mix of vegetables for self-consumption and cash crops, such as white mulberry leaves for the silk industry. Unlike in other parts of Europe, bread was made exclusively with wheat, whereas barley was only used to brew beer and to feed the animals. As mentioned above, the local wheat production was insufficient to satisfy the local demand. In an average year, the local wheat production could only feed the local population for three months, and the rest needed to be imported, usually from the interior of Castile and Andalusia. However, it was not unusual to also import grain from France, Italy, Algeria, and even Baltic grain via London in extraordinarily dry periods (Gil-Guirado, 2013). Nonetheless, during the late 17th century and 18th century new crops from the New World were introduced. The main crops, red peppers, potatoes, tomatoes, beans and corn, added to the increase in productivity and helped feed the fast-growing population (Pérez Picazo et al., 1979).

The demographic evolution in the city of Murcia during the pre-industrial period has been linked to a parallel increase in irrigable land. The union between Castile and Aragon, and the conquest of Granada in 1492 made the frontiers “disappear.” Each demographic expansion was accompanied by an expansion in large landholdings, given that the land expansions were usually initiated by local landlords and elites (Lemeunier, 1995, p. 143).

⁶A case in point is the silk industry. The irrigated orchards were specialized, since the early 16th century, on white mulberry trees (Chacón Jiménez, 1978). White mulberry leaves are used to feed silk worms, whose silk is later used to make fabrics and clothes to export.

The irrigable land was 4,300 *ha* in the 13th century and about 4,000 *ha* during the following century. The irrigable land increased after 1492 but stopped during the 17th century because of the secular crisis that affected Spain, which also affected the region of Murcia. Moreover, the city suffered a large epidemic and several floods during the 17th century, which created a demographic crisis (Pérez Picazo et al., 1979). While mortality rates were high during the 17th century, they went down during the 18th century with the subsequent population growth. Therefore, the increase in irrigable land during the 17th century was only of 1,000 *ha*. The 18th century, as we explain below, was a prosperous century for Murcia. The number of irrigated hectares doubled during this century, so that at the beginning of the 19th century there were 11,600 *ha* of irrigated land in the municipality of Murcia (Calvo García-Tornel, 1972, p. 16).

2.2 Historical Context

For centuries, the city of Murcia was the main Castilian city close to the Mediterranean Sea. This fact shaped the commercial and economic network of the city. As explained above, unlike most Castilian cities, Murcia was connected with major European cities in the pre-industrial era. The European crisis of the 17th century affected Murcia more than other cities in Castile because of its exposure to international trade shocks, worsening after the pest epidemic in 1648 (Miralles Martínez, 2000). The population did not recover until after the War of Spanish Succession (henceforth, the War), 1702-1713 (Lemeunier, 2004). The recovery of the European markets and the new Bourbon open trade policy helped with the demographic recovery.⁷ A new wave of migrants from other European regions also

⁷Murcia was loyal to the Bourbons during the War, unlike the city of Barcelona. This translated into the city receiving commercial privileges (Pérez Picazo and Lemeunier, 1984). The change in ruling dynasty also changed the trading network of the city. Genoa favored the Austrian candidate. Hence, after the War there was a decline in trading with Genoa and an increase of trading with Marseille, and of Marseille merchants, in Murcia (Montejo Montejo, 2005).

helped the recovery. During the 18th century, Murcia transformed with the Enlightenment ideas and the Bourbon reforms. Pérez Picazo et al. (1979, p. 91) argue that the city's driver of economic growth in the 18th century was international trade linked to the production of commodities. The economic system was dependent on the demand from central Europe. The building of the military arsenal in the neighboring port of Cartagena, second largest city in the region of Murcia, at the beginning of the 18th century established the port as the most important Castilian port after Cadiz. Murcia was the financial center in this new economic pole. Murcia then diversified its cash crops. In addition to silk, it produced linen for textiles; barilla used to produce soda for cosmetics and gun powder; esparto grass to produce agricultural and domestic equipment; and distilled liquors (Rosselló Verger and Cano García, 1975, p. 80). This diversification in new products was accompanied by new Royal Manufactures for Saltpeter (*Real Fábrica de Salitres*, 1654), Gunpowder (*Real Fábrica de Pólvora*, 1633) and Silk (*Real Fábrica de Seda la Piamontesa*, 1770). The local artisans also flourished as the names of the main streets in the old district testify: *Jabonerías* (soap), *Platería* (silver/jewelry) and *Trapería* (silk/clothes).

Both the city and the region of Murcia prospered as never before. The city of Murcia was among the five wealthiest Spanish episcopal sees, with an annual income of over two million *reales* (Rosselló Verger and Cano García, 1975, p. 79). By 1752, 42% of the population in the region of Murcia lived in towns of over 10,000 people, an urbanization rate higher than any other region in Europe, including Belgium and the Low Countries (Reher, 1990).⁸ Furthermore, the city had the highest increase in literacy in Spain during this century, from 14% to 31% (Soubeyroux, 1985). Some of the most important minds of the Spanish Enlightenment were born in the city of Murcia or had close connection with

⁸During this period, the local elites and the church become patrons to the arts. The famous Murcian Baroque begins in this period with the Murcian sculptural school. Francisco Salcillo and Roque López become world renown sculptors. Major urban and architectural works are undertaken. New theaters are erected and Murcia becomes a cultural center for southern Spain (Rosselló Verger and Cano García, 1975).

the city. The first Marquis of Ensenada put special emphasis on Murcia for the cadastre, which led to the cadastre in Murcia having more specificity and higher data quality than anywhere else in Spain (Camarero Bullón, 1990), as we discuss later. The most powerful figure with links with Murcia was José Moñino, the first Count of Floridablanca. This statesman born in Murcia was one of the main exponents of the Spanish Enlightenment. During his time in office as Secretary of State, he helped with the construction of major works in the city of Murcia (Peñafiel Ramón, 2008).⁹

2.3 Data

In this subsection, we describe the data sources used in this article and the variables that can be constructed from them. Because we primarily use the head of household and his income as the unit of analysis, we also provide details on how we classify and define household heads for each source. Appendix A discusses the data in more detail.

In Figure 1, we show the evolution of the population in Murcia and other Spanish cities. The population of Murcia doubled during the first half of the 18th century. By 1750, it was the second largest city in southern Spain, after Seville; and the third largest in the Mediterranean, after Barcelona and Valencia. These population figures refer to the municipality, not just the population inside the city walls, *i.e.*, the urban core. Our census data, however, refers to the population in the urban core only. Rosselló Verger and Cano García (1975, p. 83) showed that in 1712 there were 2,585 households in the urban core. With a multiplier of four members in each household, the population would be 10,340, in contrast of a total population of 24,092 in the municipality. We can make a similar comparison for 1755. Our

⁹Another notable figure is Luis Antonio de Belluga y Moncada, later known as Cardinal Belluga, was viceroy of Murcia and Valencia in 1706-1707 and bishop of Murcia in 1705-1724. During the War, he was in charge of the defense of Murcia, which was crucial to winning the War. During his time as bishop he spearheaded the expansion of arable lands, the creation of new towns and the founding of schools (Alonso Ruiz, 1950). He was a crowned cardinal and undertook major renovations in the cathedral of Murcia.

data shows that in 1755 there were 3,561 households in the urban core, or about 14,000 inhabitants. Figure 1, however, shows that the whole municipality had 59,625 inhabitants in 1755. By our own counts from the censuses the population in the urban core increased from 2,962 households in 1734 to 3,561 households in 1755, and grew from 3,561 households in 1755 to 5,037 households in 1786.¹⁰ Overall, during the 18th century, population grew faster outside the city walls than inside (Lemeunier, 2004).

2.3.1 *Milicias Registry*

The *Milicias* registries were performed for military purposes. These registries were population registers recording the age, occupation, marital status and physical condition of all men for the recruitment of militias in times of war and the draft for military service (Melgarejo Galera, 1987). The data was collected at the parish level, and for each household the records indicate the main occupation and other occupations of each household head, social treatment (that is, their status as a *Don*), social class (aristocracy), age, and marital status. The relationship between the household head and the rest of the males in the household is also noted in the records.¹¹

While these censuses usually specified who was the household head, there are two special cases we had to deal with in order to end up with only one head per household. The first case refers to households in which there was no head designated. In these households, we designated the oldest person as the head of household. The second case was households with multiple heads of household designated. For these households, we knew who was which head's son, and so we split each multiple-head household into separate house-

¹⁰Note that these figures differ from our figures in Table 1. That table refers to our sample, which differs from the full census data because we removed certain households from consideration in order to increase comparability across censuses. In the rest of this section, we explain how and why we took this sample.

¹¹The data is located at the *Archivo Municipal de Murcia AMM*, Boxes AMM-Legajo 1062 (Doc. 9) and AMM-Legajo 2764 (Doc. 8).

holds in which each son was assigned to the household with his corresponding father. We did not split the household if only one of the heads had a listed job. In that case, we simply designated the individual with the job as the only head of household. In the rare case we did not know which son belonged to whom, we gave half the sons to one head and half the sons to the other.

2.3.2 Ensenada Cadastre

The *Ensenada* cadastre is an extremely detailed census conducted by the Spanish prime minister, the first Marquis of Ensenada. It recorded the income and assets of all subjects in each town within Castile. The *Ensenada* cadastre might be the best of its kind for 18th Europe, and it is of extraordinarily high quality for the case of Murcia. Murcia was the first region where the cadastre was to be performed, in 1750. Because of its “pilot” nature and some personal mishaps by the person in charge of it, the Marquis of Malaspina, it had to be repeated in 1756 (Camarero Bullón, 1990). The new census was performed after the census for the rest of Spain was completed. The Marquis of Ensenada selected Juan Felipe Castaños for this task, because of the excellent work he performed with the cadastre for Galicia, one the most difficult ones. Moreover, the new Mayor for Murcia was Juan Díaz del Real, who had been the Mayor in Guadalajara a few years earlier when the cadastre was performed there. Therefore, not only was the Marquis of Ensenada keen on seeing a high quality cadastre in Murcia, but the two men in charge of it had previous experience. Camarero Bullón (1990) argues that this serendipitous situation made the Ensenada Cadastre in Murcia of exceptional quality. As we show below, there are several variables, such as the income for the servants and the occupation of other members of the households, that are not present in the cadastre for all regions. One last caveat is that, although the cadastre is complete for the city of Murcia, the records for some towns in the region of

Murcia have been lost (Camarero Bullón, 1990, p. 336).

The individual records for the city of Murcia contain the name and social status as well as information regarding the main occupation and other occupations of each household head, social class (aristocracy), age and marital status. It also reports information regarding other members of the household including children and other relatives, servants and other occupants of the household, such as whether they are adults.¹² Despite the number of demographic sources available for the city of Murcia, the information relative to the Ensenada Cadaster is sometimes incomplete. In this article, we use the *Libros de Cabeza de familia*, which are complete.¹³ The *Ensenada* itemizes the sources of labor income for each household by job and male individual.¹⁴ Almost every head of household has a job, and some heads of household have secondary occupations or sources of income. The *Ensenada* indicates which of the jobs is the individual's main occupation. We designate the head of household's income from their main occupation as the household's "main income." The income from the head of household's secondary occupations or sources were added to the head of household's main income and designated the as "full head-of-household (HOH) income." Some households had other individuals who were not the head but earned income. We designated the total income of the people who were not the head of household, plus the "full HOH income" as the "full household income."

Consider, as an example, the household headed by *Don Juan Vázquez Yegrós*. Vázquez's main occupation was accountant, and from it he earned 3,300 *reales*. He also worked as a solicitor, and from that job he earned 550 *reales*. His son belonged to the household

¹²The data is located at *FamilySearch*, "Collection: Spain, Catastro de Ensenada, 1749-1756," Murcia, Murcia. Vol. 72 (*Personal de legos o seglares*).

¹³The *Libros de bienes raíces de seglares y clérigos* are incomplete for the city of Murcia. See Appendix A.2 for a detailed description of the sources.

¹⁴The *Ensenada* generally does not record the occupations and earnings of women in the household. The rare exceptions were when the head of household was a woman and worked, in which case it would list her occupation and earnings. Because of this lack of information, we cannot correct for female earnings as Nicolini and Ramos Palencia (2016b) did for the case of the village of Villarramiel.

and earned 480 *reales* from his job. Finally, a servant also lived in their household, and he earned 480 *reales* from his job. In our categorization of income, the households main income was 3,300 *reales*; its full HOH income was 3,850 *reales*; and its full household income was 4,810 *reales*. Broadly speaking, there were two types of secondary occupations. Sometimes the secondary occupation was a byproduct of the main occupation. For example, many bar owners would also sell wine. It was also not uncommon for public servants to have several titles, *e.g.*, Don Luis Menchirón was a lawyer (2,200 *reales*), alderman (88 *reales*) and weighmaster (917 *reales*). However, most of the time the secondary occupation had little to do with the main occupation, and it related to trading in a particular commodity, *e.g.*, Joseph Baquero is both a doctor (3,300 *reales*) and a spice dealer (1,100 *reales*). Poorer individuals such as day laborers (480 *reales*) sometimes resorted to selling tobacco as a secondary occupation.

2.3.3 Floridablanca Census

The *Floridablanca* census is a detailed census conducted by the Spanish secretary of state, the first Count of Floridablanca, born in Murcia. It tabulates the number of people in each household by three marital categories: married, widowed, and single. For each marital category, it tallies the number of people in the household who fall in that marital category by their age bands and indicates their social status. Sometimes, it lists the name and occupation of one person who falls in that marital status in the household. Often, the married category contains the name and occupation of the married man in the household. Unlike the *Ensenada*, the *Floridablanca* has less information regarding income and only has age bands, but it has information on the parish name.¹⁵

The *Floridablanca* does not indicate who is the head of household. We designated a

¹⁵The data is located at the *Archivo Municipal de Murcia AMM*, boxes AMM-Legajo 1060 (Doc. 9) and AMM-Legajo 3849 (Doc. 8).

head for each household. First, if an individual was the only person in the household, she was designated as the head. Next, we designated as the head all individuals who were married, named, and had a listed occupation; when there were no married individuals in the household and the named widow in the household had an occupation, then the widow was designated the head. If after these designations the household still did not have a head, we designated as the head of household anyone whose name was listed. Sometimes households had no one with a listed name or occupation in the household. In these cases, we designated the individual entry recorded as “married” as containing the head of household. If there was no one married in the household, then the individual entry for the widow was designated as containing the head of household.

3 Descriptive Statistics and Methods

In this section, we provide summary statistics and a detailed description of the data. In what follows and for simplicity, we will refer to the three sources as “censuses.” We also explain our method for classifying occupations and linking them across time, which is used to assign income in the *Milicias* and *Floridablanca* censuses. The goal is twofold. First, we want to provide the reader a sense of the variables and their magnitudes, so that the inequality measures can be put into context. Second, the detailed description would be useful when we compute the robustness checks, to better interpret the changes in the inequality measures.

3.1 Summary Statistics of Censuses

In Table 1, we provide summary statistics about the information available in the samples we employ. We restrict attention to male heads of household and exclude clergy, nobility, and men with military occupations entirely. We do this for consistency across the censuses:

they were not consistent in recording households with female heads, and the *Ensenada* census did not list the income of clergy, nobility, and men in the military. The fraction of individuals who were married or widowed is relatively constant over the three censuses. We report the fraction of individuals in different age bands.¹⁶ The age distribution is also stable across the censuses. Finally, we report the fraction of individuals who are listed as a *don* in the census. *Don* is a Spanish honorific title representing an individual of high, though generally non-noble, social status.¹⁷

3.2 Occupational Coding, Income Assignment, and Effect on the Gini Coefficient

In the *Floridablanca* and *Milicias* censuses, individuals' jobs are listed, but no income is reported. The *Ensenada* census, on the other hand, does list both individuals' jobs and their incomes. To assign salaries to the *Floridablanca* and *Milicias* individuals and households, we match the jobs in those censuses to job salary summaries statistics for different occupations from the *Ensenada* census. There were three steps in the income assignment process. The first was the categorization of each *Ensenada* occupation.¹⁸ The second step was to match each *Milicias* and *Floridablanca* occupation to one of the *Ensenada* categories. The third step was to obtain the summary statistics for every *Ensenada* category. The assigned income for each *Milicias* and *Floridablanca* occupation was then (in the baseline) the mean income of its corresponding *Ensenada* category. We discuss this in more detail in Appendix A.4.

Because the *Ensenada* census listed many sources of income in a household, such as

¹⁶The *Floridablanca* census reported ages in bands, while the *Milicias* and *Ensenada* censuses reported exact ages, although with significant heaping.

¹⁷In marriage registers we have transcribed for the city of Murcia (unpublished), the fraction of grooms listed as a *don* decreases slightly over time, from 5.9% in the 1730s to 5.6% in the 1750s and 5.1% in the 1780s.

¹⁸To improve matching across censuses, we assigned to *Ensenada* occupations up to two categories: a narrow category and a broad category. We explain the details of this process in Appendix A.4.

income from the head of household's main employment, income from his secondary occupation and income from other members in the household, we produced three variants of salary summary statistics for the *Ensenada* job categories. We produced summary statistics for the salary from just the head of household's primary occupation (Main Income), from the head of household's main occupation and by-employment (Full Head of Household Income) and from the income of all household members (Full Household Income). Older household heads have higher incomes than younger ones, and older household heads are also more likely to have income from a secondary occupation. Thus, in general, using only the income from their main occupation could bias the results. We address this issue below by examining the Gini coefficient when including different sources of income. With these summary statistics in hand, it was possible to assign a salary, based on the salary summary statistics from the *Ensenada*, to the individuals in the *Floridablanca* or *Milicias* with listed occupations.

We used six different specifications for imputing income to the *Milicias* and *Floridablanca* occupations. Our baseline method was to assign to the *Milicias* and *Floridablanca* occupations the mean salary of their corresponding *Ensenada* category. We also had different specifications in which we assigned to all *Milicias* and *Floridablanca* occupations the (i) maximum salary of their *Ensenada* category and (ii) the minimum salary of their *Ensenada* category. Our fourth income imputation specification is based on the method of Modalsli (2015), which assumes a log-normal distribution for each group for which a mean and standard deviation of income exist. We therefore use the mean and standard distribution of the corresponding *Ensenada* category to impose a log-normal distribution of income for each *Milicias* and *Floridablanca* categories. In particular, we took each occupation in the *Ensenada* and computed the mean income and the variance of income in each occupation. We use the computed mean μ_i and variance σ_i^2 in occupation i as the true mean and variance

for that particular occupation. We then apply formula (5) in Modalsli (2015) to compute the Gini coefficient.

Our final two specifications for income imputation were slightly more complicated. We wished to obtain upper bounds and lower bounds for the Gini coefficients in the *Milicias* and *Floridablanca* censuses á la Manski (1990). To obtain the upper bound on inequality, we first ordered the occupations based on the mean income of the category. We then partitioned the occupations into two types, low income and high income, by choosing a mean salary cutoff: all occupations above that cutoff were designated as high income, and all below were designated as low income. We assigned occupations designated as low income the minimum income of their *Ensenada* category, and we assigned occupations designated as high income the maximum income of their *Ensenada* job category. Then we calculated the Gini coefficient using these new income assignments. This way we “maximized” inequality. It was not clear *a priori* where to set the cutoff for “low” income. Therefore, we computed the Gini coefficient when setting the cutoff at every possible centile of the salary distribution. We then picked the centile cutoff that gave the highest Gini coefficient. This Gini was our upper bound. The procedure for calculating the lower bound was similar. We again ordered the occupations by the mean income of their *Ensenada* category and partitioned the occupations according to a cutoff. This time, however, we assigned individuals designated as low income the *maximum* income of their *Ensenada* category, and we assigned individuals designated as high income the *minimum* income of their *Ensenada* category. Once again, to find the appropriate cutoff that would minimize the Gini coefficient, we computed the Gini when setting the cutoff at every possible centile of the salary distribution, and picked the centile that gave the lowest Gini coefficient.

Finally, we also classified occupations using the Historical International Standard Classification of Occupation (HISCO) system, a job classification system intended to consis-

tently categorize jobs across different periods and countries. This job classification system has been used in previous studies of the *Ensenada* census in other regions of Spain (Álvarez and Ramos Palencia, 2018). Each *Ensenada* job category was assigned a HISCO code based on the job. We then classified these HISCO-coded jobs into the HISCLASS system of van Leeuwen and Maas (2011). This system categorizes jobs by whether or not they are manual or non-manual, the degree of skill involved, whether or not the job involves the supervision of others, and whether or not they are in the primary sector (agriculture).

3.3 Common Occupations

In Table 2, we show the twenty most common occupations in the *Ensenada*. The mean salaries in *reales* of the occupations are shown along with the medians. The ratio of means to medians shows considerable heterogeneity, suggesting dispersion in within-occupation inequality. For example, for journeymen barbers the mean and median are almost identical, whereas the mean for millers is almost twice that of the median. In general, the dispersion in within-occupation wages is very low for journeymen occupations. There is no clear positive relationship between higher earning salaries and a higher ratio of mean to median salaries. In fact, the highest paid occupation, bar owners (*tabernero*), has a lower mean than median salary. To examine the within-occupation income dispersion further, we report the standard deviation and the ratio of the interquartile ratio to the median (expressed in percents). We focus on the latter number because the former is particularly susceptible to large outliers given the relatively small number of individuals in each occupation. A number of occupations, particularly journeymen occupations, have an interquartile range of zero. Others, such as bakers, show a large ratio of the interquartile range to the median, suggesting the dispersion in the wages of these occupations is not driven by the presence of a few outliers, but rather represents variation across the distribution of within-occupation

wages.

3.4 HISCLASS Distribution Over Time

Figure 2 shows the distribution of occupations across skill groups for each of the three censuses. For clarity we collapse the HISCLASS variables into four categories. There is a striking increase in the percentage of individuals listed as being in the lower parts of the occupational distribution. From 1734 to 1755, and then from 1755 to 1786, the proportion of individuals in the unskilled or low skilled HISCLASSes increases from under two-fifths to about three-fifths of the population. The proportion of “skilled” occupants declines from 1734 to 1755 and is relatively constant to the next census. This trend suggests that the growth of the city of Murcia over the 18th century was accompanied by a broad “deskilling” in the population.

The upper HISCLASSes, comprising “higher managers” and “higher professionals,” is stable from 1734 to 1755 before shrinking dramatically by 1786. This, by itself, would lead to a decrease in inequality. This is contrasted by the growth of the unskilled and lower skilled classes, which would have lead to an increase in inequality. Hence the consequences of the changes in social class are not clear from the changes in HISCLASS composition alone.

4 Inequality Over the 18th Century

In this section, we discuss the results using the method most common in the literature, *i.e.*, imputing the within occupation average. There are some caveats with the data that we discuss in this and the following section. First, as noted earlier, we only have labor income, but not other sources of income. If non-labor income is substantial and it is distributed vary differently from labor income, total income inequality would be different than in-

come inequality. Second, we have information in a city, but not of rural areas. Information regarding rural areas is not available for some of the sources, so we are unable to have a consistent measure of inequality in rural areas. Third, we only have income data for the *Ensenada*. Although we provide an extensive discussion with a battery of methods, some of the bounds are not sharp and the results depends on the assumptions of each method.

4.1 Basic Statistics

In the second panel of Table 3, we produce the Gini coefficients derived from the incomes in the *Ensenada* census. We do so under several methods. We first compute the Gini coefficients by treating each household as a single unit. This is how one would calculate income inequality if one only had a roster of heads of household and their incomes, with no other information about the structure of the household. While making these computations, we compute the Gini coefficient in three different ways. First, we compute the Gini coefficient using only the income from the main occupation listed in the *Ensenada*.¹⁹ When doing so, we find a Gini coefficient of 0.509. This is lower than the figure of 0.581 found by Nicolini and Ramos Palencia (2016b) for Palencia city, although higher than their Gini for the province as a whole.²⁰ If we include the income from the other jobs held by the head of household (full HOH income), the Gini is essentially unchanged, at 0.516. The similarity between these numbers suggests that virtually no information about inequality is lost by focusing on the main job held by the head of household. The amount of income from secondary occupations is not trivial: 7% of individuals are listed as having some form of secondary income. The median of the secondary job income was 550 *reales*, approximately half of the median for main occupations. The relatively minor role for secondary occupations in income statistics contrasts sharply with Saito (2015), whose social tables for 18th

¹⁹See Section 2.3.2 for a definition of (1) main income (2) full HOH income and (3) full household income.

²⁰Note, however, that we calculate only labor income inequality while their measure included capital income

century Japan are heavily dependent on the inclusion of secondary income.²¹ We finally compute the Gini coefficient using income of the entire household attributed to the head of household (full household income), and again the Gini coefficient is virtually unchanged, at 0.512. Thus, when computing the Gini coefficients, the income from other members of the household has little effect on the figures, for the case of Murcia.

In the above calculations, we did not take into account the number of members in the household. The rest of the columns of the second panel of Table 3 take into account, to differing degrees, the number of people in the household. When calculating the Gini above, without adjusting for household size, we sort the households according to income. We then produce the Lorenz curve (used to calculate the Gini) by starting with the income household and, moving to the household with the highest income, plotting the cumulative proportion of total income against the cumulative proportion of people. To adjust the baseline example for the household size, we calculate the per capita income for each household, then sort according to per capita household income. So, for example, when we take into account the number of male family members in the household, we divide the household's income by the number of male family members in the household, then sort on this per capita income measure to produce the Gini.

Failing to take into account the number of people in the home could bias the inequality measures. If, for example, higher income households had more people in the household, inequality computed in this way would be lower than above, as the income would be spread across more people. We do three different household composition adjustments. They are: the male-family-member adjustment, the all-family-member adjustment, and the all-household-members adjustment. We do all of these different adjustments to facilitate later comparability with *Milicias* and *Floridablanca*, as these censuses had less detailed

²¹One explanation for the difference, besides the obvious that the societies could be different in the degree to which labor was divided, is that he works with sectoral data and we with individual data.

information about household composition.

In the second column of the second panel of Table 3, we adjust the Gini by the number of males in the household. We do so primarily because the 1734 census records males only. We find that for all three income measures, the Gini coefficient is roughly 0.04–0.05 points higher after making the male family member adjustment. In the third column, we take into account all family members when computing the Gini. Again, across all three income specifications, the Gini coefficients are higher (about 0.03–0.04 points) than when we did not adjust at all for household size. Thus, it is not the case that higher income households are spreading resources across more people. Higher income households tend to be larger, but their incomes are much larger, thus making the per capita income of higher income households larger than those of lower income households. The numbers in the second and third columns are very close, suggesting that little is lost by adjusting the Gini coefficients for male household numbers only, when there is no information available about women (as in the *Milicias*). In the fourth column, we include all household members, including those such as servants who are not relatives of the household head.²² The numbers are mostly similar to the other columns with one exception. When income from the entire household is included, the adjustment for household income makes the Gini coefficient smaller than in the other cases.

4.2 Changes in Inequality

We use actual income values from the 1755 census and imputed income values for the 1734 and 1786 censuses to measure the changes in inequality over time. Our baseline analysis looks at only income from the primary occupation. For the 1734 and 1786 censuses, after

²²One possible objection to including the income of servants and including them in the household size tally is that servants and their income should be considered as a separate household. Appendix section A.6 examines this objection and shows that the Ensenada Gini statistics are robust to removing the income of servants and counting servants instead as separate households.

matching each job to a job category and its summary statistics (as described in Section 3.2), we used the average of the within-job-category income from the primary occupation (Main Income) as the imputed income values. Figure 3 shows the Lorenz curves for the different census. For the 1755 census we include both the actual Lorenz curve and the Lorenz curve when we impute the 1755 income the mean of the within-job-category income from the primary occupation. We do this to get a sense of how our Gini estimates using income imputation methods may differ from the true Gini. Notice that in Figure 3 the main differences in inequality in 1755 when using the real data versus the imputed data is that inequality is lower with the imputed data. The two Lorenz curves are very similar for the first deciles, because there is little variation in the income earned by unskilled workers, *i.e.*, most jornaleros make 480 *reales* a year. For intermediate deciles the imputation erases all within-occupation income variance and that is why the two Lorenz curves begin diverging. Table 4 reports the income-imputed Gini coefficients in the column “Mean.”

Because using the mean salary of the individual’s job category produced the closest estimate to the actual Gini of the *Ensenada* census, we focus first on changes in inequality when imputing salaries for the *Milicias* and *Floridablanca* censuses using the job categories’ mean salary. The results are shown in the column “Mean” in Table 4. When comparing these Ginis across censuses, there is about a 0.05 point drop from the 1734 to the 1755 census, while there is barely a difference between the 1755 and 1786 estimate. This would seem to imply that inequality fell a good amount between 1734 and 1755 but did not really change between 1755 and 1786. However, recall that using the mean will tend to underestimate inequality insofar as it removes within-occupation dispersion. This led to an underestimation of about 0.06 in the case of the *Ensenada* census. However, the magnitude of underestimation is likely to be much smaller for the 1786 census—the reason is that the occupations that dominate this census are “Farmer” and “Day-Laborer,” both occupations

that had almost no within-occupation variation in the *Ensenada*. As a result, the actual Gini for 1786 is likely to be much closer to the Gini using the mean than it is for the 1755 census. This suggests that there was a decline in inequality from 1755 to 1786, just as there was from 1734 to 1755. However, we note that not all imputation methods show a decline, and one possible conclusion is that inequality was stagnant over the period we study.

5 Imputation and Robustness

5.1 Robustness to Imputation Methods

We perform robustness checks on the income imputation by calculating the Gini coefficient using the within-job-category minimum and the maximum income values for the primary occupation. These values are reported in Table 4 under the columns “Minimum” and “Maximum”. Notice that the underlying assumption for assigning means, but also for the validity of the robustness checks, is that the income generating process within occupation is the same across the three censuses. Since the imputation is only 21 and 31 years back and forth respectively, we believe that this is a reasonable assumption.²³ To be clear, the assumption that we are making is not that nothing changed in Murcia from 1734 to 1786. On the contrary, our results rely on changes in occupations that happen during that period. Generally speaking, our assumption is that the distribution of income within occupation was stable during this period. For specific imputations we modify slightly this assumption. On the one hand, when we compute the Gini coefficients *à la* Modalsli (2015) we use the *stronger* assumption that the distribution was stable and distributed as a log-normal. On the other hand, when we compute the Gini coefficients *à la* Manski (1990) we use a *weaker*

²³Note that this is a good assumption to the extent that the variation of income within occupation is small, especially in relation to the variation between occupations. This is an assumption that is prevalent in the literature not only for the analysis of inequality but also for social mobility (see Abramitzky et al., 2014, for a discussion on the limitation of this approach).

assumption requiring only that the support of the income distribution within occupation was stable.

Many of the occupations that we observe in the data show little or no income variation within group. Unskilled workers (*jornaleros*) always report an income of 480 *reales* a year, or, to be precise, the enumerators were instructed to assign an income of 4 *reales* a day, and to compute 120 working days a year for *jornaleros*. Also, many of the public servants have occupations that are very specific, to the point that there is only one person with that occupation, *e.g.*, the city executioner. Most of the variation in within income occupation comes from guild workers. Apprentices who live with their masters tend to report zero income. Journeymen of different guilds, however, report very different incomes depending on their guild. As we can see in Figure 4, though, there is very little within occupation income variation for journeymen in most of the guilds. The exceptions are architect and painter, and combined they account for only 39 workers. The evidence for masters is more complicated. In Figure 5, we can see how there is substantial variation both across and even within guilds. However, guild masters belong to the high income section of the population anyway. Moreover, the majority of masters are in occupations with little within occupation variation, such as flax weaver, silk weaver, shoe maker, garment maker, bloodletter, chocolatier and sting maker. There are, however, some occupations with several members and substantial variation such as surgeons and tailors, but all combined there are not that many masters in those occupations with substantial within-occupation income variance. Thus variation in their income imputation have little impact when comparing measures of inequality over time.²⁴

We also estimate bounds for the Gini coefficient (Manski, 1990) as explained in Section

²⁴To be precise, if we were to assign each guild master the maximum income for their occupation, the Gini coefficient would increase. However, since there are not many occupations with wide variance and the numbers in those occupations does not change much over time, the final impact on changes in Gini coefficient would be small.

3.2. In the second row of Table 4, we show the actual Gini coefficient of the *Ensenada* census against the Gini coefficient when we imputed to each individual their job category's mean, minimum, and maximum salary as well as the lower bound and upper bound Gini coefficient found using the method described above. All of the Gini coefficients were calculated by imputing the summary statistics from that job category's main income source, and no adjustments were made for the number of people in the household.

Comparing the the actual Gini we calculated for the *Ensenada*, we find that assigning individuals the mean salary of their job category leads to an underestimation of the Gini by 0.07 points, thus underestimating the level of inequality in the society as described by the Gini coefficient. This underestimation is intuitive, as failing to account for the within-occupation inequality may lead to understating the degree of inequality. The use of the minimum salary for the job category leads to an underestimation of about 0.09, while use of the maximum salary leads to an overestimation of the Gini by about 0.1 points. Finally, the upper bound overestimates the Gini by 0.24 points and the lower bound underestimates it by about 0.15 points. Our final income imputation method was based on the method of Modalsli (2015), which assumes a log-normal distribution for each group for which a mean and standard deviation of income exist. As in his data, we find that using the mean income for everyone in a group to compute the Gini results in a substantially lower estimate than the log-normal assumption. However, we find that assuming the log-normal distribution within groups results in an overestimate of the degree of inequality. Specifically, this assumption results in a calculated Gini of 0.558 in 1755, as compared to the actual value of 0.511.

Using other summary statistics for the imputation of income generally suggests that inequality may have declined from 1734 to 1786. Imputing the minimum value produces a Gini about 0.045 points higher in the 1734 census than in 1786 census; the bound projec-

tions are also higher for the upper bound projection and lower bound projection for 1734 (by about 0.025 and 0.027 points, respectively). The only case in which the 1786 census has a higher Gini is when the maximum value is used to impute salary: in that case the 1786 Gini is about 0.026 points higher. Note that when we use the imputation method of Modalsli (2015), the calculated inequality falls only slightly from 1734 to 1755, and then more dramatically by 1786.

It is more difficult to examine changes in inequality relative to 1755 using the non-mean imputation methods because of the asymmetry in the assignment of job categories. Every job in the *Ensenada* can be assigned to a narrow job category—its own. Therefore, summary stats are taken only over jobs with the same name. This stands in contrast with the jobs in the *Milicias* and *Floridablanca* censuses. For those jobs, an exact narrow job category match is not always possible, so these are sometimes matched a broad job category. For example, in the *Ensenada* cadastre there are a few different kinds of scribes, such as royal scribe, numbers scribe, or salt rent scribe. However, there is no occupation named customs scribe, a title which does appear in the *Milicias* registry. Therefore the customs scribe is matched to the broad job category of Scribe, which summarizes income over all people with a scribe job. As a result, jobs in the *Milicias* and *Floridablanca* censuses will tend to have lower minimum values and higher maximum values, since the broad job category always selects these statistics over a larger set than its constituent narrow categories. This will push the Gini coefficients using the minimum imputation in the 1734 and 1786 censuses downward as minimums will tend to be lower relative to the 1755 census. Conversely, Gini coefficients for those two censuses will tend to be higher relative to the 1755 census when using the maximum salary for job categories. In the scribes example, the *Ensenada* minimum, mean, and maximum figures are: royal scribe (550, 1023 and 2200 *reales*); numbers scribe (1100, 2517 and 3300 *reales*); and tobacco rent scribe (4400, 4400 and 4400

reales). The minimum, mean, and maximum income values over all scribes are (550, 1850, 4400 *reales*). In summary, using a broader category means that the within-occupation distribution of income would have a larger support. This will always increase (decrease) the upper (lower) bounds. Occupations with name mismatched that need to be “broadened” tend to earn high income, which will increase (decrease) the inequality measure when using the maximum (minimum).²⁵

5.2 Household Size Adjustments

A second dimension we consider during the Gini robustness checks is the number of people in the household. Our baseline analysis calculates the Gini coefficient and Lorenz curve by treating the household as a single unit. Households were sorted by the head’s income from his primary occupation (or the within-job-category average, when imputing). Starting with the poorest household and moving towards the richest household, the cumulative proportion of income and cumulative proportion of households was graphed, as in the Lorenz curves in Figure 3.

This baseline method for calculating inequality might lead to a systematic mismeasurement of inequality. For example, if richer households had larger households, then the baseline analysis would (likely) overestimate “true” inequality as rich households would have to spread out the income over more people and thus would not be as wealthy relative to the rest of the households as the baseline analysis would make them out to be. For this reason, we adjust for household size in the robustness checks.²⁶

Due to the different motivations that produced them, the censuses do not report members of the household consistently across censuses. The 1734 census reports almost exclusively male family members of the household head. The 1755 census, by contrast, records

²⁵See Appendix A.4 for more information on the job categorization and matching procedure.

²⁶See Section 4.1 for more information on the household adjustment calculation.

all the people in the household, including non-family individuals, who are usually servants or apprentices. The robustness checks therefore adjust for different measures of household size. When we adjust for “Male Family Members,” we calculate the per capita income by dividing income by the number of males in the household who are related to the head (including the head). Likewise when we adjust for “All Family Members,” we divided by the number of people in the household who are related to the head, and when we adjust for “Household Members” we also include non-family who are listed as being in the household. Table 3 shows the results of these household adjustments.

The row in each of the panels indicates the kind of income used. For the 1755 panel, the row “Main” income reports the Gini considering only income from the head of household’s main occupation. The row “Full HOH” reports the Gini when considering the head of household’s income from all sources. “Full Household” reports the Gini when considering the income of all people in the household, not just the head. Because the 1734 and 1786 censuses did not report the head of household’s income, only occupation, individuals in those censuses were matched according to their occupations to occupations in the 1755 census. The estimated income for the individuals in the 1734 and 1786 censuses was then the average income of the matched occupation in the 1755 census. The rows “Main” report the Gini when the average was taken over main income of 1755 heads-of-household with the matched occupation. The rows “Full HOH” report the Gini when the average was taken over all sources of income of 1755 heads-of-household with the matched occupation in the 1755 census. “Full Household” report the Gini when the average was taken over all sources of income of 1755 households whose head of household had the matched occupation.

Table 3 shows how accounting for family composition can affect the inequality measures. The effects are not homogeneous across censuses. If in the data, households with

higher income usually have more family members, we would expect that adjusting for family size would reduce the inequality measure, or decrease the Gini coefficient. However, this is not the case uniformly. Whereas the Gini increases in 1734 and 1755 when adjusting for the number of males in the household, the Gini is virtually unchanged in 1786. Adjusting for all family members, however, increases inequality in both 1755 and 1786, the two censuses where complete household information is available. The difference when adjusting for household composition suggests that in 1786 there is a gender imbalance that is different for different income households. In particular, the results are consistent with higher income households having a higher proportion of males than lower income households. This could be a direct consequence of older emancipation age for males in high income households. Finally, adjusting for all household members, *i.e.*, including servants, seems to reduce the inequality measured as compared to the measure including only family members. This is because higher income households tend to have more servants.

Another important difference for 1786 relates to how the Gini changes depending on the income definition. In 1734 and 1755 the Gini changes little when we use different definitions of income.²⁷ In 1786, however, the differences are large, specially when comparing the main specification to the Full HOH. This means that, especially by 1786 but to a lesser extent earlier, the income generated by other activities of the household head and by members of the household was significant, and that it was particularly important for lower income households. Moreover, whereas in 1734 the main difference is between full HOH and full Household, emphasizing the importance of income generated by other household members, in 1786 the main difference is between Main and Full HOH, emphasizing the importance of the secondary occupations of the HOH.

²⁷The Gini is slightly changed when using the broad income categories for mean income for the Ensenada, declining from 0.448 to 0.441.

6 Discussion

In this section, we discuss the results and put them into the context of what is known of living standards for Murcia during the 18th century. We discuss the causes for the possible declines in inequality. We then discuss the results and put them into the European context, discussing potential explanations for the similarities and differences between Murcia and other European cities.

van Zanden (1995, p. 661), in his study of the pre-modern period, concluded that there are “strong indications that prior to 1800 economic expansion, where it occurred, was coupled with a considerable increase in inequality.” Scheidel (2017, p. 95), reviewing the recent and growing cross-country literature on pre-modern inequality, suggests that over this period “in the more dynamic north, the disequalizing forces of global trade and urbanization were complemented by growing wage dispersion.” A contrasting view is that of Alfani and Ryckbosch (2016), who use four regions and show that the sharpest increases in inequality were associated with declining economies. They focus on changes in inequality rather than comparisons among absolute levels, as they note that differences in sources make cross-region comparisons particularly fraught.

Recent work in Spain and Italy (Nicolini and Ramos Palencia, 2016b; Álvarez and Ramos Palencia, 2018; Alfani, 2015) has shown that inequality was high in areas which experienced little economic growth. Indeed, Nicolini and Ramos Palencia (2016b) find higher levels of inequality in Palencia city compared to the more economically robust Amsterdam, and suggest that this fact, combined with the general positive correlation between urbanization and inequality, may mean that Spain was a particularly unequal country in the 18th century. Though Nicolini and Ramos Palencia (2016b) computed total income inequality (including capital income), our results still complicate this picture. The city of Murcia was in global trade networks (Molina Molina, 1992), and yet its labor income

inequality was less than in the city of Palencia in the declining rural interior.²⁸

Santiago-Caballero (2011) used a measure of agricultural inequality for the Spanish province of Guadalajara during the 18th century and found a decrease in inequality at the end of the 18th century. Armario Sánchez (1993) reports a Gini coefficient for land ownership of 0.598 for the city of Murcia, using the *Ensenada* Cadastre, which is higher than the Gini estimated by Santiago-Caballero (2011) using tithes. However, similarly to wealth (stock) and income (flow) inequality, inequality from land ownership (stock) might be higher than from grain production (flow).

If inequality did decrease, or fail to increase, in Murcia city during this period, it was during a time in which the municipality and region was experiencing economic growth. Pérez Picazo et al. (1979) argue that the economic growth during the 18th century translated into higher living standards, despite the high population growth. They based their conclusions on three factors: (i) stable weather without major climate shocks; (ii) the introduction of new crops, better suited to the local environment, for self-consumption mostly from the New World (corn, potato and tomato), and as inputs for the local industry or the international trade (linen, esparto grass and barilla); (iii) the availability of large empty tracks of land that could be used for agriculture, and thus avoid the Malthusian trap. A fourth factor relates to the change in international trade. Whereas during the 17th century the main trading partner was Genoa, during the 18th century it was Marseille with trade in silk and the introduction of exports of soda for the cosmetic industry, produced with the barilla ashes (Pérez Picazo and Lemeunier, 1984).

Figure 2, which is computed without imputing any income, shows one explanation for the patterns in inequality Murcia. This figure shows a steady increase in the fraction of

²⁸One way to reconcile these trends is that the inequality measured for Palencia in this period included capital and labor income, not just labor income, and while capital income may have been increasingly unequal, perhaps labor income was not.

workers that are unskilled or low skilled. Historians have recurrently visited the topic of Murcia's low human capital in the 19th and 20th century Martínez-Carrión (2011). Thus, Figure 2 suggests that a drop in human capital happened during the 18th century that has not recovered yet. Here, we use the terms human capital and skill interchangeably to mean the occupational level, with higher skills or higher human capital occupations typically earning a higher income. Whereas this convention makes sense when talking about occupations in guilds, and also assigns low skills to *jornaleros* and other unskilled workers, this may not directly apply to many occupations in the public sector. We do not claim, nor is it our aim to discuss, whether individuals with higher human capital got better jobs or were better paid. Rather, we document that individuals with occupations that are commonly classified as requiring higher skills or higher human capital, tend to earn a higher income. Álvarez and Ramos Palencia (2018) discuss this point for the Ensenada Cadastre for central Castile.

One clue as to why this drop in human capital occurred lies in the land availability and distribution in the region of Murcia at this time. Unlike in most of Castile and Andalusia, which were characterized by large landholdings, the region of Murcia (and Valencia) was characterized by small, family-size holdings. Moreover, the church only owned 10% of the agricultural land (Pérez Picazo et al., 1979). Nonetheless, the land concentration increased during the first half 18th century, and decreased afterwards (Calvo García-Tornel, 1971). The atomization of land ownership in the second half of the 18th century is due to two main factors (Pérez Picazo et al., 1979). First, the investment opportunities from international trade and the silk industry made the landowners willing to sell their land to invest in the new enterprises. Second, in the short term, the silk boom allowed small farmers to accumulate enough wealth to buy small plots of land.

Pérez Picazo and Lemeunier (1994) suggest that the main reason behind this drop in

human capital has to do with improvement in irrigation and the increase in irrigable area. In this sense, workers that would have otherwise been apprentices and journeyman in some guild instead moved to be self-sufficient farmers with a small irrigated plot. Because farmers are “low skilled” workers, but may earn more than guild members, this produced a drop in human capital and a decrease in inequality. This hypothesis reinforces the importance of studying human capital for pre-industrial societies (Álvarez and Ramos Palencia, 2018).²⁹ Brea-Martínez and Pujadas-Mora (2018) show how inequality decreased for Barcelona during the second half of the 18th century, precisely during a period of economic growth.

7 Conclusion

Information on income inequality in pre-industrial societies is sparse. Pre-census sources typically do not record income or information on household composition, and do not cover the whole population. Moreover, in the survey conducted by Milanovic et al. (2011) there is only one article with income data for the 18th century. Due to the lack of data, most articles have relied on proxies for income to estimate income inequality.

The first direct contribution of this paper is to provide one of the few accounts of income distribution in the pre-industrial era. Mediterranean Spain enjoyed high urbanization rates, high living standards and access to the Atlantic trade. In line with Alfani and Ryckbosch (2016), these characteristics were associated with relatively low inequality.

²⁹One can think of the increase in irrigation due to the silk boom during the 18th century, as a Dutch disease type of effect, which have long lasting effects. The temporary increase in silk prices during the middle of the 18th century, together with technological change in the construction of dams and canals, created an increase in the construction of dams and canals in Spain and elsewhere in Europe. This created a short-term increase in rents for small holding in agriculture, which meant that workers that would have otherwise been apprentices and journeyman in some guild, move to be self-sufficient farmers with a small irrigated plot. This temporary shock destroyed many of the local guild, at least those not related to the silk. When the silk boom was over, there were no guilds jobs to return to .

There appears to be a broad deskilling: the upper income occupations became less prevalent in the city of Murcia over the 18th century. A lack of increasing inequality, then, was not a sign of a robust society but rather a sign of one on the verge of relative economic stagnation.

We also analyze the effect of household composition and secondary occupation income on measured inequality. The latter is particularly important as many studies rely on information about primary “occupation,” but for many individuals there were multiple sources of income. However, we find that the effect of excluding this information is very small in our case. In addition to the contributions above, we analyze income inequality over time, under a robust set of assumptions about how to assign income information when only the occupation is known. In addition to imputing income based on the mean income by occupation, we perform a series of robustness checks by assigning the maximum and the minimum by occupation. We also show how household composition can affect inequality measures: when richer households have more members, inequality is lower.

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A Appendix: Detailed Data Description

In this section we provide a broader description of the data, and the relevant literature that has used similar sources.

A.1 *Milicias*

Milicias registries were performed at the local level periodically. Their goal was to have an estimation of the potential size of a conscripted army. Due to their local character, their periodicity and time span varies from place to place, but most towns in Spain performed them at least once every decade during the 16th to 19th centuries. *Milicias* registries are one of the less studied demographic sources. This is due to the unequal survival of records across towns, the fact that they only contain information regarding males, and the heterogeneity on the information contained. In any case, all of them contain the name, age, occupation and marital status of all men of age, also distinguishing the clergy and the nobility, and those exempt from military duty for any reason. Melgarejo Galera (1987) used a *Milicias* registry for demographic analysis. However, he does not use any economic information or family composition.

A.2 *Ensenada*

The *Ensenada* Cadastre is the first modern census in Europe and it contains detailed information about the subjects of Castile. It was performed for fiscal reasons in 1750-1756. The goal was for the Crown to establish an annual lump sum tax in each city, rather than the arbitrary and *ad valorem* taxes inherited from medieval times. Thus, the royal envoys sent the enumerators to each city, and the citizens had no incentive to lie regarding their assets or income. Moreover, if found to be lying, they were subject to punishment. The tax was never implemented because the cities were concerned that after the tax was im-

plemented, the Crown would just increase it when it needed more revenue. This project resulted in a vast amount of information comprising 84,000 books, containing geographic, demographic, economic, and sociological information of the Castilian Crown.

With respect to the use of the sources, there is a common misnaming of the classification of sub sources, which are the *Respuestas Generales* and *Respuestas Particulares*. There is a confusion between *Respuestas Particulares* and *Relaciones de Particulares* (also called *Memoriales*). The former corresponds to point (2) below, and it encompasses all information at the household level. The latter corresponds to point (2.a) below, and it encompasses the raw surveys performed by the royal officials, without checks by the local experts. Many authors claim that by using (2), they are using all the information, including the corrected information, when they are really using (2.a). The reason is typically that (2.a) (*Relaciones de Particulares*) are the only surviving sources. This misnaming begins with the earliest uses of this source and Camarero Bullón (1985) already pointed out the error. The correct classification is between: 1) *Autos y diligencias de la averiguación*; and 2) *Libros elaborados a nivel local*. The former are reports with aggregate data written in Madrid to provide a summary of the tax potential of the cities and territories. The latter correspond to the micro data and to extended summaries at the local level. Following Montojo Montojo (1997) and Camarero Bullón (2002), the *Ensenada* Cadastre can be classified as follows:

1. *Autos y diligencias de la averiguación (Respuestas Generales)*
2. *Libros elaborados a nivel local (Respuestas Particulares)*
 - (a) *Libros de relaciones de particulares (Memoriales).*
 - (b) *Libros de lo raíz, reales, maestros o de hacienda.*
 - (c) *Libros personales, de familia o padrones o vecindarios.*

While the information in (1) is aggregated always at the municipal level, the information

in (2) is typically at the household level. In (2.a), also called *Memoriales*, each household head would declare his real estate properties (urban and rural), assets and household composition. This was not an official document, and was only based on the declaration of the household head. (2.b), divided into secular and clergy, provides a description of the assets owned by each household head, verified by the royal technocrats, based on the information contained in (2.a). Finally, (2.c) contained personal information of each household head. It is summary of the information in (2.a), this time emphasizing family composition and the income generated and assets owned by each household member. This information was validated by bureaucrats at the City Hall. In summary, (2.a) are long texts detailing interviews with each household head. (2.b) and (2.c) are tabulated. (2.b) contains information regarding each asset owned by the household and (2.c) contains information regarding the household members and their income and assets.

The *Memoriales* (2.a) is the best preserved of the sources mentioned above. Therefore, most of the literature in agrarian history has focused on this source (Camarero Bullón, 2010). However, as mentioned above, this information was not confirmed by either royal or local authorities, which make it subject to error. Moreover, its structure and content is very heterogeneous, which make comparisons across locations hard. In this paper we use the *Libros personales* (2.c). This has the advantage of the information on family composition being codified and confirmed by the local authorities.

Although the *Ensenada Cadastre* is well known among Spanish historians, and it contains very detailed information, most of the literature has focused on the aggregate sources (1). The lack of use of the local sources is due to several reasons: the difficulty of handling such large volume of data, and the immense transcription work load associated with it, and non-surviving of the sources in many municipalities due to fires, flooding, or war (Camarero Bullón, 1985; Rueda Solano, 2015; and Garrido-González, 2016). Santiago-

Caballero (2011) uses the aggregated data in the *Respuestas Generales* to study inequality in Castile during the 18th century. The few authors that have used the local sources have focused on the wealth distribution and production means, as a classic question in agrarian history (Donézar, 1981; García Latorre, 1998). They have focused mainly on (2.a) (Amalric, 1985). There are a series of recent articles using the *Ensenada Cadastre* to study income inequality at the individual level Álvarez and Ramos Palencia (2018); Nicolini and Ramos Palencia (2016b). However, they focus on the interior of Castile, not the Mediterranean region.

To best of our knowledge, for the city of Murcia, the existing literature has focused exclusively on the question of wealth distribution. The best work using (2.a) has been done by Donézar (1981) and especially by Armario Sánchez (1993). Armario Sánchez (1993) used the sources in (2.a) for all the towns in the Kingdom of Murcia and produced data from 222,000 households, to study land ownership. However, he did not collect information regarding family composition, occupation or other types of assets.

A.3 *Floridablanca*

The *Floridablanca* census is considered the most reliable census for Spain during the 18th century. The census was performed in 1786. A set of questionnaires was sent to the royal representatives in each province with the order to perform the census. Although the goal of the census was to assess the depopulation of the interior in favor of the coasts, it was used to as a propaganda tool to show the population growth of Spain (García Sestafe, 1992). Other authors have claimed that the goals were to increase taxes or conscription (Chacón Jiménez et al., 1992). Enumerators were instructed to go “street by street and house by house,” enumerating the number of individuals, their age, marital status and occupation (Royal Order, July 25, 1786). They were aided by the local authorities and

priests (Dopico and Rowland, 1990). Because the information was always collected at the local level, the nature of the information is disaggregated. Nonetheless, most of the literature has focused on municipal or provincial summaries (Dopico and Rowland, 1990; Eiras Roel, 1992). There has been studies using this census for most provinces in Spain (Chacón Jiménez, 1992), usually focusing on demography and family composition. However, to the best of our knowledge, this is the first paper using the *Floridablanca* census to study social inequality. For the province of Murcia, we are the first to use the disaggregated data in the *Floridablanca* census.

A.4 Job Matching

In this section, we describe the job matching process in more detail. The first part of the job-matching process involved assigning jobs in the *Ensenada* to a job category. Each *Ensenada* job was assigned to at least one category—which we call the “narrow” category—and some were assigned to a second category—which we call the “broad” category. The narrow category was nearly always a direct translation of the job title. Ideally, this is the only category we would have needed. If every *Milicias* and *Floridablanca* had an obvious counterpart among the *Ensenada* occupations, we would not have needed to assign broad categories to some *Ensenada* occupations. Unfortunately, this was not always the case. Sometimes, the *Ensenada* job was too specific, or not specific enough, to allow proper matching across censuses.

For example, the *Ensenada* contained many specific types of “Escrivano” (Scribe), such as “Escrivano del numero” (Numbers Scribe) or “Escrivano Real” (Royal Scribe) but had no people with the title of just “Escrivano” (Scribe). On the other hand, the *Milicias* and *Floridablanca* census had numerous individuals with the title of just “Escrivano” (Scribe) or with a specification of scribe not found in the *Ensenada*, such as “Escrivano de Aduanas” (Cus-

toms Scribe). To allow for greater flexibility and generality in the salary assigning process, when issues like these arose, relevant *Ensenada* jobs were given a broad category in addition to their narrow category. So, continuing with the example, the *Ensenada* occupation “Escrivano del numero” and “Escrivano Real” were given the narrow categories “Numbers Scribe” and “Royal Scribe”, respectively, and both were assigned to the broad category of “Scribe”. For the matching step of the process, the *Milicias* and *Floridablanca* occupations of “Escrivano” and “Escrivano de Aduanas” were assigned to the category “Scribe”, while the occupation “Escrivano del numero” was assigned to the category “Numbers Scribe”, which is its perfect match.

The use of broader job categories for assigning income adds another potential layer of bias when calculating inequality. To a certain extent, the effect should be similar to the effect from assigning the narrow job category average income. Broadening the job category would then underestimate the Gini if the amount of within-broad-category income variation is substantial. There is, on the other hand, a second influence that has an ambivalent effect on the bias of the Gini estimation when imputing income using the broad job categories. Taking the example of the scribes above, suppose the broader category of Scribe assigns to the Customs Scribe occupation (which did not appear in the *Ensenada*) a mean income different from the actual mean income of the Custom Scribe job. This discrepancy could lead to an overestimation (or underestimation) of the between-group income difference between Custom Scribe and all other occupations.

A.5 *Labradores, Jornaleros, Arrieros, and Traginantes*

In the aggregated sources (resúmenes generales) of the *Ensenada* for Murcia, there were listed 6,085 *jornaleros* (day-laborers) and 4,525 *labradores* (farmers). In *Floridablanca*, there

were 5,085 *jornaleros* 4,525 *labradores*.³⁰ Notice that these numbers refer to the Municipality, not the urban core. For the urban core, our data for the Ensenada shows 27 *jornaleros* and 6 *labradores*. This low number of *jornaleros* contrasts with the 225 *jornaleros* and 29 *labradores* in 1734, and especially with the 1,652 *jornaleros* and 387 *labradores* in 1786. The contrast is even more pronounced when we see that there were 249 *arrieros* (mule drivers) and 245 *trajinantes de carreta* (handcart operators) in Ensenada, but no *trajinantes* and only 32 *arrieros* in Floridablanca, and 6 *arrieros* and 9 *trajinantes* in *Milicias*. González Lopo (2008) shows how many *jornaleros* in Galicia during the 18th century worked as *arrieros* for big ranchers outside the harvest season. We think that the same might be true for Murcia, and that many workers that work as *jornaleros* during the harvest season, would work sometimes as *arrieros* during the off season. Chacón Jiménez and Chacón Martínez (2015) argue that, for the Kingdom of Murcia, the classical distinction between farmers as *jornaleros* and *labradores*, changed in the written sources during the second half of the 18th century. They show how the same individual would appear with one occupation in one source and with another occupation in the other source, depending on the season where the data was collected, or whether they are ascribed to their own household or the paternal household.

A.6 Servants as a Separate Households

When calculating Ginis, the “Full Household” income specification included the income from all people in the household, including servants. (By servants, here we broadly mean all people whose salaries are paid by other members of the household.) Similarly, the “Household Members” specification counted servants as part of the household size. Because servants are paid from the income of other household members, one worry would

³⁰ The municipality of Murcia then has 57% of *jornaleros* as a fraction of agricultural workers, which contrast with the 68% as the average for the whole Kingdom of Murcia, which reflects the large presence of small landholdings in the irrigated orchards in the city of Murcia (Melgarejo Galera, 1986)

be that this apparent double-counting of income might affect the accuracy of the Ginis. To address this issue, we include two tables to argue that the inequality statistics we report are robust to different ways of handling servants and their income. First, in Table A.1, we calculate the Gini coefficient in the Ensenada using the full household income but excluding servants. Compared to the original calculations, the Gini increases by a small amount: between 0.005 and 0.018 points, depending on the household size adjustment. Second, we separate out servants and their income into a separate household, and then we calculate the Gini coefficient under various definitions of income, but without adjusting for household size. The results are in Table A.2. The Gini coefficient increases by a small amount again, with no more than a 0.01 increase. Thus, our method appears robust to changing how the servants are considered and double-counting does not seem to be an issue for the accuracy of the inequality statistics presented.

Table 1: Summary Statistics.

	1734	1755	1786
Don Status	12.1	11.3	8.78
Married	89.9	89.5	94.0
Widowed	2.33	4.46	3.64
Age 16-24	5.67	7.83	5.92
Age 25-39	36.0	37.2	34.8
Age 40-49	25.1	24.5	23.8
Age 50+	28.6	25.9	34.7
N	1798	3023	3595

Notes: Table displays summary statistics of male heads of households across the samples of the three censuses. Each variable is binary and the sample average listed as percents. "Don status" refers to if the individual is listed with the honorific "Don" in the census.

Table 2: Most Common Occupations in the Ensenada.

Occupation	Mean	Median	St. Dev	IQR/Median	N
Mule Driver	1505	1080	938	135	249
Handcart Operator	2541	1440	2685	100	245
Flax Weaver (Master)	645	630	94	14	111
Tailor (Journeyman)	699	720	72	0	105
Silk Weaver (Master)	688	720	171	25	102
Miller	2382	1100	2580	100	79
Tailor (Master)	1148	1080	391	33	74
Silk Weaver (Journeyman)	542	540	21	0	73
Silk Spinner (Journeyman)	895	900	68	0	70
Shoemaker (Journeyman)	527	540	32	0	64
Textile Carder (Journeyman)	900	900	0	0	62
Servant of Notables	1114	1095	437	46	60
Spice Dealer	1470	1100	2111	100	50
Breadbaker	1476	480	1470	350	50
Bar Owner	9950	10200	7910	143	48
Barber (Journeyman)	553	550	21	0	46
Silk Spinner (Master)	1536	1620	563	33	45
Ironmonger	2694	2500	1997	88	44
Baker	1667	1430	1018	100	40
Flax Weaver (Journeyman)	470	450	56	0	40
TOTAL	1749	1080	2850	92	3023

Notes: Table depicts the mean, median, standard deviation (*reales per year*), and number of each of the twenty most common occupations in the *Ensenada* cadastre (census).

Table 3: Ginis with Income and Household Member Variations by Census.

1734				
Income Used	Single Unit	Male Family	All Family Members	Household Members
Main	0.490	0.567	-	-
Full HOH	0.499	0.580	-	-
Full Household	0.474	0.559	-	-
1755				
Income Used	Single Unit	Male Family	All Family Members	Household Members
Main	0.509	0.560	0.549	0.529
Full HOH	0.516	0.566	0.554	0.532
Full Household	0.512	0.553	0.543	0.512
1786				
Income Used	Single Unit	Male Family	All Family Members	Household Members
Main	0.444	0.442	0.451	-
Full HOH	0.376	0.378	0.388	-
Full Household	0.367	0.368	0.378	-

Notes: Table shows the Gini coefficient calculated using the different possible income sources and household size adjustments. The year on the top left of each of the three panels indicates the year of the census for the Ginis reported in that panel. The column "Single Unit" treats the household as a unit and makes no household size adjustments. The column "Male Family" adjusts for the number of male family members in the household. Likewise, the column "All Family Members" adjusts for all members of the household who are related to the head of household. Finally, the column "Household Members" adjusts for all members reported as living in the household, regardless of their relation to the head of household. Columns without reported values indicate that the census did not provide enough information to reliably calculate the Gini using that household adjustment. The row in each of the panels indicates the kind of income used. For the 1755 panel, the row "Main" income reports the Gini considering only income from the head of household's main occupation. The row "Full HOH" reports the Gini when considering the head of household's income from all sources. "Full Household" reports the Gini when considering the income of all people in the household, not just the head. See Section 2.3.2 for a more detailed explanation of income categorization in the 1755 census.

Table 4: Imputation Ginis By Census.

Census	Lower Bound	Min	Mean	Actual	Modalsli	Max	Upper Bound
1734	0.321	0.358	0.490		0.570	0.619	0.738
1755	0.357	0.422	0.441	0.509	0.557	0.613	0.751
1786	0.296	0.314	0.444		0.473	0.647	0.714

Notes: Table shows the Gini coefficient using different imputation methods, by census year. Here, we take the household as the unit of analysis and do not take into account number of people in the household.

Table A.1: Ensenada Ginis Excluding Servants.

	Single Unit	Male Family	All Family Members	Household Members
Removing Servant Income	0.517	0.566	0.555	0.530
Original	0.512	0.553	0.543	0.512

Notes: Table shows the Gini coefficient when removing servants and their income from the calculation by household size adjustment. The column "Single Unit" treats the household as a unit and makes no household size adjustments. The column "Male Family" adjusts for the number of male family members in the household. Likewise, the column "All Family Members" adjusts for all members of the household who are related to the head of household. Finally, the column "Household Members" adjusts for all members reported as living in the household, regardless of their relation to the head of household.

Table A.2: Ensenada Ginis Servants as Separate Household.

	Main	Full HOH	Full Household
Separate Servant Household	0.513	0.521	0.522
Original	0.509	0.516	0.512

Notes: Table shows the Gini coefficient when considering servants in a household as a separate household by the income specification used. The column "Main" income reports the Gini considering only income from the head of household's main occupation. The column "Full HOH" reports the Gini when considering the head of household's income from all sources. "Full Household" reports the Gini when considering the income of all people in the household, not just the head. To separate out servants, for each household a single new household was created with the all of the servants from the original household. For these servant households, the income values across income specifications are the same: it is just the total income of all of the servants of the household.

Figure 1: Map of Spain and population statistics.

	1591*	1631*	1712*	1755	1768	1786	1857	1900
Palencia	12,556	7,520	6,380	10,064	9,323	10,345	12,811	15,940
Guadalajara	7,916	-	-	5,718	4,736	6,712	6,650	11,114
Toledo	45,674	-	9,744	18,509	15,074	18,021	17,275	23,317
Valladolid	33,588	22,160	14,152	21,201	18,820	23,284	41,943	68,789
Murcia	14,051	18,788	24,092	59,625	54,357	65,515	89,314	111,539
Almería	-	-	4,728	8,629	7,882	14,958	27,036	47,326
Granada	-	-	42,900	55,948	51,211	56,541	68,743	75,900
Málaga	-	-	18,204	40,873	41,692	51,098	94,293	130,109
Sevilla	73,666	-	-	81,412	84,306	80,915	112,529	148,315
Cádiz	2,448	-	16,052	42,779	64,838	71,080	70,811	69,382
Huelva	4,360	-	2,500	5,740	5,377	8,519	21,359	21,359
Alicante	-	-	4,980	-	16,834	17,899	27,550	50,142
Barcelona	-	-	29,616	-	-	130,114	183,787	533,000
Valencia	-	-	33,160	-	75,733	105,492	106,435	213,550

Notes: *The data is an estimation from multiplying by 4 the number of neighbors recorded in each census as suggested by Lemeunier (2004). **Cities in the Kingdom of Aragon do not appear in the population censuses of 1591, 1631, 1752. (1) Census of the Castilian Crown, 1591. (2) Census of the Salt, 1631. (3) Campoflorido Census, 1712. (4) Ensenada Cadastre, 1755. (5) Aranda Census, 1768. Data not available for Barcelona. (6) Floridablanca Census, 1786. (7) First modern Spanish census, 1857. The source for all numbers comes from the *Instituto Nacional de Estadística* (INE). For the case of Murcia, the population data include all the whole municipality, while our censuses only include the parishes within the city wall.

Figure 2: Distribution of HISCLASS Across Three Censuses.

Notes: Figure depicts the distribution of HISCLASS occupations across the *Milicias* 1734, the *Ensenada* (1755), and the *Floridablanca* census (1786). “Higher professional” includes HISCLASSES 1 (“Higher managers”) and 2 (“Higher professionals”). “Lower professional” includes HISCLASSES 3 (“Lower managers”), 4 (“Lower professionals, clerical, and skilled personnel”), and 5 (“Lower clerical and sales personnel”). “Skilled” includes HISCLASSES 6 (“Foremen”), 7 (“Skilled Worker”), and 8 (“Farmer”). “Unskilled/Low Skilled” includes HISCLASSES 9 (“Lower-skilled workers”), 10 (“Lower skilled farm workers”), 11 (“Unskilled workers”), and 12 (“Unskilled farm workers”).

Figure 3: Lorenz Curves for the Three Censuses.

Notes: The figure depicts Lorenz curves calculated for the different censuses. The figure includes the actual *Ensenada* (1755) Lorenz curve as well as the imputed *Ensenada* (1755) curve. All imputed curves use only mean salary information from the main income source. None of the curves adjust for the number of people in the household. Households headed by nobles, military men, clergy, or women were excluded. The “Equality” curve demonstrates the Lorenz curve under the condition of perfect equality.

Figure 4: Income Distribution for Head of Household Guild Journeymen.

Notes: The figure depicts box plots showing the distribution of earnings for Guild journeymen, for each Guild. Guild journeymen earning 0 reales were retired, thus making no earnings, but they kept their title as journeymen. There were no Pastry Cook journeymen.

Figure 5: Income Distribution for Head of Household Guild Masters.

Notes: The figure depicts box plots showing the distribution of earnings for Guild Masters, for each Guild. Guild masters earning 0 *reales* were retired, thus making no earnings, but they kept their title as masters. One Surgeon who earned 7,700 *reales* is not included. The four Pastry Cooks are also not included. They had earnings of 1,500, 1,500, 13,000, and 13,700 *reales*.