Numeracy of religious minorities in Spain and Portugal during the Inquisition era*

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Abstract:

We assess the numeracy (age heaping) of religious minorities, particularly Jews, and other defendants of the Spanish and Portuguese Inquisitions, and compare it to the general Iberian population. Our database includes 13,000 individuals who took part in Inquisition trials, and 17,000 individuals recorded in censuses and parish registers who serve as a control group. We thoroughly discuss the representativeness of our samples for the populations we aim to capture. Our results point at a substantial numeracy advantage of the Judaism-accused over the Catholic majority. Furthermore, Catholic priests and other groups of the religious elite who were occasional targets of the Inquisition had a similarly high level of numeracy.

Keywords: Human Capital, Religion, Minorities, Inquisition, Portugal, Spain

JEL: N33, Z12

1. Introduction

Max Weber's famous argument that Protestant Christians are prone to save and work long hours and thereby contributed to the rise of capitalism in Northern Europe has inspired a vast literature on the link between religion and economics (recently, Becker and Woessmann (2009) provided a human capital interpretation). Botticini and Eckstein

(2005, 2007, 2012) argued that the Jewish communities enjoyed a high level of human capital, gained by religious motivations, which provided them with a comparative advantage in entering skilled professions. These authors attribute this educational advantage to a religious law invoked in the first century CE by the religious group of the Pharisees that forced Jewish fathers to teach their male children to read Hebrew, or to send them to school to do so. Although not its goal, this religious emphasis on literacy was a precondition for the specialization of Jews in highly skilled and well-paid occupations in urban centres later-on.

The Catholic Monarchs expulsed Jews from their kingdoms in the late 15th century and for more than three centuries the Inquisition in the Iberian Peninsula persecuted "New Christians", formerly Jews or Muslims, and other religious minority groups[1]. This may have had negative long-term consequences for economic development, partly due to emigration and partly due to persecution. The historian Antonio Saraiva (2001, p. 34) makes the point that "the departure of the Jews was a devastating blow to the Spanish economy". Joseph Pérez (2014, pp.118-119), a prominent Hispanicist, holds that without resulting in a "national catastrophe" in Spain, the expulsion caused disturbances in the economy at the local level, mainly because artisans and merchants disappeared from one day to the next[2]. In a quantitative study, Vidal-Robert (2014) finds that inquisitorial activity had a negative impact on economic development, which he proxies by population growth, until the second half of the 19th century. Anderson (2015) compares the development of what he calls "top-achievers" in countries with established Inquisitions (Italy, Spain and Portugal), most of them of

[1] "New Christian" and "*converso*" are terms used to refer to Jews and Muslims who converted to Christendom, as well as their baptized descendants. Those who secretly practiced Jewish rites were also called "crypto-Jew", "Judaizer" and "marrano".

[2] He also admits that the Inquisition prohibited many scientific books from the mid-16th century, not because of its opposition to science, but because they were written by Protestants in other European countries or by Semites (Pérez 2005, pp. 215-217).

Jewish origin, with other countries in which oppression was not institutionalized. His findings suggest that the Inquisition-countries experienced a significant decline in the numbers of top-tier scientists, artists, authors and composers after the Inquisition began, whereas other countries saw an increase in them.

In this study, we quantify the numeracy advantage of religious groups persecuted by the Inquisition, with the use of the age-heaping technique, now well established in the literature. It is a human capital measurement exercise, which compares the different (religious) categories of Inquisition defendants with a representative sample of the early modern Iberian population[3].We confirm our hypothesis that people tried for secretly practicing Jewish rites (crypto-Jews) had a substantial advantage in numeracy over the average Catholic majority, although the gap narrowed over time. An additional finding is that other (religious) elite groups of society that became occasional targets of the Inquisition had a similar or even higher numeracy. The non-elite defendants who were tried for "minor heresies" were not significantly more numerate than the non-Inquisition control group. However, our study focuses on Jews, because this religious minority is thought to have played an important role in the Iberian economy and polity, particularly before the expulsion, and it represented a key target of the Inquisition.

We use a novel dataset composed of defendants of various "crimes" in the courts of the Spanish and Portuguese Inquisition to assess the numeracy of religious groups from the late 15th until the late 18th century. The original sources are trial records and *relaciones de causa* in particular; trial summaries carried out by every district court and sent to the Inquisitor General in Madrid, which contain valuable information on the

[3] There is ample qualitative evidence that, for example, Jews invested immoderately into human capital (see section 2), but almost no quantitative evidence, at least for the region and time period we study. Qualitative descriptions can sometimes be biased by prejudice and self-representation. Thus, we think complementary quantitative evidence of numeracy is a valuable contribution.

defendants. The non-Jewish majority is captured by a comparison sample based on population censuses as well as parish registers (see Appendix A.1). Focus on the Iberian Peninsula has the advantage that the majority of the population was relatively homogenous culturally.

We must note from the outset, however, that our samples are not without definition issues. For example, the Inquisition did not accuse every person who secretly practiced Jewish rites, and some individuals who were accused probably did not adhere to the Jewish religion (the same is true for those accused of Protestantism and other "crimes"). For this reason, we will refer to our sample of alleged Jews as "Jewish-accused" or JA. Still, our sample comes closest to a core group of Spanish and Portuguese who adhered to Jewish religion and custom.

In section 2, we provide a brief overview of the literature on the relation between (particularly Jewish) religion on the one hand, and education and occupations on the other. We discuss various hypotheses regarding Jewish motivations for investing immoderately into education. Section 3 gives a historical background on Jews and the Inquisition in Iberia. Section 4 introduces the method, the data and the sources. We also address potential caveats in the research design, like the representativity of the samples. In section 5 we discuss the results, and section 6 concludes.

2. Religion, human capital, and the economy: A literature review

"The Protestant Ethic and the Spirit of Capitalism" (1905), Max Weber's seminal work, strongly influenced the subsequent literature on religion and economics. His argument that Protestant Christians (particularly Calvinists) are prone to save and to work long hours, thereby contributing to the rise of capitalism, inspired economic theories on why

adherents of a particular religious belief are more successful than others[4]. More recently, Becker and Woessmann (2009) offered an alternative explanation to Weber's theory. Analysing differences in literacy between nineteenth-century Prussian Protestant and Catholic counties and using instrumental variable methods, they conclude that the human capital that was gained by Lutherans due to the need to read the Bible (in German) allowed Protestant regions to prosper economically and caused Catholic regions to fall behind.

In answer to Weber's seminal work, the economist Werner Sombart (1911) argued that the characteristics ascribed by Weber to Protestants apply to a greater degree to Jews. In "The Jews and Modern Capitalism", Sombart hypothesizes that there may be a connection between the shifting of the economic centres from Southern to Northern Europe and the movement of the Jews. For example, at the end of the sixteenth century, Holland enjoyed sudden economic development that coincided with the establishment of a prosperous Jewish community in Amsterdam formed by refugees from Portugal. Although these populations were small in quantity, one can imagine learning effects within the non-Jewish population, knowledge transfer, and crucial entrepreneurial input. In a similar vein, Ashraf and Galor (2011, pp.76-77) argued that the Jewish and other minorities played a beneficial role for economic development.

Several scholars have attempted to identify the reasons for the selection of Jews into urban high-skilled occupations. A line of scholars dating back to Werner Sombart (1911) maintains that Jews and other persecuted religious or ethnic minorities preferred to invest in human capital rather than physical capital because it was portable and could

[4] Several economists and social scientists have investigated the influence of Catholic versus Protestant religion on economic behaviour and outcomes. For instance, exploiting the strong adhesion of minority groups to religious ethical principles and the historical persistence of the geographical distribution of denominations within the cantons of Switzerland, Nunziata and Rocco (2016) find that Protestants are more prone to engage in entrepreneurial activities than Catholics. Nunziata and Rocco (2018) provide similar evidence for the former Holy Roman Empire. Iannaccone (1998), Barro and McCleary (2006) and Iyer (2016) provide reviews of the literature that associates religion in general, as dependent or independent variable, with socio-economic outcomes.

less easily be expropriated. Therefore, Jews did not invest in land, and their educational advantage allowed them to engage in highly skilled urban occupations. Historians of Judaism including Cecil Roth (1938) and Solomon Katz (1937) argue that *restrictions* imposed on Jewish minorities by local rulers refrained them from engaging in agricultural activities and encouraged them to specialize in trade and crafts and, later, in money lending[5]. An alternative explanation was proposed by the economist Simon Kuznets (1960, 1972), who analysed the occupational structure of the Jewish population in nineteenth century Eastern Europe and North America. He attributes the engagement of Jews in non-farming occupations to a non-economic decision common to small *minorities*. To maintain their cohesion, group identity and customs, the Jewish community (like other small minorities, such as the Parsi in India or the Huguenots in early modern Western Europe) preferred to be concentrated in selected industries, which happened to be urban occupations. Before Kuznets, Max Weber had hypothesized that Jews voluntarily segregated into certain occupations to correctly observe their strict religious rituals, which, in his view, was a trait common to all religious minorities (Botticini and Eckstein 2012). In a similar vein, Gross (1975) claims that turning to mercantile activities is a common phenomenon among immigrants, who are familiar with more than one language and culture, and therefore able to mediate between different places.

On the other hand, Botticini and Eckstein (2005, 2007, 2012) argued that the Jewish communities enjoyed a high level of human capital, gained by religious motivations, which provided them with a comparative advantage in entering skilled professions. These authors attribute this educational advantage to a religious law invoked in the first century CE by the religious group of the Pharisees that forced

[5] Nevertheless, this view was rejected by Botticini and Eckstein (2005, 2012), who argue that at the time and places the occupational transition occurred, no constraints prevented Jews from owning land (or engaging Christian laborers to work on their farms).

Jewish fathers to teach their male children to read Hebrew, or to send them to school to do so. During this time, the Pharisees became the dominant religious group among the Jews in Israel, and Judaism transformed from a religion of "sacrifices in temples" to a religion of the study of the Torah in the synagogue. Although not its goal, this religious emphasis on literacy was a precondition for the specialization of Jews in highly skilled and well-paid occupations when urbanization progressed in the eighth century Muslim world. The ability to read and write constituted an advantage for Jewish farmers to take over particular activities such as commerce, crafts, medicine, and finance. When they dispersed in Europe, Jews had already specialized in urban professions and continued to pursue them in the Diaspora.

Despite the existing documentation, quantitative evidence on Jew's human capital relative to the non-Jewish majority's in the same historical period and region is scarce[6]. Whereas Botticini and Eckstein (2005, 2007, 2012) focus on the period before 1500 and mostly on other world regions, the available information on literacy of Jews and New Christians in Iberia in the modern era is scattered and comes mostly from records of particular Inquisition trials[7].

3. Background: Religious minorities and the Inquisition in Iberia

Until the fifteenth century, the Iberian population consisted of mixed confessions (Muslim, Christian, and Jewish). Jews had prospered socially during the Muslim rule of

[6] There is however quantitative evidence on the late 19th and early 20th century (and not all Jewish population groups were found to have higher levels of education compared to other religious groups). For example, Ó Gráda (2006) studied Jewish immigrants in Dublin using the Irish census of 1911 and found that Jews had substantially lower values of both literacy and numeracy compared to the Catholic population of Dublin, not to speak of other religious groups such as Protestants. The reason was probably that the Jews of Dublin were mostly refugees born in the Russian Empire, where education levels were substantially lower. In a similar vein, Chiswick (1991) looks at the occupational status of Jews in the US in 1900 (most of them also refugee migrants from Russia) and finds that it was lower than that of the indigenous population.

[7] Botticini and Eckstein (2005) argue based on archival documents and secondary literature that in the 9th to 12th century Muslim Near East, primary education and literacy were almost universal in the Jewish male communities (while both were low among the non-Jewish majority).

Al-Andalus –which lasted in parts of today's Spain and Portugal from 711 and until 1492 – and some kept occupying important positions in the economy and polity during the "Reconquista" in Christian Spain[8]. In the Christian kingdoms of Iberia, Jews held high-ranked posts in public administration, including the posts of royal counsellors, royal treasurers and bankers, and heads of the king's chanceries. Other typical professions included small and large-scale merchants, physicians and lawyers. Money lending and other financial operations, stigmatized activities in medieval Europe, played a key role in Jewish economic life as well. Jews in Iberia also produced artisans; typically tailors, jewellers, and blacksmiths (Kamen 1965, Roth 1995).

Anti-Semitic tensions in Iberia had long been latent and worsened during the fourteenth century, leading to Jewish massacres in 1391 and in 1412[9]. Probably up to 200,000 Jews accepted conversion during this period, starting with the upper classes (Pérez 2005, p. 141). During the reign of the Catholic Monarchs of Castile and Aragon (covering most of the Spanish territory), several measures were taken to isolate Jews from the rest of the population, culminating in the issuance of a royal edict of expulsion of the Jews from Spain in 1492 (Pérez 2005). As a result of the proclamation of the edict, of the approximately 200,000 Jews living in Castile and Aragon in 1492 (Pérez 2005, p. 164), an estimated 50,000 left in exile for good while the rest converted to

[8] According to Pérez (2005), the situation for the Jews changed in Muslim Spain in the 11th century with the arrival of the Almoravids, who were less tolerant with non-Muslims, and many fled to the (re-conquered) Christian territories.

[9] Pérez (2005, p. 124) holds that worsened economic conditions, the outbreak of plague epidemics, political instability and the incitement of preachers, provoked the anger of the common people against Jews who served as scapegoats in 14th century Iberia (consisting at that time of the Christian kingdoms of Castile, Aragon, Navarre and Portugal; as well as the Muslim kingdom of Granada). Others have ascribed the growing anti-Semitic tendency in the late middle ages and early modern era to the hostility of the feudalistic nobility against a rising middle class consisting of Jews and, increasingly, New Christians who controlled commerce, capital and intellectual life (Saraiva 2001, Netanyahu 1995). Furthermore, their engagement in financial activities – which were condemned by the Christian church – and their supposed "unwillingness to take part in manual labour" probably provoked the animosity of the Christian population (Kamen 1965).

Christianity (Pérez 2005, p. 192) [10]. Roughly half of them migrated to Portugal, the rest to North Africa, Turkey, Italy and Western Europe. Portugal granted them temporary asylum in return for payment. Because the Jews who remained in Spain or returned from exile had been forced to convert, they were suspected of secretly practicing Jewish rites.

The Spanish Inquisition was officially introduced with the promulgation of the Papal Bull "Exigit Sincerae Devotionis" under the rule of the Catholic Monarchs Isabella I of Castile and Ferdinand II of Aragon in 1478 and was suppressed for good in 1834. Since the first tribunal, based in Seville, commenced its activity in 1480, more than 100,000 trials were conducted against so-called Judaizers, converted Muslims, Protestants, and other "heretics" (Vidal-Robert 2014). It established sixteen permanent courts in the Spanish Peninsula, the Canary Islands and Mallorca, each ruling over a certain jurisdiction. Since the late 16th century, the Inquisition also set up courts and persecuted JA throughout the Spanish Empire in Latin America, including Lima, Mexico and Cartagena de Indias, as well as in Spanish territories in Italy[11]. The Inquisition soon acquired a reputation outside Iberia for being a repressive instrument of racial and religious intolerance that regularly employed torture and restricted Spain's intellectual development for centuries (Rawlings 2006, p. 1)[12].

The motive of the Catholic Monarchs to set up this institution was most probably to reach (social and) religious uniformity in their highly religiously fragmented

[10] This is about 2 percent of the Spanish population of the time. It should be noted that estimates of the number of Jews living in Spain at the time of the edict vary considerably. Saraiva (2001) talks about 90,000. Regarding those who left for exile, estimates vary as well, but the most reliable recent sources claim that discounting those who returned in the first few years, the total number of exiled Jews was 50,000.

[11] Although there are data available on Inquisitorial trials of Jews in the colonies, we do not include them in our analysis because our sample would be too heterogenous.

[12] As mentioned earlier, many of historians and social scientists have argued that the Inquisition inhibited scientific, intellectual and economic progress; while others have attenuated this view (e.g. Pérez 2012, pp. 159-177). Furthermore, recent historians claim that the Spanish Inquisition did not employ torture to gain confessions or apply the death penalty to a larger extent than other European courts of the time (Rawlings 2006).

kingdoms, as a way of securing political stability (see also Johnson and Koyama 2019)[13]. The aim of the Inquisition was to assure the orthodoxy of New Christians who converted from Judaism and, to a lesser extent, Islam[14]. The royal decrees of expulsion of Jews and forced baptism of Muslims, of 1492 and 1502 respectively, led to forced mass conversions and resulted in more targets for the Inquisition. Religious and intellectual reformers, Protestants, as well as so-called "minor heresies", behavioural attitudes that violate Christian rules, were also persecuted. While at the beginning the Spanish Inquisition dealt mostly with Judaism, this crime became relatively infrequent from the 16th century. Even though the Spanish Inquisition was a centralized institution, there were some differences between regional courts in the type (and number) of crimes they dealt with. For example, in comparison to other courts, the tribunal in the Canary Islands tried a much larger share of Protestants – all of them foreigners – given the active relations with Dutch and German traders and the high levels of immigration in the archipelago (Fajardo Spinola 2005, p. 113).

In Portugal, the Inquisition was formally established in 1536 and endured until 1821[15]. It set in place permanent courts in Coimbra, Lisbon, and Evora in Iberia, as well as in Goa, a Portuguese colony in India. More than 40,000 trials took place during its existence and at least 85 percent of them concerned Judaizing (Saraiva 2001). Despite the anti-Semitic sentiments of the population and the forced baptism of all Jews in 1497, the persecution of crypto-Jews was initially less severe than in Spain. In fact, the newly

[13] Other possible motivations have been brought up, particularly by earlier scholars. For example, to standardize the different criminal laws and guarantee uniform prosecution within Spain; to extract wealth for the financing of the state, given that expropriation was one form of punishment (Llorente 1822); as an instrument of repression to avoid internal revolts at times of war, when the crown had its military resources abroad (Vidal-Robert 2014). The state-financing and other motivation have been discarded by more recent historians (Pérez 2005, 2012; Rawlings 2006).

[14] The Inquisition did not have any jurisdiction over actual Jews or Muslims, as they were not members of the Catholic Church and therefore could not be accused of heresy. One exception was that of the Jews alleged of proselytism, which means those specifically accused of influencing Christians to convert (see, e.g., Roth 1995, p. 213).

[15] The Portuguese and the Spanish Inquisition were separate organizations and acted autonomously. During the temporary union of Spain and Portugal after 1580, the Portuguese Inquisition still had its own General Inquisitor and General Council.

baptized Jews (including those who had fled Spain) were protected from any investigations into their religious beliefs and practices for a few decades after 1497. King Manuel III wished to retain the New Christian population in Portugal; he actually banned the emigration of New Christians under threat of death and confiscation of goods. Thus, converted Jews probably continued to practice their former religion until king João III finally obtained a papal bull for an Inquisition in Portugal in 1536 (Saraiva 2001). When the Portuguese throne was taken over by the Spanish monarch in 1580 (and until 1640), the Holy Office courts of Portugal became more aggressive against "Judaizers" and other heretics. In fact, the late 16th and early 17th century is the era during which most sentencing took place (Saraiva 2001).

4. Method, data and classification

The method used here to measure human capital is the "age-heaping" technique. Age-heaping captures the numeracy component of human capital, which is an important precondition for the adoption and development of technologies and a prerequisite for modern market economies (see also A'Hearn et al. 2009). The phenomenon of heaping applies to historical populations (as well as people in the poorest countries today), in which a substantial share of the people are unable to state their exact age and hence reported a rounded age, such as "I am 30", when they were in fact 29 or 31, for example. This results in an age distribution with peaks on multiples of five (Figure 1). How is the degree of age-heaping calculated? The ratio between the preferred ages and other ages can be measured by several indices, the most common of which is the Whipple index. This index measures the proportion of people who state an age ending in a five or zero, assuming that each terminal digit should appear with the same

frequency in the "true" age distribution (or the degree to which the distribution of age statements approaches an equal distribution).

$$(1)\quad Wh = \left(\frac{(Age25 + Age30 + Age35 + \ldots + Age70)}{1/5 * (Age23 + Age24 + Age25 + \ldots + Age72)} \right) \times 100$$

For an easier interpretation, A'Hearn et al. (2009) suggested another index, which is called the ABCC index. This is a simple linear transformation of the Whipple index and yields an estimate of the share of individuals who correctly report their age, thus ranging from 0 to 100:

$$(2)\quad ABCC = \left(1 - \frac{(Wh - 100)}{400} \right) \times 100 \quad \text{if} \quad Wh \geq 100 \text{; else } ABCC = 100 .$$

A technical requirement of the ABCC Index is that it is applied to an age distribution in which every final digit occurs with roughly the same frequency. It is usually calculated for fixed age ranges starting with the final digit 3 and ending with the final digit 2; 43-52, for instance. This allows the final digits of 0 and 5 to be spread more evenly across the age ranges, mitigating the effect that more people are alive e.g. at 60 than at 69, and thus the number of 60-year-olds will be higher (Crayen and Baten 2010). In this study, we consider individuals aged 23 to 72. We usually ascribe the ABCC Index to the decade of birth. The share of persons able to report an exact age has been shown to be highly correlated with other measures of human capital, such as literacy and schooling, across countries and individuals and over time (Mokyr 1983; A'Hearn et al. 2009; Crayen and Baten 2010). While age-heaping based numeracy is not without problems, it complements other indicators of human capital (which are also imperfect; see Crayen and Baten 2010)[16].

[16] For instance, the fact that a person reports a rounded age can be related not only to her inability to calculate her age from her birth year, or to keep track of her age; but also to the fact that she does not know her birth year or that she has forgotten it given that it is unimportant in the context where she lives (which is less related to innumeracy).

A potential objection to this line of research could be that Inquisition litigants were actually asked about their literacy[17].Usually, numeracy is considered as a proxy indicator for education which is particularly useful if literacy data is not available. However, for a number of reasons, numeracy also has advantages over literacy measures. One advantage of age-heaping based numeracy – and perhaps the most crucial one – is that we can create a comparative sample of the general Iberian population, which would not be possible with literacy in this study[18]. A second advantage is that age reporting was less the focus of the Inquisition. Literacy can be heavily biased in Inquisition records, because it was most likely interpreted as a signal for being Jewish or Protestant. Age was much less suspicious, because contemporaries did not know about the proxy function of rounded ages.

Finally, the relationship between economic growth and numeracy is far stronger than to school enrolment or literacy, as the recent economic growth literature has shown: numerical skills are the ones that matter most for economic growth. Hanushek and Woessmann (2012) argued that math and science skills were crucial for economic success in the 20th century. They observed that these kinds of skills outperform simple measures of school enrolment in explaining economic development. Hence, if there were an effect of religious persecution on economic development, it would more likely be related to numeracy.

[17] However, most of the sources we used to compile our dataset do not report it. Generally, the "relaciones de causa", summaries sent to the Inquisitor General in Madrid by district courts, do not include literacy information. For example, in the publication of the Logroño and Córdoba Inquisition trials (Henningsen 2004, pp. 397-437; Gracia Boix 1983), no literacy information is available.

[18] Delgado (1993) summarizes the status of our knowledge on literacy in 17th century Spain emphasizing that the evidence – mainly based on signature ability using notarized contracts and wills – is very incomprehensive; it is regionally biased in favor of the northern and central regions, urban areas, men and particular social groups. Rodriguez and Benassar (1978) even use Inquisition records to draw inferences on literacy for the general population. The authors themselves emphasize the problems due to sample selection bias.

We construct a large database that includes 1) a sample based on Inquisition trials from Spain and Portugal, and 2) a comparative sample based on non-Inquisition sources. In Table 1, we present the earliest and latest birth years of individuals recorded in both Inquisition and census/mortality sources as well as the number of cases. We only take into account the individuals born between the mid-15th and the late 18th centuries, who reported an age between 23 and 72 years. In order to avoid potential temporal composition effects, we will include time fixed effects below.

Appendix Table A.1 cites all the sources used to compile the database. The comparative sample consists of individuals recorded both in "padrones" / "visitas" (regional, usually municipal, population counts) and "catastros" carried out during the Inquisition era, such as the Catastro de Ensenada, as well as ecclesiastical death records of Spain and Portugal[19].

The Inquisition sample was compiled using information on the defendants who were tried in eleven out of nineteen district courts that existed in the Iberian Peninsula (Figure 2 locates Inquisition courts). In Portugal, the Inquisition had courts in Lisbon, Coimbra, and Évora, and our dataset includes defendants at all three[20]. The Inquisition in Spain, including the Canary and Balearic Islands, had permanent courts in 16 cities, and our dataset includes trials from eight different courts spread across the country; regional bias is therefore less of an issue. Our main data source are summaries of Inquisition trials (*relaciones de causa*), which contain valuable information on defendants including their name, age, occupation, genealogy, place of residence and origin, along with brief notes on charges, confessions, remorse, and sentencing[21]. Given the large amount of information collected by officials, this source constitutes a useful

[19] "Catastros" are surveys carried out for taxation purposes, including extensive information on the population, as well as on land ownership, geography and other characteristics of a region.
[20] And for a short time (1541 until c. 1547), also in Porto, Tomar and Lamego.
[21] The information included in the *relaciones de causa* varies over time and between courts. Usually, at the beginning the information included was less extensive.

instrument for the historiography of the social and economic position of Jews and New Christians.

The two types of sources (census and mortality registers) used to construct our control group sample have already been used for numeracy analyses by A'Hearn et al. (2009), but we will still discuss potential social and regional biases. The social sample selection bias in the Spanish and Portuguese "control group" samples, based on census and mortality data, is not substantial because these sources aimed to include the entire population at the year of census taking or death. In Spain and Portugal, almost everyone was Catholic and was entered into the death registers. Potential exceptions are emigrants; however, emigration affected only a modest share of the Christian population during the early modern period. The mortality records are obviously not self-reported ages, but earlier studies found that spouses or other close relatives typically reported the ages of the deceased (A'Hearn et al. 2009). The priests sometimes based the age statements on interviews with the deceased just before death. In a minority of cases, when neither source of information was available, they simply estimated the age, which might result in a slightly lower estimate of numeracy relative to the true value. Ploetz (2013) found that death-register-based and census-based numeracy correlated strongly where both estimates were available, but death-register-based ones were slightly lower. Hence, in the regressions below we will add a dummy variable for the control group observations coming from mortality registers. In addition, we also run a robustness test using only census type samples, which are usually considered not to contain substantial bias. We find that the differences were small compared to the other estimates (see Appendix Table A.3). Both strategies yield almost the same results; hence, the mortality register bias does not cause problems.

Given the regional differences in education levels, especially in Spain, we carefully verified that our data were representative for both Spain and Portugal by comparing the regional coverage of our samples with the regional distributions of the actual populations in the censuses of the eighteenth and nineteenth centuries (Appendix C discusses changes from the 16th to 18th century regional population weights). In Table 2, we compare our samples with the population statistics of the earliest national censuses of Spain (census of Floridablanca 1787) and Portugal (national census of 1864)[22].

In our original comparison dataset, the regions of South Castile, Granada and Northern Portugal were overrepresented, as we had managed to gather more information on residents of those regions. We drew a random sample (using the stata command *sample*) from both regions to make the regional distribution of our comparison sample coincide with the one of the Floridablanca census and the 19th century national census of Portugal. How regionally representative is our dataset for the whole population of Portugal and Spain now? In general, the Spanish source seems quite representative by region: the larger units of the country have relatively similar population shares in the census and in our sample. The same is true for Portugal. The only exceptions are the islands, for which we have no control group. Any remaining regional bias will be controlled using regional fixed effects in the regressions.

Finally, is our sample of JA representative of the total Jewish population? Unfortunately, there is no other (unbiased) source for Iberia that can show the numeracy of Jews or New Christians. However, all Jews and New Christians who remained on the Iberian Peninsula after the edict of expulsion were potential "victims" of the Inquisition court, independent of their educational level; and a substantial share was actually

[22] We should note that the latter censuses cannot be used for our analysis because they do not contain information on individual ages; we must therefore rely on the compilation of regional census samples and death registers.

accused, given that *conversos* were widely believed to practice Jewish rites secretly (e.g. Rawlings 2006, p. 49). Moreover, although the occupational status of the Jews included in our sample is on average high, their occupational structure coincides with that ascribed in the literature to the Jewish population in Spain and Portugal at the time (Kamen 1965, Saraiva 2001). As in several other European countries, e.g., Prussia in 1849, the Jewish occupation structure was very much skewed towards commerce, professionals, and crafts (see Table 3)[23]. Clearly, Prussia had a more rapidly progressing industrial development in the 1840s; hence, we can observe a composition of occupations that shows more accountants and tradesmen than our earlier sample for Iberia. If we only look at the post-1650 period in our Inquisition sample, the share engaged in commerce rises to 40 percent (not shown), approaching the Prussian share. The structure of Jewish occupations in both countries can be considered similar, but, in Prussia, slightly more individuals belonged to those occupational groups of trades and services, relative to agriculture and traditional professional occupations, including doctors and lawyers. In conclusion, our sample of Jewish occupations that we find in the Spanish Inquisition documents seems plausibly representative for early modern Spain, and occupational selectivity is therefore probably limited. In section 5.3 we provide further discussion of particularities of Inquisition sources possibly affecting age statements.

As noted above, Inquisitorial trial documents provide comprehensive personal information on the defendants, such as their age, birthplace, occupation and gender. We can also derive information on the alleged crime for most of the individual cases. We

[23] We use the Prussian sample because this is the most suitable source we have found for the sake of comparison. Historical studies about Jews in other southern European countries like Italy in the same period suggest a similar occupational composition as in Iberia, but do not include quantitative evidence.

classify the Inquisitorial crimes into categories based on Contreras and Henningsen (1986) in Table 4 [24].

Judaism, Islam, and Protestantism were considered the three "major heresies" by the Inquisition. The category of Protestantism includes Calvinism, Lutheranism, Erasmism, Illuminism, and Freemasonry because these schools were perceived as similar to each other in doctrinal orientation. A number of defendants were actually brought to trial for various "major heresies" at the same time. For example, Maria Cazalla was arrested and accused of Lutheranism, Illuminism, Erasmism and Molinism (a Catholic theological line named after the Spanish Jesuit Luis de Molina who claimed that divine grace and human free will are not mutually exclusive) in 1532 (see Kamen 1965, chapter 5). "Minor heresies" refers to unorthodox beliefs and behaviours of Old Christians, which the Inquisition began to be responsible for after the 1560s. They included polygamy, other crimes related to sexual promiscuity (such as sodomy, cohabitation, or infidelity), blasphemy and propositions, superstition and witchcraft, offenses against the Holy Office or impeding its correct functioning (including giving false court testimony; not serving an imposed sentence and corrupted "family of the Inquisition") and being an accomplice to a crime[25]. Contreras and Henningsen include the category of "solicitation" in the "minor heresies". "Solicitation" occurred if a priest seduced a woman during confession. We have ascribed this type of crime to a category we call "clergy crimes". It includes other offenses such as clergymen getting married and secretly married men becoming priests, priests holding more than one Mass per day, or holding a Mass without having fasted. This category is particularly interesting because it represents Catholics who belonged to one of the presumably best-educated social groups of early modern society, given that they had to be literate and have

[24] See also Rawlings (2006, p.13).
[25] The most common propositions would include denying the existence of God. Family of the Inquisition referred to lower rank members of the Inquisition whose role was to serve as informants.

coursed theological studies. A last, a related category is the one of "false priests", preachers pretending to be priests. These people usually belonged to the lower clergy and celebrated Mass without being entitled to it.

Naturally, the relative frequency of the different crimes addressed by the Inquisition varied between Inquisition courts and across time (see Table 5). For example, whereas the Spanish Inquisition dealt mostly with converted Jews at its inception, fifty years later, when most Inquisition trial documents of our sample begin, this crime was already much less frequent. Moreover, with the rise of Lutheranism in Germany in the sixteenth century, the court turned its attention to religious and intellectual reformists[26]. There is a slight surge in the relative number of JA at the Spanish Inquisition in the 17th century. The latter could be due to the revival of the persecution of Jews by the Spanish Inquisition some decades after the union of Portugal and Spain in 1580, when Portuguese New Christians emigrated *en masse* to Castile (Saraiva 2001). In total in our dataset, "Judaism" is by far the most frequent crime, accounting for 60 percent of all alleged crimes while the other crime categories each account for between 0 and 7.6 percent (Table 4). However, this is mainly due to the fact that our Portuguese Inquisition sample is three times larger than our Spanish one and Judaism represents around 71 percent of crimes in the former sample (in the latter, only 11 percent).

In sum, we can hypothesize that, on average, the defendants at the Inquisition were more numerate than the rest of the population. Part of the accused were "major heretics", including Jews, Protestants, and other spiritual devotees. Illuminists, "Erasmians", Lutherans, and other Protestants were usually individuals who had thought critically about theological (and political) issues and had adopted innovative

[26] There is also a notable surge in the number of crimes in the late 1ate 16th and early 17th century when not only the New Christian-focused Inquisition reached a climax, but the accusation of witches in central Europe and other religious persecutions also did (Oster 2004).

views on spiritual and intellectual life. They were often familiar with devotional literature censored by the Inquisition or had even written it themselves (Rawlings 2006, pp. 90–113; Kamen 1965). As described before, Jews in the Iberian Peninsula were often professionals, successful merchants, and craftsmen[27]. One could thus imagine that a share of the persons tried at Inquisition courts were relatively well-educated, but other groups of defendants, like polygamists, not necessarily. This is what we will test in the following section. Moreover, we will assess whether the JA were more numerate than the Catholic control group even if we hold occupations constant.

5. Results

We test the numeracy differences described above in logistic regressions, controlling for other potential determinants of numeracy such as gender, age, time period or region. A logistic regression model was used because it meets the requirements of a dichotomous dependent variable best.

The binary dependent variable, "not heaped age (more likely numerate)", takes the value of 1 if the age reported was not a multiple of five, and 0 otherwise (the inverse of "age statement is a multiple of five"). Roughly one half of the sample reports an age ending on 5 or 0. Both genders are almost equally represented and one quarter belongs to the "young" age group (age 23-32). We control for both gender and age (by including a young age dummy) because these variables are important determinants of age-heaping; in other words, the numeracy advantage of men over women was considerable at the time and younger individuals more often rounded on multiples of two and less on multiples of five (see Crayen and Baten, 2010, on this). Moreover, we include time

[27] Therefore, they were sometimes accused by jealous competitors (Fajardo Spinola 2005, p.113, Rawlings 2006, p. 42).

dummies (half centuries of birth) because our dataset covers a long period of time, as well as region dummies to control for regional differences in education.

Given that logit models are sometimes more sensitive to measurement error, we also test a linear probability model (LPM). Recently, LPMs have been frequently used, partly because the issue of heteroscedasticity can easily be circumvented using robust standard error estimation. Using these two alternative approaches, the logit and the LPM models, allows us to test the robustness of our results. The basic model setting is described in Equation 1, below (which applies similarly to the logit):

$$(1) \quad num_{itr} = \alpha + \beta_1 JA_i + \beta_k crimes_i + \delta' X + \gamma_t + \mu_r + u_{itr}$$

where i denotes the respective individual, t denotes the period of birth, and r denotes the region in which this individual was born. As the main variable to be explained, num is the binary response variable that represents numeracy, α is a constant term, β_1 is the coefficient of those accused of engaging in Jewish practices, and β_k is the coefficient vector for the other crimes persecuted. $\delta' X$ is a matrix of other controls (gender, age group, sources). γ_t, and μ_r denote time and region fixed effects, and u is the error term.

Table 6 reports the results of the logistic regressions for Portugal and Spain separately. In Table A.2 we also report the regression results for the pooled sample (Spain and Portugal together), of both the logistic and the linear probability regressions. Marginal fixed effects (mfx) are displayed for the logit models. We multiplied the marginal fixed effects by 125 as to report percent values and to adjust them for the 20

percent of ages that were truly multiples of five, given a normal age distribution (see Juif and Baten 2013 and Appendix B for details)[28].

In Columns 1 and 5, we assess the differential between all defendants of the Inquisition and the control group that reflects the average Spanish or Portuguese population. The tried sample was considerably more numerate than the control group, on average, confirming our above hypothesis that many of them were more educated.

The coefficients of the core variable in this study are displayed in Columns 2, 3, 6 and 7: those accused of practicing Jewish rites had 15 to 23 percent higher numeracy (i.e. lower probability of stating a rounded age) than the comparison group, and this was both statistically as well as economically significant. The difference in the numeracy advantage of JA between Spain and Portugal might be a consequence of the lower numeracy of the control sample in Portugal; there was 16 percent less numeracy in the 17th century, for example[29]. As the Spanish control sample had already reached a higher numeracy level, there was less space for the JA to tower them.

These JA coefficients were also economically meaningful. Their average, 16 percent, accounts for approximately one third of the total numeracy increase of Europe from the late 15th to the late 18th century (A'Hearn et al. 2009)[30].

When examining the average numeracy for every crime category and the corresponding index for the complete comparison sample, we can observe higher numeracy for many crime categories when compared to the non-Inquisition sample. In

[28] The share of reported ages that are non-multiples of five would yield a lower bound estimate of numeracy, because part of those reporting a multiple of 5 do so correctly.
[29] According to the results published under www-clio-infra.eu
[30] To counter-check our results of a Jewish human capital advantage, we used literacy evidence available to us from the Inquisition trials of the Canary Islands. Whereas 82 percent of those accused of "Judaizing" could read and write, only 42 percent of the remaining defendants were literate. This source, however, contains relatively few JA (only 3 percent). There is evidence that their literacy advantage also applies to Latin America. Wachtel (2007, p 23), for example, observes a significantly higher level of literacy of individuals accused of "Judaizing" in Mexican Inquisition trials in the seventeenth century compared to the other defendants at this court: all of the men and half of the women could read and write.

Columns 2, 3, 6 and 7 of Table 6, we show the deviation of numeracy levels from the comparison sample. The Catholic elite had the greatest numeracy, as observed from the high values for "Solicitation and clergy crimes". The defendants acting "against the Holy Office", even though it was not necessarily expected, also had a high numeracy (both groups were 24 to 31 percent less likely to report a rounded age than the control group). The Protestants, Freemasons and similar religious groups followed close behind. Those accused of blasphemy had a considerable advantage over the (Christian) control group as well. Interestingly, Muslims who were caught by the Inquisition also displayed higher numeracy than the average Spanish and Portuguese population during the early modern period (by 10 to 16 percent). The lowest numeracy among Inquisition trial categories corresponds to polygamy, false priests, miscellaneous (for Portugal) and, in the case of Spain, witchcraft and superstition. For those crimes, the coefficient was modestly sized and insignificant in some cases (certainly smaller than the JA coefficient). In Columns 3 and 7, we omit the categories that were insignificant, and results remained robust.

The fact that defendants of crime categories like miscellaneous, false priests, polygamy and witchcraft were only modestly (and not significantly) more numerate than the ordinary Iberian population included in our control sample can serve as evidence that there was no substantial selectivity into the Inquisition source per se. Those "crimes" were usually not committed by the particularly highly educated, but by ordinary persons. Thus, if Inquisition defendants were more numerate, on average, it was probably due to the religious backgrounds of some target groups (JA, Protestants) of the Inquisition, and some special occupations (priest, printers etc.).

We now know that the most educated individuals in the Inquisition sample – excluding JA – are those accused of "solicitation and other clergy crimes",

Protestantism, and "detractors of the Holy Office"; but we also expect document falsifiers and prohibited book keepers and printers, who were included in other crime categories like "witchcraft and superstition", "propositions and blasphemy" or "miscellaneous", to be more numerate. To segregate the effect of this intellectual elite being part of the control group in the regressions focusing on the Inquisition sample only (Column 4 and 8), we added an independent dummy variable ("elite crimes"). In fact, relative to other tried categories, this newly created category performed best. JA were around 8 percent more numerate than the other (non-elite) defendants (Columns 4 and 8). As noted above, in all these regressions, we control for gender, the age group 23-32, as well as time and region fixed effects.

The gender gap in numeracy is also an interesting aspect. The disadvantage of females is 16-17 percent for Portugal and 6 percent for Spain (see Table 6). However, within the Inquisition sample, the numeracy gap is larger and men are 14 percent (Spain) to 19 percent (Portugal) more likely to be numerate (Table 6, Columns 4 and 8). It seems to be the case that women are considerably underrepresented in the elite-crimes-category (only 5 percent in this category are women), and overrepresented in the crime category for witchcraft and superstition, for instance. Accusation of witchcraft did often hit poor and marginalized women (Oster 2004).

The JA often had highly skilled, professional occupations. Hence, we were curious whether those accused of Judaism still had higher numeracy compared to the control population, if we restrict both samples to specific occupation groups. That is, we assess if there is an extra "Jewish" numeracy bonus. We consider Portugal first, because we have many cases within both the Inquisition and the control groups, including occupational information. In Table 7, Column 1 we exclude the highly skilled professionals and merchants, i.e. occupations for which the JA were famous. If we only

take into account the JA in this broad, non-elite group and compare them to the corresponding control group of the Catholic majority, we still find a significant numeracy difference of 15.45 percent, which is a quite substantial value. We also control for gender, age groups, occupational fixed effects between the different groups of occupation (within the non-elite sample), time fixed effects and region fixed effects in this regression. In Column 2, we perform a second test that was more restrictive: In addition to the highly skilled professionals, we also exclude the semi-professionals (clerks, for example). We still have a significant and strong effect. In Column 3, we restrict the sample to the craftsman and other industrial groups. Here, we again have a very large and significant coefficient for the Portuguese JA.

We repeated this set of regressions for southern and central Spain (Appendix Table A.4). Only for this part of Spain do we have a substantial amount of occupational information in the control group (and at least a modest number of cases in the Inquisition group), whereas for other parts of Spain, occupational information was lacking, especially for the early centuries. However, even for the center and south, the sample sizes for the JA with occupational information is small, with a maximum of 41 cases per occupational group. Interestingly, the size and significance of the coefficients is very similar to the Portuguese case, even if we cannot fully interpret the result due to the small N. Among the broad group that excludes the highly skilled professionals and merchants, we have 41 cases. The JA of this group have an additional numeracy of 29.52 percent, relative to the control group. Among the narrower group of craftsmen and other industrial occupations, we have 24 cases and a coefficient of 27.68 percent. In sum, we can conclude that the religious rule effect is still visible, even if we only study specific occupational groups, thereby holding the occupational effect constant. The

results were strong for the Portuguese case, for which we have a substantial amount of observations (including occupations), and less clear for Spain (due to small N).

5.1 Cross-checks: Were ages determined differently in Inquisition sources? What was the role of migration?

We have already discussed some potential selectivity issues above. In this section, we would like to discuss some further potential caveats of our research design. First, we assess the potential concern that there were perhaps incentives for defendants to lie about their age, which may have influenced the accuracy of age statements in Inquisition sources. For example, one could imagine that people might have been more exact than, say, in census age reporting situations, because they were more afraid of inquisitors. However, asking for one's age was most likely the least exciting part of an Inquisition trial, because ages did not play a role in the decision; very young as well as very old people were tried, and if mercy towards younger or older defendants was given by some individual Inquisition officials the difference between, for example, the reported age of 30 or 31, did not play a role. Moreover, in the original trial transcriptions the age question was asked in the same way as by census enumerators: "what is your age?" In response, the accused mentioned his or her age[31].

Another way to test if age was reported with a different degree of precision in Inquisition trials is to compare the numeracy of persons with the same occupation (and religion) included in both the Inquisition and the comparative samples. One possibility is to compare basic numeracy based on the age statements of priests and the average population using census records only. Even if the numeracy of a typical village priest

[31]A potential difference with respect to other sources is that, both in death registers and in censuses, it is possible that a relative answered the age question instead of the individual concerned (especially for children and dead people), whereas this was not the case in trials. Personal questions, including age, were asked in an initial hearing; therefore, the answers are not "contaminated" by torture (Rawlings 2006).

were not identical to priests accused by the Inquisition, a similar magnitude of the numeracy differential might suggest that numeracy estimates based on Inquisition age data are not implausible. We consider the Spanish Ensenada census (which reflects the late 17th and early 18th century birth cohorts) and find that priests had a numeracy of 99 percent, whereas the average population had a numeracy of 77 percent (Figure 3). Hence, priests had a 22 percentage point advantage in numeracy. For the early 18th century, we obtain a difference of 20 percentage points by comparing the numeracy of clergy accused at the Inquisition and the average (census population) numeracy during this period. This finding indicates that the magnitude of the difference between those accused of elite crimes and the average population was not unrealistic (compare Figure 3 and Table 6). This similarity also confirms the argument presented above that (social) selectivity into the Inquisition source did not play a major role.

Did migration play a major role? Clearly, a large share of Spanish Jews fled to North Africa, North-western Europe, Northern Italy and elsewhere (see section 3). The exact number of Jews who emigrated is unknown, and even less is known on who they were and how they were selected. Ladero Quesada (1988) presents scattered evidence of Jews from the Kingdom of Granada who embarked from Málaga and Almería to North Africa in 1492. Of the 115 exiled, only five declared that they had no possessions (pp. 255-259). On the other hand, Ladero Quesada (2007) found that of the 266 families who embarked from Almuñecar in the same year, 57 declared that they had no property (p. 284). Also, he finds proof that the exiled rich tried to help the poorer ones cover the expenses of emigration. Based on existing evidence, it is hard to pin down whether the Jews who left after the edict of expulsion were richer or more numerate than those who stayed behind and became potential targets of the Inquisition. However, we would speculate that the leavers were rather positively selected. The purity of blood

requirements for holding important posts made it increasingly difficult to keep the same role in economic and political life that some of them had before the expulsion (Pérez 2005, 2014; Kamen 1965, 1988). Furthermore, migration costs are generally thought to create a filter, particularly in historical times when transport was expensive and knowledge about distant places scarce. Thus, we can probably conclude that our estimates of the substantial numeracy advantage of the JA are rather a lower bound estimate, as (positively selected) Jews and New Christians who left Iberia are not taken into account.

5.2 Trends over time

Apart from observing the average numeracy advantage of JA over the comparison group in the period under observation, it is also interesting to see how the numeracy gap evolved over time. For that purpose, we portray the average numeracy levels of both the JA and the comparative sample by birth decade in Figure 4. Our dataset allows us to compare both groups over a period of two centuries. The gap seems to be largest at the beginning (although we rely on a relatively small comparative sample for the 16th century) and becomes gradually smaller, although the numeracy levels of both groups increases substantially between the late sixteenth and late eighteenth centuries. What may explain this secular rise in numeracy? Globalization and a rise in trade with other regions of the world certainly played a strong role, given the importance of numeracy for engaging in trade activities. However, although we observe a considerable rise in numeracy, it is slower than in other parts of Europe. This period, from the sixteenth to the eighteenth centuries, contained the height of the European human capital revolution (Tollnek and Baten 2017). A'Hearn et al. (2009) estimated that numeracy grew by 50 percentage points in north-western Europe (UK, Netherlands, and protestant Germany),

from 45 percent in the 1450s, to 95 percent in the 1750s; while in southern Europe, their numeracy estimates for northern Italy yielded a growth from 55 percent to 80 percent in the same period. Thus, although we observe a rise in numeracy from around 40 in the late sixteenth to 70 in the late eighteenth century in our control groups for Portugal and Spain, the growth is slower than elsewhere in Europe (see also Appendix Figure A.1). Interestingly, southern Europe and Iberia in particular, fell back in relative terms especially in the early seventeenth century, precisely during the hottest phases of the Inquisition. Although this is not a clear proof that the effect of Inquisition matters, at least the timing supports this view.

A reason for the declining gap between JA and the average population may be that the Jews and New Christians who could afford it had left the peninsula by the 18th century given the reigning hostility towards them (even though most probably left immediately after the edict of expulsion). Another explanation could be that the Catholics took over jobs that were freed by Jews and New Christians, given that Inquisition sentences and the purity of blood requirements introduced from the 15th century barred the latter and their descendants from holding many economically and socially important posts (Kamen 1965, 1988). The exclusion of those who could not proof purity of blood from public offices, university colleges, military and religious orders, guilds, etc. may have disincentivized educational investments. A further possibility is that the most numerate New Christian families assimilated Catholic doctrine and rites more successfully, or acquired the support of influential Old Christians, and thus did not become targets of the Inquisition (and therefore do not appear in our dataset).

6. Conclusion

In this study, we quantified the numeracy of the different groups of defendants of the Spanish and Portuguese Inquisitions and compared it to that of the general Iberian population. In line with previous qualitative research, we confirmed the hypothesis that Jews and New Christians enjoyed a substantial advantage in numeracy over the Catholic majority.

Jewish religious doctrine probably had a strong influence on educational efforts and, as claimed by Botticini and Eckstein (2007, 2012), this educational advantage turned out to be useful for entering highly skilled urban occupations. However, at the time when purity of blood requirements removed Jews and New Christians from some of the most important posts, their numeracy advantage was still substantial. It continued to distinguish them from their Catholic compatriots throughout the period of our research, even though the gap narrowed over time. The gap may have narrowed due to (a) the ceiling of our numeracy measure, (b) the rise in demand for skilled positions, incentivizing investments into education by Old Christians, and the fact that New Christians were banned from pursuing some occupations, particularly in the public sector, (c) the eventual skill selective emigration of Jews and a gradual, successful assimilation of the more educated New Christian families (maybe they had better access to information on Catholic doctrines).

We also found that other groups who became targets of the Inquisition had a substantial educational advantage: Protestants, who were largely foreign or intellectuals, and formed a small group in Iberian society; Catholic priests, who had gone through higher education; and those who were accused impeding the correct functioning of the Inquisition. We discussed the potential biases of the samples that were used to assess the Jewish and control groups, and found the potential biases to not be substantial.

Can we draw any conclusions on the effect of inquisitorial activity against religious minorities on economic development? In his early 20th century study "The Jews and Modern Capitalism", Sombart (1911) already hypothesized that there may be a connection between the shifting of economic centres from Southern to Northern Europe and the forced movement of the Jews who were expelled from Spain and Portugal and settled, for instance, in Holland. Ashraf and Galor (2011) also argued that small religious minorities can have an important effect on economic growth.

Even if Iberia was possibly already behind other Western European countries in terms of numeracy before the Inquisition was set in place (#cite), and even if religious persecutions took place in other areas of Western Europe, we would suspect that the effect of the persecution of quite numerate groups was detrimental for economic development[32]. We can speculate that without the danger of being denounced to the Inquisition, the average human capital of the Iberian Peninsula – also counting the spill-over effects of religious minorities' human capital to the rest of the population – would have been higher. Pérez (2005) has convincingly argued that the numbers of emigrants and persecuted JA were modest relative to the whole Iberian population, but the high visibility of executions generated an element of terror that should not be underestimated in its effect on retarding human capital formation. The Inquisition probably deterred converts who stayed in or returned to Iberia, as well as the Old Christian majority population, from reading Enlightenment literature and eventually from entering occupations that required but also exercised numeracy, and that were associated with Jews (see Table A.5 for a numeracy rank by occupation groups in the Inquisition sample). That human capital is a crucial prerequisite for modern economic growth

[32] For instance, the number of converts who were executed by the Spanish Inquisition in its first decades of existence, before 1525, was 2,000 individuals (15,000 were "reconciled" with the Catholic church), which is similar to the number of Protestants executed in France at that time – though the Inquisition investigated and punished less harshly many more individuals and continued to be active for much longer (Johnson and Koyama 2019, p. 158)

highlights the probable adverse effects of Inquisitorial activity on the development of this region. However, the quantification of those effects lies outside the scope of this study.

References

A'Hearn, B., Baten, J., and Crayen, D. (2009), 'Quantifying Quantitative Literacy: Age Heaping and the History of Human Capital', *Journal of Economic History*, 69(3): 783-808.

Anderson, R. W. (2015). Inquisitions and Scholarship. Social Science History, 39(4), 677-702.

Ashraf, Q., and Galor, O. (2011), 'Cultural Diversity, Geographical Isolation, and the Origin of the Wealth of Nations', National Bureau of Economic Research (No. w17640).

Becker, S.O. and Woessmann, L. (2009), 'Was Weber Wrong? A Human Capital Theory of Protestant Economic History', *Quarterly Journal of Economics,* 124: 531-596.

Botticini, M. and Eckstein, Z. (2005), 'Jewish Occupational Selection: Education, Restrictions, or Minorities?', *Journal of Economic History*, 65: 922-948.

Botticini, M. and Eckstein, Z. (2007), 'From Farmers to Merchants, Conversions and Diaspora: Human Capital and Jewish History', *Journal of the European Economic Association*, 5(5): 855-926.

Botticini, M. and Eckstein, Z. (2012), *The Chosen Few: How Education Shaped Jewish History, 70-1492*, Princeton University Press.

Chiswick, B. R. (1991). Jewish Immigrant Skill and Occupational Attainment at the Turn of the Century. *Explorations in Economic History*, 28(1): 64–86.

Contreras, J. (1982), *El Santo Oficio de la Inquisicion de Galicia*, Madrid: Akal Universitaria.

Contreras, J. and Henningsen, D. (1986), 'Forty-four Thousand Cases of the Spanish Inquisition (1540-1700): Analysis of a Historical Data Bank', in G. Henningsen and J. Tedeschi (eds.), *The Inquisition in Early Modern Europe. Studies in Sources and Methods*, Dekalb, Illinois: Northern Illinois University Press, pp. 100-129.

Crayen, D. and Baten, J. (2010), 'Global Trends in Numeracy 1820-1949 and its Implications for Long-term Growth', *Explorations in Economic History*, 47(1): 82-99.

Delgado Criado, B. (Ed.) (1993): La educación en la España moderna (siglos XVI-XVIII). Madrid: Ediciones SM (Historia de la educación en España y América, 2).

Fajardo Spinola, F. (2005), *Las Víctimas de la Inquisición en las Islas Canarias*, La Laguna: Editorial Universidad de La Laguna.

Garcia Fuentes, J. M. (2006), *Visitas de la Inquisición al Reino de Granada*, Granada: Editorial Universidad De Granada.

Gracia Boix, R. (1983). Autos de Fe y Causas de la Inquisición Española, Córdoba: Diputación Provincial.

Hanushek, E. A. and Woessmann, L. (2012), 'Do Better Schools Lead to More Growth? Cognitive Skills, Economic Outcomes, and Causation', *Journal of Economic Growth*, 17(4), 267-321.

Iannaccone, L.R. (1998), 'Introduction to the Economics of Religion', *Journal of Economic Literature*, 36(3):1465-1495.

Instituto Nacional de Estadísticas de Espana http://www.ine.es.

Instituto Nacional de Estadistica do Portugal http://www.ine.pt.

Iyer, S. (2016). The new economics of religion. *Journal of Economic Literature*, 54(2), 395-441.
Johnson, N. D., and Koyama, M. (2019). Persecution & toleration: The long road to religious freedom. Cambridge University Press.
Juif, D. and Baten, J. (2013), 'On the Human Capital of 'Inca' Indios before and after the Spanish Conquest. Was there a "Pre-Colonial Legacy"?', *Explorations in Economic History,* 50(2): 227-41.
Kamen, H. (1988), The Mediterranean and the Expulsion of Spanish Jews in 1492, Past & Present, No. 119, pp. 30-55
Kamen, H. (1965), *The Spanish Inquisition.* London: Weidenfeld and Nicolson.
Keywood, T. and Baten, J. (2019). Elite Violence and Elite Numeracy in Europe from 500 to 1900 CE: A Co-Evolution?
Leeuwen, M.H.D. van, Maas, I., and Miles, A. (2002), *HISCO: Historical International Standard Classification of Occupations,* Leuven: Leuven University Press.
Ladero Quesada, M.A. (1988), Granada después de la conquista: repobladores y mudéjares, Madrid: Diputación Provincial
Ladero Quesada, M.A. (2007), "De nuevo sobre los judíos granadinos al tiempo de su expulsión", En la España Medieval, Vol. 30, 281-315
Llorente, J.A. (1822), *Historia crítica de la Inquisición de España*, third volume, Madrid: Imprenta del Censor.
Mokyr, J. (1983), *Why Ireland Starved: A Quantitative and Analytical History of the Irish Economy, 1800-1850,* London and Boston: Allen and Unwin.
Myers, R. (1976), 'An Instance of Reverse Heaping of Ages', *Demography,* 13 (4): 577-580.
Netanyahu, B. (1995), *The Origins of the Inquisition in Fifteenth-Century Spain,* New York: Random House.
Nunziata, L. and Rocco, L. (2016). 'A Tale of Minorities: Evidence on Religious Ethic and Entrepreneurship', *Journal of Economic Growth,* 21(2): 189-224.
Nunziata, L., and Rocco, L. (2018). The Protestant ethic and entrepreneurship: Evidence from religious minorities in the former Holy Roman Empire. European Journal of Political Economy, 51, 27-43.
Ó Gráda, C. (2006), 'Dublin Jewish Demography a Century Ago', *The Economic and Social Review*, 37 (2):123-147.
Oster, E. (2004), 'Witchcraft, Weather and Economic Growth in Renaissance Europe', *The Journal of Economic Perspectives*, 18(1), 215-228.
Pérez, J. (2005), Los judíos en España, Madrid: Marcial Pons.
Pérez, J. (2012). Breve historia de la Inquisición en España. Barcelona: Crítica, Colección Austral: Contemporánea Humanidades.
Pérez, J. (2014), Historia de una tragedia: la expulsión de los judíos de España, Barcelona: Crítica
Ploetz, J. (2013), 'Central American Human Capital, 1800-1950', Bachelor Thesis, Tübingen University.
Rawlings, H. (2006), *The Spanish Inquisition,* Malden, USA: Blackwell Publishing.
Rodríguez, M. C. and Bennassar, B. (1978), Signatures et niveau culturel des témoins et accusés dans les procès d'inquisition du ressort du Tribunal de Tolède (1525-1817) et du ressort du Tribunal de Cordoue (1595-1632). In: Cahiers du monde hispanique et luso-brésilien (31), pp. 17–46.
Roth, C. (1938), *The Jewish Contribution to Civilization*, London: Macmillan & Co.
Roth, N. (1995), *Conversos, Inquisition and the Expulsion of the Jews from Spain,* Madison, USA: The University of Wisconsin Press.

Saraiva, A. S. (2001), *The Marrano Factory: The Portuguese Inquisition and Its New Christians 1536-1765*, Leiden: Brill.
Sierra, J. (2006), *Procesos de la Inquisicion de Toledo (1575-1610). Manuscrito de Halle,* Madrid: Editorial Trotta.
Sombart, W. (1911), *The Jews and Modern Capitalism,* Kitchener: Batoche Books, 2001.
Tollnek, F. and Baten, J. (2017), Farmers at the heart of the 'human capital revolution'? Decomposing the numeracy increase in early modern Europe. The Economic History Review, 70: 779-809.
United Nations Statistic Division: http://unstats.un.org/unsd/demographic/products/dyb/DYBcensus/V1_Notes1c.pdf
Vidal-Robert, J. (2014), 'Long-run Effects of the Spanish Inquisition', CAGE Online Working Paper Series, Volume 2014 (Number 192).
Villanueva, J.P. and Bonet, B.E. (1984), *Historia de la Inquisición en España y América*, tomo III, Madrid: Biblioteca de Autores Cristianos.
Wachtel, N. (2007), *La Fé del Recuerdo: Laberintos Marranos*, Buenos Aires: Fondo de Cultura Económica.
Weber, M. (1905), *The Protestant Ethic and the Spirit of Capitalism*, London: Unwin, 1956.

TABLES AND FIGURES

Table 1: Inquisition and non-Inquisition sources (comparative samples), individuals aged 23 to 72

Type of Source	Geographical region	Birth years	N (cases)
Census/Mort.	Portugal	1549-1799	1,956
Inquisition	Portugal	1469-1778	10,408
Census/Mort.	Spain	1540-1799	14,887
Inquisition	Spain	1454-1795	3,115
Total	Spain/Portugal	1454-1799	30,366

Table 2: Data representativeness of regional units in Spain and Portugal

SPAIN

Regions	Census of Floridablanca 1787		Comparative sample (late 15th to late 18th century)	
	Total population	Percent	Obs. No	Percent
Aragon and Navarre	2,723,708	26.1	2,527	26.1
Central Castile	3,272,591	31.36	2,794	28.9
Northern Castile	2,164,402	20.74	2,178	22.5
Southern Castile and Granada	2,106,810	20.19	2,180	22.5
Canary Islands	167,224	1.6		
Total Spain	10,434,735	100	9,679	100

PORTUGAL

Regions	Census of 1864		Comparative sample (late 15th to late 18th century)	
	Total population	Percentage	Observations	Percentage
Northern Portugal	1,795,222	42.99	984	50.7
Southern Portugal	2,032,292	48.55	957	49.3
Island	358,792	8.57		
Total Portugal	4,186,306	100	1,941	100

Source Spanish population: Instituto Nacional de Estadísticas de Espana (http://www.ine.es)
Source Portuguese population: Instituto Nacional de Estatística do Portugal (http://www.ine.pt).
Notes: Table includes 11,6211 observations from the comparative sample, for which birth region information was available.
The regional categories for Spain were made along with the historical distribution that included the kingdoms of Aragón, Navarre, Castille and Granada. The regional units are composed of the following provinces: Centre-Castille: Albacete, Ciudad Real, Toledo, Cuenca, Guadalajara, Madrid, Badajoz, Cáceres, Salamanca, Avila, Segovia, Soria, Burgos, Valladolid, Zamora,

León, Palencia, la Rioja. North-Castille: La Coruna, Pontevedra, Ourense, Lugo, Asturias, Cantabria, Vizcaya, Guipúzcoa, Álava. South-Castille and Granada: Huelva, Sevilla, Cadiz, Córdoba, Jaén, Murcia, Granada, Almeria, Malaga. Aragon and Navarre: Alicante, Valencia, Castellon, Tarragona, Lleida, Barcelona, Girona, Teruel, Zaragoza, Huesca, Navarra.
The regions of Portugal are composed of the following provinces: Northern Portugal including Braga, Bragansa, Vila Real, Vianna do Castello, Porto, Aveiro, Coimbra. Southern (incl. Central) Portugal includes Setubal, Portalegre, Beja, Evora, Faro, Viseu, Guarda, Castelo Branco, Leiria, Santarem and Lisbon. Islands includes the Azores and Madeira.

Table 3: Grouped occupations of male JA, 1450 to 1799, and a comparison with Prussian Jews in 1849, based on HISCO categories[33]

Occupational group	JA in Inquisition Sample		Prussian Jews in 1849[34]	
	Freq.	**Percent**	**Freq.**	**Percent**
Sales workers, merchants, shopkeepers	933	34.2	28513	47.8
Manufacture, craftsmen	666	24.4	12054	20.2
High skilled professionals (doctors, lawyers, teachers, university graduates)	359	13.2	1610	2.7
Agriculture, fishery	301	11.0	1876	3.1
Military	107	3.9		
Administrative and managerial, clerks	83	3.0	536	0.9
Transport, construction, mining, sailing, hunting	64	2.3	1294	2.2
Service[35], housekeeping	51	1.9	6358	10.7
Clergy	48	1.8		
Rest category (no job, "worker", "assistant", “employed”)	118	4.3	7441	12.5
Total	2,730	100	59,682	100

[33] HISCO stands for Historical Standard Classification of Occupations (Van Leeuwen, Maas and Miles 2002)
[34] Source: http://www.jewishencyclopedia.com/articles/11652-occupations
[35]Includes barber, brewer and butcher.

Table 4: Classification of crimes following Contreras and Henningsen (1986)

Crime	Frequency	Percent
Judaism	7,767	57.44
Blasphemy, propositions	1,031	7.62
Witchcraft and superstition	805	5.95
Polygamy	646	4.78
Detractors of the Holy Office (making offenses against the court or impeding its right functioning)	570	4.22
Mahometism	504	3.73
Clergy crimes (solicitation at confession and other crimes committed by clergy)	391	2.86
Sexual promiscuity (sodomy, immoral statements, infidelity, cohabitation)	329	2.43
Protestantism, Calvinism, Illuminism, Freemasonry	275	2.03
Miscellaneous	111	0.82
False priests	31	0.23
Accomplice	28	0.21
Crime unknown	1,035	7.65
Total	13,523	100

Table 5: Number of trials by crime category and half century of birth, Spain and Portugal separately

Portugal

Crime	1450-1500	1500-1549	1550-1599	1600-1649	1650-1699	1700-1749	1750-1799
Polygamy	3	72	114	128	107	82	28
Blasphemy, Propositions	21	142	164	82	63	48	19
False priests		1	4	1	6	7	2
Solicitation, clergy		21	38	55	98	63	8
Mahometism	17	108	90	59	29	18	
Judaism	180	1539	2249	2003	1137	321	1
Misc.		12	8	7	4	7	1
Protestantism	1	76	28	13	25	21	20
Detractors of the Holy Office	2	40	136	84	47	41	6
Sexual promiscuity	2	32	80	47	13	5	
Witchcraft and superstition	6	59	79	81	120	92	8
Accomplice		1	1	12	6	6	1
Unknown crime	2	6	12	10	17	4	

Spain

Crime	1450-1500	1500-1549	1550-1599	1600-1649	1650-1699	1700-1749	1750-1799

Polygamy	1	72	114	128	107	82	28
Blasphemy, Propositions	6	221	213	17	16	12	8
False priests		2	5				
Solicitation, clergy		40	36	10	14	8	
Mahometism	4	132	96	12	4	1	
Judaism	6	50	55	10	213	3	
Misc.		34	21	5	6	5	2
Protestantism	1	18	66	2	1	3	
Detractors of the Holy Office	3	59	67	8	8	1	2
Sexual promiscuity		59	91				
Witchcraft and superstition	2	57	190	48	53	8	2
Accomplice		2	2				
Unknown crime	101	155	434	149	158		

Table 6: Determinants of non-heaping (i.e. those more likely to be numerate) in logit regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Only Portugal				Only Spain		
Samples included	Total inqui-sition effect	All indiv. "crimes"	Indiv. crimes (selected)	Only inquis. cases	Total inqui-sition effect	All indiv. crimes	Indiv. crimes (selected)	Only inquis. cases
Female	-15.95***	-16.84***	-17.26***	-18.82***	-6.66***	-6.02***	-5.87***	-14.15***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age 23-32	14.42***	14.69***	14.81***	15.75***	10.12***	9.83***	9.91***	12.85***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inquisition source	20.51***				12.58***			
	(0.000)				(0.000)			
Judaism-accused		22.85***	18.95***	8.41***		18.40***	16.60***	7.53*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.073)
Elite crimes				14.87***				13.68***
				(0.000)				(0.001)
Mahometism		13.84***	9.62**			16.65***	13.07***	
		(0.005)	(0.032)			(0.000)	(0.002)	
Protestantism		25.23***	21.43***			28.94***	24.79***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Polygamy		6.08				9.55		
		(0.171)				(0.127)		
Blasphemy, propositions		17.00***	13.00***			22.43***	18.27***	
		(0.000)	(0.000)			(0.000)	(0.000)	
False priests		9.78				20.04		

		(0.504)				(0.285)		
Solicitation and clergy crimes		28.47***	25.03***			25.69***	22.97***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Accomplice		22.27*	18.68			22.78		
		(0.060)	(0.136)			(0.378)		
Miscellaneous		12.96				29.75***	26.61***	
		(0.227)				(0.000)	(0.000)	
Against Holy Office		27.13***	23.62***			31.26***	27.32***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Sexual promiscuity		19.49***	15.39***			12.81**	9.43*	
		(0.001)	(0.004)			(0.024)	(0.092)	
Witchcraft, superstition		13.49***	9.65**			7.04		
		(0.002)	(0.014)			(0.111)		
Crime unknown		17.21*	13.30			8.20***	5.44*	
		(0.070)	(0.157)			(0.009)	(0.052)	
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,364	12,364	12,364	10,408	18,002	18,002	18,002	3,115
P./Adj. R-sq	0.063	0.063	0.063	0.063	0.039	0.039	0.039	0.039

Notes: The dependent variable is "not heaped age" (more likely to be numerate). The reference category is male individuals, aged 33 to 72, born between 1600 and 1649 (all specifications); drawn from a census source (models 1-2 and 5-6); from a census source *or* accused of selected crimes at the Inquisition (models 3 and 7); drawn from the Inquisition-database and not accused of Judaism or an elite crime (models 4 and 8). We controlled for regional fixed effects by including regional dummies and for time effects including half centuries of birth; we also controlled for the source being a death register where appropriate (omitted from this Table). We multiplied the coefficient of the regressions by 125 as to report percentages and to adjust them for the 20% of ages that were truly multiples of five, given a normal age distribution. Robust p-Values are given in parentheses: ***p<0.01, **p<0.05, *p<0.10

Table 7 Regressions, comparing only JA in Portugal with the comparative group

	(1)	(2)	(3)
Occ groups:	All excl. profess	Also less semi-prof.	Only Industr.
Judaism-accused	15.45**	16.46**	23.59*
	(0.020)	(0.014)	(0.065)
Gender	Yes	Yes	Yes
Age 23	Yes	Yes	Yes
Occup. FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
N	2,040	1,931	543

Note: The number of inquisition defendants (JA) is for Column 1, 2, and 3, respectively: 1,639, 1,538, 475; the number of cases of the normal population (control) group is for Column 1, 2, and 3 respectively: 401, 393, 68. The "Yes" statements indicate that these variables are included, but the main coefficients of interest here are those of the JA.

Figure 1: Age distribution of the Inquisition and the control data set

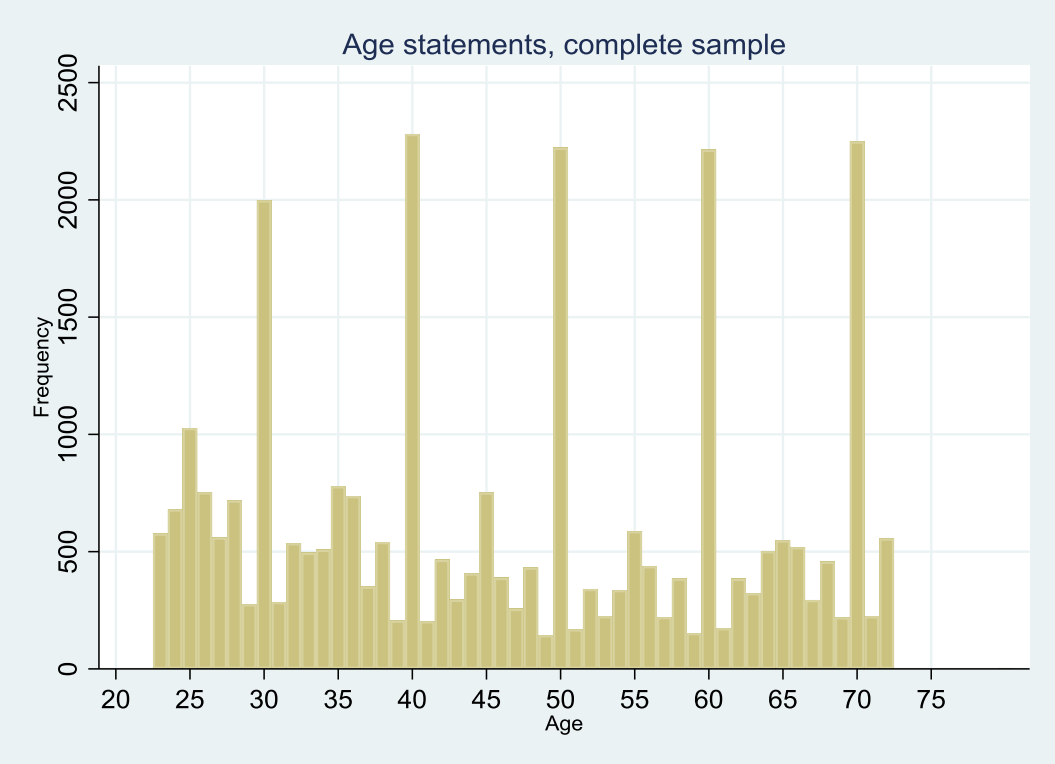
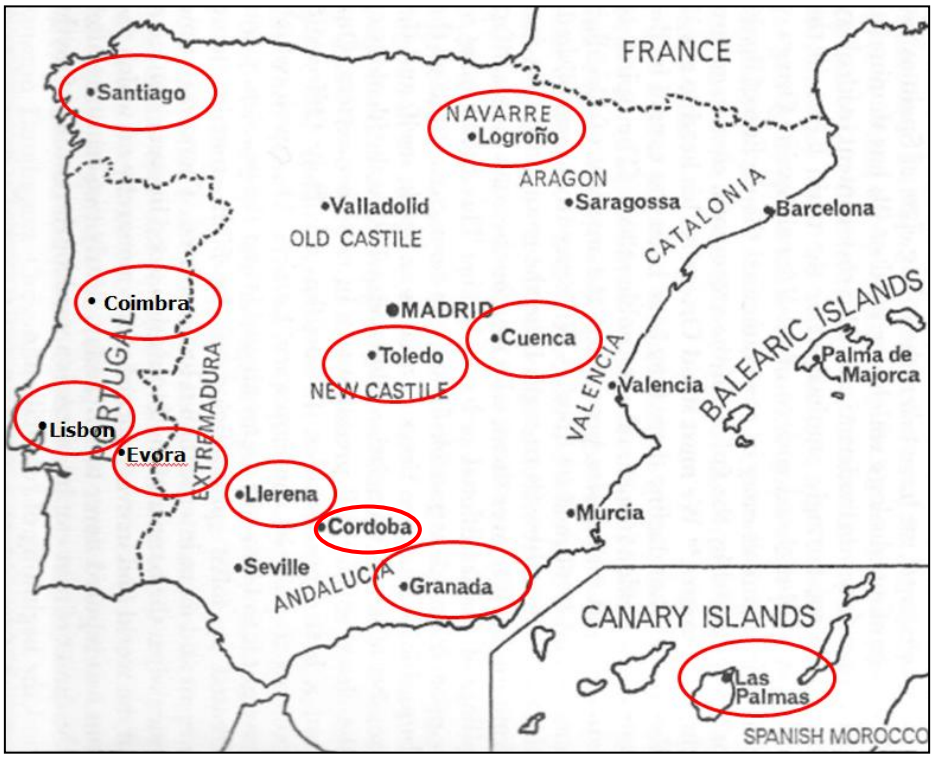


Figure 2: Inquisition courts in Portugal and Spain



Source: Kamen (1965), modified by authors

Figure 3: ABCC Index of clergy and the population average, according to the Inquisition sample and the "census only" sample of the Catastro de Ensenada census

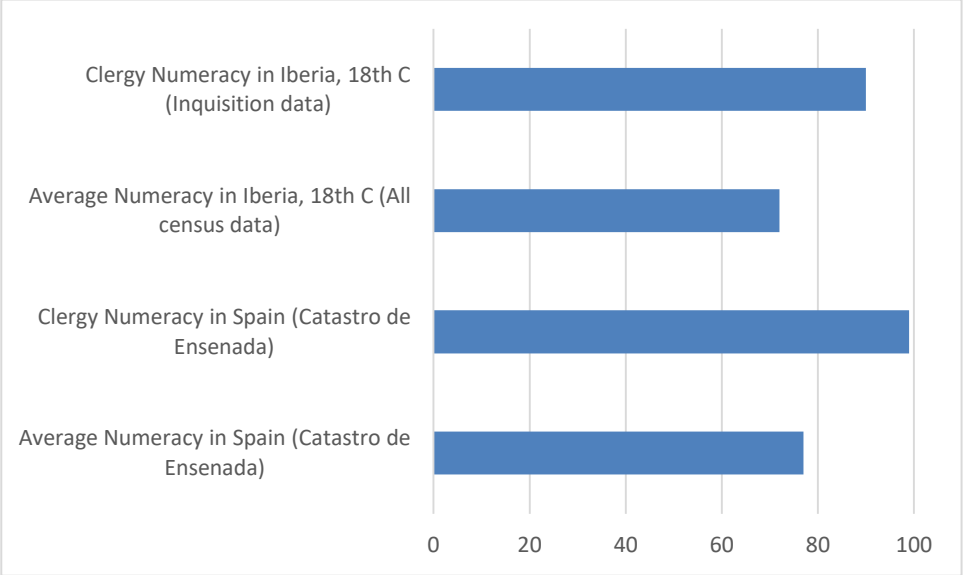
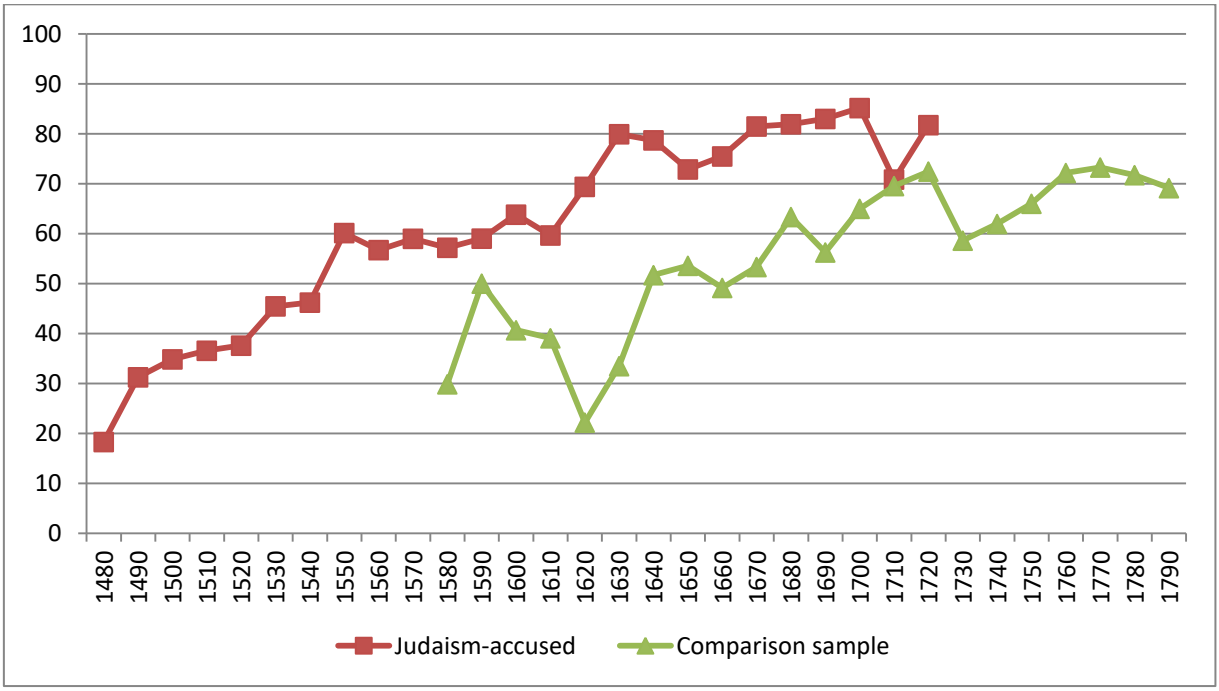


Figure 4: ABCC Index of JA and the Comparative Sample in the Iberian Peninsula

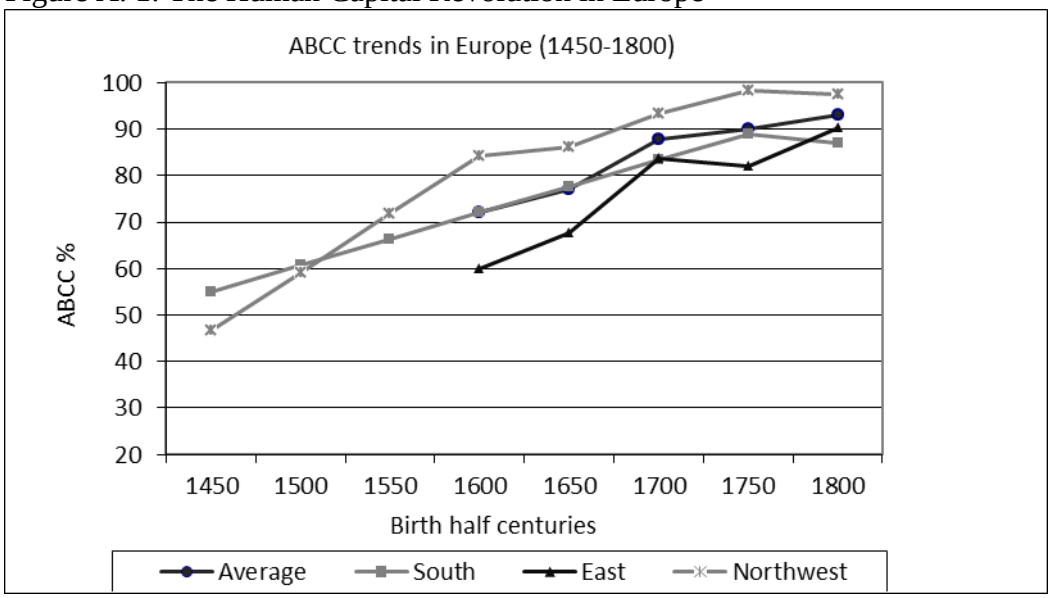


Note: Birth decades with 50 or more observations are included.

Appendix A

Appendix Figures:

Figure A. 1: The Human Capital Revolution in Europe



Note: Values refer to half centuries of birth around the years noted. Evidence is based on A'Hearn, Baten and Crayen (2009), Table 4. We included all countries for which longer series or at least early values were available: "Northwest" comprises Great Britain, the Netherlands and protestant Germany, "South" refers to Italy (North). "East", the average of Russia, Bohemia and Austria (from around 1600). "Average" is the average of these three regions. When values between the benchmark dates were missing, they were interpolated. Weak estimates (in italics in Table 4 of A'Hearn et al., 2009) were omitted. For Great Britain and the Netherlands before 1600, the benchmark year of Great Britain in 1600 was used, and the changes from Germany (protestant).

Appendix Tables:

Table A.1: Data and sources

Inquisition Tribunals (years of court cases)	**Source**
Canary Islands (1521 – 1819)	Data provided by Francisco Fajardo Spinola. See also: Fajardo Spinola, F. (2005). Las Víctimas de la Inquisición en las Islas Canarias. La Laguna, Universidad de La Laguna
Córdoba (1572-1745)	Gracia Boix, R. (1983). Autos de Fe y Causas de la Inquisición Española. Córdoba: Diputación Provincial
Cuenca (1521 – 1723)	National Historical Archive, Madrid (data provided by Sara Nalle)
Galicia (1641)	Contreras, J. (1982). El Santo Oficio de la Inquisicion de Galicia. Madrid: Akal Universitaria
Granada (1577–1614)	Garcia Fuentes, J. M. (2006). Visitas de la Inquisicion al Reino de Granada. Granada: Editorial Universidad De Granada
Llerena (1695 – 1730)	Villanueva, J. P. and Bonet, B. E. (1984). Historia de la Inquisición en España y América, tomo III. Madrid: Biblioteca de Autores Cristianos
Logroño (1609 – 1633)	Henningsen, G. (2004): The Salazar Documents, Inquisitor Alonso de Salazar Frías and Others on the Basque Witch Persecution. Boston: Brill Leiden
Toledo (1577-1610)	Sierra, J. (2006). Procesos de la Inquisicion de Toledo (1575-1610). Manuscrito de Halle. Madrid: Ed. Trotta.
Évora, Coimbra, Lisboa (1487 – 1894)	National Archive Torre do Tombo, Lisbon [36][http://antt.dglab.gov.pt/].
Comparison Sample (census/death year)	**Source**
Catastro Badalona, 1717	National Historical Archive Catalonia
Catastro Andalucía, 1750-53	National Historical Archive, Madrid
Catastro Guadalajara, 1752	National Historical Archive, Madrid
"Visitas" Coimbra	Arquivo Histórico Municipal de Coimbra
Padrones Arcos de la Frontera, Bornos, Medina Sidonia, Vejer de	[FamilySearch.org]

[36] For the data entry we thank Rosemarie Triebe.

La Frontera, Tarifa, Villamartin, Acala de los Gazules, Chiclana 1641	
Padrones Córdoba 1643, 1693, 1718, 1761	[FamilySearch.org]
Padrón Cuevas de San Marcos 1705	Diocesan Archive, Málaga
Padrón Málaga 1776	Municipal Archive, Málaga
Padrones Écija 1573, 1645, 1704, 1775	[FamilySearch.org]
Marriage registers Granada, 1630, 1680, 1730	Diocesan Historical Archive, Granada
Padrones Jaén 1706, 1711	[FamilySearch.org]
Padrón Loja 1750	[FamilySearch.org]
Padrones Puerto de Santa María 1719, 1734, 1794	[FamilySearch.org]
Padrones Carmona, Estepa, Osuna, Puebla de Cazalla, Utrera, Villafranca de la Marisma, Arahal, Fuentes, Marchena, Morón de la Frontera, Salteras 1641	[FamilySearch.org]
Padrones Vera 1726, 1797	Municipal Archive, Vera
Death registers Portugal, 1570-1799	[FamilySearch.org]
Death registers Spain, 1570-1799	[FamilySearch.org]

Table A.2. Determinants of non-heaping (i.e. those more likely to be numerate) in Iberia, logit and linear probability regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Model	Logistic regressions				Linear Probability Models			
Description	Total inqui-sition effect	All indiv. "crimes"	Indiv. crimes (selected)	Only inquis. cases	Total inqui-sition effect	All indiv. crimes	Indiv. crimes (selected)	Only inquis. cases
Female	-10.65***	-10.48***	-10.50***	-17.94***	-10.07***	-10.01***	-10.03***	-16.95***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age 23-32	12.61***	12.08***	12.11***	14.61***	11.62***	11.58***	11.61***	13.86***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inquisition source	19.24***				15.64***			
	(0.000)				(0.000)			
Judaism-accused		22.59***	22.38***	7.98***		21.96***	21.75***	7.40***
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)

Elite crimes				13.93***				13.14***
				(0.000)				(0.000)
Mahometism		15.49***	15.29***			15.25***	15.05***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Protestantism		26.01***	25.82***			26.13***	25.92***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Polygamy		7.36**	7.16**			7.11**	6.92**	
		(0.016)	(0.018)			(0.015)	(0.017)	
Blasphemy, propositions		19.32***	19.26***			19.15***	18.94***	
		(0.000)	(0.000)			(0.000)	(0.000)	
False priests		13.09				12.43		
		(0.249)				(0.262)		
priesitation and clergy crimes		27.36***	27.30***			28.06***	28.01***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Accomplice		21.30**	21.14*			21.51*	21.33*	
		(0.037)	(0.077)			(0.056)	(0.058)	
Miscellaneous		25.26***	24.03***			24.18***	24.00***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Against Holy Office		28.39***	28.22***			29.32***	29.11***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Sexual promiscuity		16.10***	15.90***			15.75***	15.54***	
		(0.000)	(0.001)			(0.000)	(0.000)	
Witchcraft, superstition		9.51***	9.32**			9.15***	8.97***	
		(0.001)	(0.015)			(0.001)	(0.001)	
Crime unknown		5.86**	5.70**			5.35**	5.21**	
		(0.023)	(0.027)			(0.029)	(0.033)	
Constant					23.20***	21.98***	27.09***	76.48***
					(0.000)	(0.000)	(0.000)	(0.000)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	30,366	30,366	30,366	13,523	30,366	30,366	30,366	13,523
P./Adj. R-sq	0.0538	0.0538	0.0538	0.0538	0.05	0.05	0.05	0.07

Notes: The dependent variable is "not heaped age" (more likely to be numerate). The reference category is male individuals, aged 33 to 72, born between 1600 and 1649 in the region of Central Castile (all specifications); drawn from a census source (models 1-2 and 5-6); from a census source *or* accused of selected crimes at the Inquisition (models 3 and 7); drawn from the Inquisition-database and not accused of Judaism or an elite crime (models 4 and 8). We controlled for regional fixed effects by including regional dummies and for time effects including half centuries of birth; we also controlled for the source being a death register where appropriate (omitted from this Table). We multiplied the coefficient of the regressions by 125 as to report percentages and to adjust them for the 20% of ages that were truly multiples of five, given a normal age distribution. Robust p-Values are given in parentheses: ***p<0.01, **p<0.05, *p<0.10

Table A3: Determinants of non-heaping (i.e. those more likely to be numerate) in Spain and Portugal in logit regressions, death registers excluded

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Samples incl.	Only Portugal				Only Spain			
Female	-17.45***	-18.48***	-18.97***	-18.82***	-5.26***	-2.99*	-2.51	-14.15***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.082)	(0.135)	(0.000)
Age 23-32	15.32***	15.60***	15.72***	15.75***	9.39***	9.05***	9.16***	12.85***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inquisition source	20.48***				15.21***			
	(0.000)				(0.000)			
Judaism-accused		22.80***	18.64***	8.41***		19.45***	17.63***	7.53*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.073)
Elite crimes				14.87***				13.68***
				(0.000)				(0.001)
Mahometism		12.99***	8.42**			18.00***	14.79***	
		(0.009)	(0.045)			(0.000)	(0.001)	
Protestantism		25.90***	21.78***			31.04***	27.70***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Polygamy		6.49				11.23*	7.75	
		(0.149)				(0.073)	(0.202)	
Blasphemy, propositions		17.00***	12.68***			24.59***	21.05***	
		(0.000)	(0.000)			(0.000)	(0.000)	
False priests		10.06				21.76		
		(0.479)				(0.233)		
Solicitation and clergy crimes		28.09***	24.38***			27.70***	25.54***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Accomplice		22.46*	18.60			23.89		
		(0.060)	(0.127)			(0.343)		
Miscellaneous		12.98				31.32***	28.73***	
		(0.221)				(0.000)	(0.000)	
Against Holy Office		26.92***	23.16***			33.22***	30.02***	
		(0.000)	(0.000)			(0.000)	(0.000)	
Sexual promiscuity		18.66***	14.23***			15.19***	12.21**	
		(0.001)	(0.006)			(0.007)	(0.027)	
Witchcraft, superstition		13.43***	9.30**			7.34		
		(0.002)	(0.011)			(0.112)		
Crime unknown		16.88*	12.68			10.22***	7.55**	
		(0.077)	(0.180)			(0.003)	(0.016)	
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,939	10,939	10,939	10,408	7,336	7,336	7,336	3,115
P./Adj. R-sq	0.0634	0.0634	0.0634	0.0634	0.0322	0.0322	0.0322	0.0322

Notes: The dependent variable is “not heaped age” (those more likely to be numerate). We controlled for time effects by including half centuries of birth and regional fixed effects as described in Table 5. Coefficients show the marginal fixed effects of logistic regressions, multiplied by 125 (see Appendix B). Robust p-Values in parentheses: ***p<0.01, **p<0.05, *p<0.10

Table A.4: Comparing only JA in Southern and Central Spain with the control group

	(1)	(2)	(3)
Occ. Groups:	All excl. profess	Also less semi-prof.	Only industr.
Judaism-accused	29.52***	21.02*	27.68**
	(0.004)	(0.095)	(0.049)
Gender	Yes	Yes	Yes
Age FE	Yes	Yes	Yes
Occup. FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
N	6,536	5,874	2,072

Notes: The number of inquisition defendants (JA) is for Column 1, 2, and 3, respectively: 41,29, 24; the number of cases of the normal population (control) group is for Column 1, 2, and 3 respectively: 6,495, 5,845, 2,048. The “Yes” statements indicate that these variables are included, but the main coefficients of interest here are those of the JA.

Table A.5: Numeracy of male Inquisition defendants (Portugal and Spain) by occupation group in the 16th and 17th century

Occupation group	**Obs. No**	**ABCC Index**
Clergy	401	82
Professionals	386	79
Military	235	78
Sales workers, merchants, shopkeepers	1034	75
Administrative and managerial tasks	143	68
Agriculture, fishery	530	67
Traditional services (barber, brewer, miller, housekeeper)	259	67
Manufacture, craftsmen	836	64
No information	5100	62
Rest category (no job, "worker", "assistant", “employed”)	258	59

Appendix B: Notes on the "likely-to-be-numerate" estimation

Assume that $\frac{1}{m}$ of the population are numerate and that age is uniformly distributed.
$1 - \frac{1}{m} = \frac{m-1}{m}$ is not numerate and will state a multiple of five as their age anyway.
$\frac{1}{5} \cdot \frac{1}{m}$ of the population will correctly and non-accidently report a multiple of five.
In total, $\frac{1}{5m} + \frac{m-1}{m} = \frac{1-5m-5}{5m} = \frac{5m-4}{5m} = 1 - \frac{4}{5m}$ will claim to be a multiple of five years old.
Conversely, $1 - \left(1 - \frac{4}{5m}\right) = \frac{4}{5m}$ will answer with an age that is not a multiple of five.
The fraction of the population assumed to be numerate is recovered by multiplication with $\frac{5}{4}$, since $\frac{4}{5m} \cdot \frac{5}{4} = \frac{1}{m}$.

Appendix C. Changes in regional population weights between the 16th and 18th centuries

We are aware that the 18th century is relatively late in the inquisitorial era. However, the mean year of our comparison sample is later than for the Inquisition sample (around 1700). Still, we have compared the regional distribution of the population in the 18th century with that of the 16th century as portrayed in Nadal (1984). According these estimates, the share of the population living in Aragon and Navarre was lower (ca. 21 percent), and the growth rate in this part of Spain (between the 16th and 18th centuries) was higher than the national average. On the other hand, the share of the population living in central Castile was higher in the 16th century (ca. 35 percent) and the rate of population growth lower. Thus, it could be that the Aragon and Navarre are slightly overrepresented and central Castile slightly underrepresented, using the 18th century weights. However, the accuracy of the 16th century census has been debated. We performed a test with the average of the 16th and 18th century weights and we found that the results did not change substantially. With respect to Portugal, Oliveira Marques and Alves Dias (1994, p. 178) hold that the distribution of the population among the different provinces was not very different in the early modern period when compared to the 20th century, even though urbanization meant that growth rates between smaller localities varied.

References:

Nadal, J. (1984). La población española:(S. XVI a XX) (Vol. 12). Ed. Ariel.

Oliveira Marques, de, A. H. and Alves Dias, J. J. (1994). A Populaçao Portuguesa Nos Séculos Xv E Xvi. Coimbra: Biblos Coimbra: 171-196