Malthusian Responses to
Demographic Shocks and Extractive Institutions:
Evidence from the 1609 Spanish Expulsion of Moriscos*

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Abstract

The Malthusian era set the stage for modern economic growth, but data are generally unavailable to analyze Malthusian economies in detail. This paper uses uniquely-detailed records to examine the 1609 expulsion of Moriscos from Valencia. Population declined dramatically in former-Morisco districts and, in contradiction to standard Malthusian models, population remained relatively lower for centuries. Extractive institutions appear to have muted the standard Malthusian response to labor scarcity, instead restricting population growth and raising pre-tax output per capita. While extractive institutions severely limit modern economic growth, this episode suggests how extractive institutions may persist through the Malthusian era.

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Prior to the onset of modern economic growth, in the “Malthusian” era, increases in income per capita are thought to be ephemeral. Technological growth or a decline in labor availability might temporarily increase income per capita, but a subsequent increase in population and a decline in the land-to-labor ratio would return income per capita to its initial level (Galor, Clark). Although cross-sectional data generally support predictions from the Malthusian model, there is scarce evidence on Malthusian economies’ dynamic response to labor scarcity. Only aggregate data are available following plagues and wars (cites), which may themselves have direct economic impacts.

Extractive institutions have historically generated extreme wealth for elites, but may also increase income per capita in a Malthusian economy by constraining population. Peasants' income premium is expropriated, muting any broad demographic response, yet peasants have no long-run financial incentive to oppose the persistence of extractive institutions. Historical extractive institutions have been found to restrict modern economic growth (cites, AJR, Dell, Nunn), but it is less understood how early institutions influence Malthusian economies and why extractive institutions persist over centuries.

This paper integrates an analysis of Malthusian economies and extractive institutions, examining the 1609 expulsion of Moriscos from Valencia. Moriscos, or converted Muslims, had long been forced to pay a high share of agricultural output to their area’s noble. The Spanish Crown expelled the Morisco population from Valencia in 1609, leading to severe agricultural labor shortages in districts with a high Morisco population share. Extractive institutions persisted in former-Morisco areas, however, and became applied to Christians. Extending a traditional Malthusian model to include extractive institutions, the empirical analysis examines predicted changes in population, output, and output per capita.

For a sample period from 1572 to 1786, the empirical analysis uses data on population and a remarkable high-frequency proxy for the value of agricultural output. The Catholic Church was entitled to roughly 10% of agricultural output in each district, but auctioned these tithe collection rights every four years. The Archbishopric of Valencia maintained records of the tithe auction prices by district and year. Percent changes in district-level tithe auction prices should be roughly equal to percent changes in the value of agricultural output, assuming minimal changes in the cost of tithe collection.

The main empirical specifications estimate changes in population, output, and output per capita in districts with a higher Morisco population share in 1609, relative to changes in

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1 “Bad” characteristics during the Malthusian era, such as high disease burdens, are associated with lower population density and higher income per capita, which is necessary to maintain the otherwise-disadvantaged population (Clark). Higher disease burdens may have the same impact in some modern economies (Young; Acemoglu and Johnson), and even consumption disamenities can have similar impacts through migration (Roback 1982).
other districts from the same region. The empirical estimates are robust to controlling for
differential changes associated with distance to the City of Valencia, distance to the coast,
terrain ruggedness, and latitude and longitude.

Following the 1609 expulsion of Moriscos, Christian migration only partly compensated
for the loss of agricultural labor in former-Morisco districts. Output declined and, due to an
increase in the land-to-labor ratio, output per capita increased.

Population remained lower through 1786, inconsistent with predictions from the stan-
dard Malthusian model. Drawing on historical accounts, we propose that the persistence of
extractive institutions in former-Morisco areas discouraged further migration and muted the
typical Malthusian demographic response to labor scarcity. Increased land-to-labor ratios
compensated Christians for higher tax rates in former-Morisco districts.

Output and output per capita relatively increased in former-Morisco districts through
the 17th and 18th centuries. One potential explanation is that persistent labor scarcity,
not typically seen in the Malthusian era due to demographic responses, created unusually
strong incentives for labor-saving technological adjustment as observed in periods of modern

In the transition from Malthusian economies to modern economic growth, there has been
a Great Divergence in world output per capita. While early extractive institutions may
have increased output per capita in the Malthusian era, the persistence of these institutions
can severely restrict economic growth in the modern era. Indeed, in complementary work,
Chaney (2008) finds that persistent institutions stunted the modern development of non-
agricultural sectors in former-Morisco areas. Malthusian responses to labor scarcity and
extractive institutions are less often observed, yet are illustrated by the expulsion of Moriscos
from Valencia in 1609.

I Historical Background

I.A Institutional Exploitation of Moriscos in the Kingdom of Valencia

Islamic forces invaded the Iberian Peninsula in 711 CE and, over the following 700 years,
Muslim and Christian forces fought for control in a series of wars known collectively as the
Reconquista. During this period, however, many cities prospered economically under
Muslim rule. In particular, the Muslim City of Valencia was one of the largest cities in
Western Europe.

In the early 13th century, following the Muslim defeat at Las Navas de Tolosa by a
Christian coalition, Christian armies from the North began to advance southwards. In 1238,
the Muslim City of Valencia surrendered to the army of king Jaume I of Aragón, and remained
afterward under Christian control.
As the Christian Kingdom of Valencia began to form, Christians were initially a religious minority. Over the next two centuries, the Christian population share increased to roughly two-thirds through immigration of Christian settlers and emigration of Muslims. In 1525, the remaining Muslim population was forced to convert to Christianity. The formerly-Muslim population became known as Moriscos, who often continued to practice Islam in secret.

The Morisco population, like their Muslim predecessors, was subject to severe extractive institutions. Morisco populations were highly concentrated on land owned by Christian nobles, who exercised substantial control over judicial and municipal institutions. Nobles crafted local institutions to extract maximum rents from the Moriscos. For example, Moriscos were required to purchase items at above-market prices from stores owned by nobles; grind their grain in nobles’ mills; and present annual gifts and free labor services to the nobility (Ciscar 1977, pp. 228-235).

Nobles directly extracted a large proportion of Moriscos’ agricultural production. At the harvest, a Morisco’s crops were divided amongst three groups. The Catholic Church received a tithe, or roughly 10% of the crop. The noble, in whose jurisdiction the Morisco lived, received a more-negotiable crop share that often reached as high as 40% in addition to seignorial dues. The Morisco received the remainder, despite incurring all production costs. By comparison, Christians generally paid only the Church tithe and seignorial dues (Ciscar 1993, p. 200).

These extractive institutions in Morisco areas enriched Valencia’s nobility. One contemporary noted that “to say that the Moriscos are slaves of their lords is not appropriate because they are much more than slaves,” while another exclaimed that the Moriscos “drink a jug of water and eat a handful of raisins and everything else is for their lords” (Torres 1969, p. 135). This extractive relationship was reflected in the popular saying: “quien tiene moro, tiene oro” or “he who has a Muslim has gold” (cited in Braudel 1995, p. 789).

Unsurprisingly, Valencia’s nobility strove to maintain local Morisco populations. Nobles undermined efforts by the Spanish Inquisition to eradicate Islamic practices from Morisco areas, as Moriscos’ covert Islamicism served to justify their economic exploitation (Ciscar 1977, p. 68). Beginning in the 1570s, Valencia’s nobility resisted growing pressure to expel the Morisco population (Benítez 2001). The Spanish Crown renewed efforts to expel Moriscos in the early 17th century, perhaps to provide a nominal victory after a series of military and political setbacks (Benítez 2001, p. 430). There were also growing fears that Moriscos might aid an Ottoman invasion of the Iberian Peninsula. When planning the expulsion of Moriscos, the state council noted that “the greatest difficulty that we might face in this endeavor is the resistance of the lords of morisco vassals due to the losses they will sustain” (Benítez 2001, 398-399). Despite such resistance, the decision to expel Moriscos was made on April
I.B The Expulsion of Moriscos in 1609

In September 1609, the Spanish Navy gathered off the coast of Valencia and rumors circulated that this concentration of naval power would be used to expel the Moriscos. Valencia’s nobles convened and sent an embassy on September 16th to King Phillip III to lobby for the cancellation of the expulsion, citing the “irreparable damages, destruction, affliction and calamities that the Kingdom would inevitably endure following the execution of such a measure” (Salvador 1998, p. 129-130). The nobles’ embassy did not arrive until after the expulsion had begun, however, and was unable to stop the expulsion (Ciscar 1977, p. 138). As compensation, however, the Crown assured the nobility that they would receive royal aid in dealing with economic losses from the expulsion. In particular, the Crown allowed the nobility to confiscate the Moriscos’ belongings and appears to have promised to intervene with the nobles’ creditors.

Most of the population learned of the expulsion from its public announcement on September 22nd. Over the following three months, approximately 110,000 Moriscos left Valencia. Many Moriscos were escorted from their homes to exit ports by military force, where the vast majority were taken to North Africa. There were two revolts in October of 1609, though these were limited to mountainous terrain and were quickly subdued (LaPeyre 1959, pp. 56-57). Some Moriscos continued to hide in the mountains, and the last 15 are reported to have been captured on February 2nd, 1612 (LaPeyre 1959, p. 67). Overall, the Kingdom of Valencia lost approximately 130,000 Moriscos or roughly one-third of its total population prior to the expulsion.

In the Kingdom of Valencia, the loss of labor devastated agricultural production in former-Morisco areas. Many nobles declared bankruptcy and stopped paying their debts, contributing to a collapse of Valencia’s central bank in 1613.2

Nobles needed laborers to work the land in former-Morisco areas and attracting sufficient migration required the relaxation of extractive institutions. The institutional framework in former-Morisco areas remained harsh, however, relative to other agricultural areas in Valencia. In former-Morisco areas, “the peasants had to pay ... a large share of the harvest to their lord,” and the “the local market was heavily controlled and dominated by seignorial

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2 Nobles had accumulated substantial debt prior to the expulsion, using as collateral the revenue streams from Morisco areas. This debt was held mainly by the Valencian merchant class, who primarily resided in the capital city of Valencia (Regl 1964 p. 164). The nobles’ default devastated the finances of the Valencian elite, who withdrew substantial funds from Valencia’s bank (Regl 1964, p. 90). The city itself was forced to take a substantial loan from the bank, contributing to a loss of confidence in the bank’s solvency, and a run on the bank led to its collapse (Torres 1969, p. 134-136; Regl 1964, p. 176). The bank was recapitalized following its collapse, although it continued to experience difficulties through the 17th century.
monopolies [and] the election of local officials was largely controlled by the lord” Ciscar (1975, p. 148). Facing financial ruin, nobles’ creditors encouraged the continuation of exploitative institutions to maximize rent extraction in former-Morisco areas (Ciscar 2006).

Despite the extractive institutions, Christian immigrants were attracted to former-Morisco areas by the prospect of farming larger plots of land than were available elsewhere. Christian immigrants were also able to move into Moriscos’ abandoned houses and obtain agricultural equipment for free or at low cost. Further, Moriscos’ constructed terraces and irrigation systems largely remained intact following the expulsion. Finally, Christian immigrants were often offered temporarily tax concessions to encourage immigration (Lloret 2002, p. 355).³

In the years following the expulsion, there was substantial migration into former-Morisco areas. Most immigrants were drawn from surrounding non-Morisco areas, though there are some reports of immigration from outside of Valencia (Torres 1969).⁴ By 1630, however, the nobles seem to have succeeded in imposing restrictions on labor mobility. Immigrant settlers were often unable to meet the required agricultural payments, and became increasingly indebted to the nobles (Ciscar 1975). These debt obligations contributed to decreased labor mobility in the decades after the expulsion.

Extractive institutions persisted in former-Morisco areas, as diverging economic practices further isolated the population. An 18th century observer noted that inhabitants of former-Morisco areas “are loaded with seignorial tributes and appear to only work to fill the coffers of their lords” (Cavanilles 1958 [1797], II, p. 202).

Extractive institutions may have muted Malthusian-style demographic responses to labor scarcity. Casey (2008, p. 24) notes that birth rates remained low in former-Morisco areas, despite a relatively high land-to-labor ratio after the expulsion. The population in these areas also suffered “nutritional deficiencies,” perhaps increasing mortality rates. Casey (2008, p. 44) attributes these phenomena to “the low level of economic development” due to the “harshness of the new [post-expulsion] seigneurial rent terms.”

The Moriscos’ expulsion is generally considered to have lowered economic output in former-Morisco areas, even contributing to the economic decline of Spain in the 17th century.⁵ When differential treatment of former-Morisco areas was abolished at the end of the 18th century and beginning of the 19th century, observers decried the impoverished state of inhabitants in former-Morisco areas (Ardit 1968, p. 37). At the end of the 19th century and

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³Christian migrants appear to have received upfront returns in exchange for subsequently higher post-harvest tax rates and greater seignorial control over local institutions, consistent with an inability for nobles to commit to lower future extraction once migrants were settled.

⁴Migrants are thought to have been drawn from Valencia’s poorer inhabitants, i.e., those willing to accept an exploitative institutional framework in exchange for land and capital (Ciscar 1993, p. 189; Torres 1969, p. 73).

⁵See Hamilton (1938) for a critical review of this literature.
the start of the 20th century, Valencia is thought to have undergone a demographic transition and left behind the Malthusian era (Furió, pp. 550-552).

II Theory

II.A Baseline Model of a Malthusian Economy

Consider a community $c$ in period $t$ that produces output $y_{ct}$ using a concave constant-returns-to-scale production technology ($F(A_{ct}, L_{ct}, K_{ct}, N_{ct})$) that depends on a technology parameter ($A_{ct}$), labor ($L_{ct}$), capital ($K_{ct}$), and land ($N_{ct}$). Land is in fixed supply and is owned by a noble, who receives a share $\tau$ of total output in each period.

Labor is supplied inelastically by infinitely-lived families $f$, who are freely mobile across communities. Families have a concave utility function over goods $G$ and surviving children $C$, who supply labor in the following period ($L_{ft+1} = C_{ft}$). Families invest in capital, which depreciates over time ($K_{ft} = (1 - \delta)K_{ft-1} + I_{ft}$). Families each receive $(1 - \tau)Y_{ft}$.

Community output, capital, and labor is the sum over all resident families.

The two key features of a “Malthusian economy” are: (1) diminishing returns in labor and capital, and (2) positive population responses to income per capita. In the first case, land is a fixed factor, so income per capita declines in the quantity of labor ($\frac{d(Y_{ft}/L_{ft})}{dL_{ft}} < 0$). In the second case, increases in income per capita cause households to have more surviving children ($\frac{dL_{ft}}{d(Y_{ft}/L_{ft})} > 0$), through increased fertility or decreased mortality.

As a result, the “Malthusian trap” is that aggregate productivity increases have no impact on income per capita ($\frac{d(Y_{ft}/L_{ft})}{dA_{t}} = 0$). Instead, higher productivity leads to higher equilibrium population density. By contrast, holding population fixed in the short-run, aggregate productivity shocks increase income per capita ($\frac{\partial(Y_{ft}/L_{ft})}{\partial A_{t}} > 0$).

II.B Predicted Impacts from a Local Population Decline

Consider the impacts when the population declines in community $C$, both suddenly and unexpectedly. Total output declines, yet output per capita increases due to increased land availability. Families migrate into the community and local families have more surviving children.

The economy reaches steady-state once population levels fully recover in all communities. Total output and output per capita return to their initial levels. Future technological growth increases total output and total population, but does not affect output per capita.\textsuperscript{7}

\textsuperscript{6}By contrast, in a Solow model, $\frac{d(Y_{ft}/L_{ft})}{dL_{ft}} = 0$ because capital investment responds sufficiently to population growth.

\textsuperscript{7}By contrast, in a Solow model, the economy reaches steady state once capital has depreciated and population has migrated such that the return to capital is equalized. Output per capita returns to the previous level, but capital, population, and output remain permanently lower to the extent that population cannot immediately migrate completely and some capital is allowed to depreciate. Total output increases with
II.C Model of a Malthusian Economy with Extractive Institutions

In a modification to the baseline model, assume that there are Christian families \( f^C \) and Morisco families \( f^M \). Morisco families are predominately located in Morisco communities \( d^M \), whose nobles are allowed to impose a higher tax on Moriscos only \( \tau^M \).

Consider the impacts when all Morisco families are expelled from the country, both suddenly and unexpectedly. Further, the land-owning noble for a former-Morisco community is allowed to impose the higher tax on Christian families. The predicted responses are similar to the baseline model, but with a wedge imposed by the higher tax rate.

In the steady state, former-Morisco areas remain less-populated. Christians are less willing to settle in these areas than before, due to the new higher tax on Christian families. In equilibrium, output per capita must increase to compensate Christians in former-Morisco areas \( \frac{Y^M}{L^M} = \frac{Y^C}{L^C} \times (1/(1 - (\tau^M - \tau))) \), which implies that population must remain lower in former-Morisco areas. Christians’ retained output is no higher in former-Morisco areas, so there are no relative demographic differences in fertility or mortality.

Output remains lower in former-Morisco areas, though the persistent scarcity of labor may encourage technological adjustment toward labor-saving methods. Output and output per capita may then increase over time; if nobles adjust extraction rates in equilibrium to maximize rents, there will be no increase in peasants’ retained output and no further migration or demographic response.

Extractive institutions, represented by higher tax rates, mute the Malthusian population response to higher output per capita. In a sense, this breaks the “Malthusian trap.” The noble obtains all benefits, however, from higher levels of output per capita.\(^8\)

III Data Construction and Average Changes by District Type

III.A Agricultural Output and Population Data

In Valencia, every four years from 1572 to 1786, remarkable data are available to proxy for the total value of agricultural output. The Archbishopric of Valencia was entitled to approximately 10% of all agricultural output in each administrative tithing district (or delmari) under its jurisdiction.\(^9\) Rather than directly collect agricultural goods, the Archbishopric separately auctioned the right to collect its share of output in each district over the sub-

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\(^8\) The model also predicts that nobles’ resistance to the Moriscos’ expulsion may be declining over time. A noble earns rents from retaining Moriscos because the revenue-maximizing tax rate exceeds the level initially allowed for Christians. As Christian populations increase nationally and drive down the marginal return to labor, the noble could increasingly attract Christians despite a high tax rate. Thus, there is an increasing incentive to accept the expulsion of Moriscos and impose high tax rates on Christians.

\(^9\) The rate at which agricultural output was taxed appears to have remained constant over the entire period (Ardit 1987).
sequent four years in exchange for upfront fixed cash payments (Llibrer 2011). Winning bids were usually made by inhabitants of that district, as local inhabitants were most able to forecast the value of collection rights.

The Archbishopric of Valencia recorded the value of each winning bid in each tithing district and time period. We construct a continuous panel of district-level tithe auction prices from 1572 to 1786. Percent changes in district-level tithe auction prices should be roughly equal to percent changes in the value of agricultural output, assuming minimal changes in the cost of tithe collection. Further, relative changes in the value of agricultural output should mainly reflect changes in the relative quantity of output, as agricultural markets maintained similar output prices across districts.

Town-level population data are available from three sources. First, from a manuscript created between 1565 and 1572, town populations in the Kingdom of Valencia were compiled by Roque Chabás in 1890. Second, in 1622, population data were recorded during the ad limina visit organized by the Vatican. Third, Badenes and Bernat provide town-level population data from Censuses conducted throughout the Kingdom of Valencia in 1609, 1646, 1692, 1712, 1730, 1768, 1786. The 1609 Census, conducted in anticipation of the expulsion, records the number of Christians and Moriscos.

III.B Tithing Districts, Shaded by Morisco Population Share in 1609
The main geographic unit of analysis is a tithing district, of which there are 96 in our main sample. Some district borders changed over the analyzed time period, but the geographic unit of analysis is held constant by summing auction prices over sub-divided areas (Ardit 1987). Town-level population data was matched to tithing districts based on a 17th century

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10 Each November, the Archbishopric announced which tithing districts were to be auctioned. On January 6th and 7th of the following year, the collection right for each district was sold to the highest bidder.
11 Winning bidders also took on all collection costs, which may have been lower for local inhabitants.
12 These records have survived in a series of books known as the Llibres d’arrendaments dels delmaris de l’arquebisbat de València, which are now in the Arxiu de la Catedral de València. The period from 1501 to 1800 is covered in books 4388 to 4401, which have been compiled and studied by various authors. We use transcriptions by Ardit (1987), who builds on work of previous authors and notes that his series contain “very few errors [if any]” (Ardit 1987, p. 291).
13 We assign the auction value in year $t$ to years $t + 1$, $t + 2$, and $t + 3$. We assume a linear interpolation between missing years, which are 4.6% of the total number of observations.
14 We assume no collusion amongst risk-neutral bidders, who have accurate expectations and low discount rates, such that the winning bid in each district reflects ten percent of the expected value of agricultural production (net of collection costs).
15 Population data initially record the number of households and then record the number of individuals in 1768 and 1786; for aggregate comparisons, following standard practice in this historical literature, households are assumed to contain 4.5 individuals. This assumption does not affect the estimation of relative changes.
16 Of the 102 tithing districts recorded by Ardit (1987), five districts are omitted due to missing population data and one non-contiguous district is omitted. The 96 sample districts cover 9568 square kilometers, roughly 45% of the Kingdom of Valencia.
map provided by Ardit and later maps by Badenes and Bernat.\textsuperscript{17}

Figure 1 maps the 96 tithing districts, shaded to reflect the Morisco population share in 1609 prior to the expulsion. The population is 0\% Morisco in 31 districts (shaded white), between 0\% and 100\% Morisco in 40 districts (shaded light gray), and 100\% Morisco in 25 districts (shaded medium gray).\textsuperscript{18} Mapped boundaries do not each reflect distinct tithing districts, as some districts contain non-contiguous pieces. Thicker lines denote nine regional boundaries, as defined by Ardit (1987).\textsuperscript{19} The City of Valencia is in the Northeast, in a cross-hashed non-tithing area, and the coastline is to the East. Two small tithing districts with unavailable population data are cross-hashed.

Following the Christian conquest, Christian settlers occupied fertile regions around the City of Valencia and Muslims were increasingly pushed into more rugged terrain. Within region, however, districts with a greater Morisco population share in 1609 did not have statistically different population density, tithes per km\textsuperscript{2}, or tithes per capita.\textsuperscript{20} The main empirical estimates report subsequent within-region changes for districts with a greater Morisco population share in 1609, but alternative empirical specifications also control for changes over time that are correlated with distance to the City of Valencia, distance to the coast, terrain ruggedness, and latitude and longitude.

III.C Average Changes in Morisco and Christian Districts

Figure 2, panel A, reports average log population density in “Morisco districts” and “Christian districts,” normalized to zero in 1609.\textsuperscript{21} For these preliminary figures, “Morisco districts” have a positive Morisco population share in 1609 and “Christian districts” have zero reported Moriscos.

\textsuperscript{17}We are grateful for materials and assistance from Manuel Ardit. Beginning in the 17\textsuperscript{th} century, we created a digitized map of Valencia’s tithing districts using manuscripts 4440 and 4441 from the Arxiu de la Catedral de València. This archival source lists the population centers in each tithing district, and we assign population data to each tithing district based on name and geographic proximity.

\textsuperscript{18}In the second category, Morisco population shares are fairly evenly distributed between 0\% and 100\% with a mean of 48\%.

\textsuperscript{19}For clarity, regional boundaries are omitted around non-contiguous district pieces.

\textsuperscript{20}Following the main empirical specifications, the three district-level outcomes in 1609 are regressed on the Morisco population share in 1609 and region fixed effects, weighting by district population and adjusting the standard errors for heteroskedasticity. For log population per square km, the estimated coefficient on fraction Morisco is 0.152 with a standard error of 0.165. For log tithes per square km, the estimated coefficient on fraction Morisco is 0.073 with a standard error of 0.204. For log tithes per capita, the estimated coefficient on fraction Morisco is -0.079 with a standard error of 0.187. Christian migration and demographic responses might be expected to equalize output per capita across districts. Moriscos’ retained output per capita is lower, leading to relative population declines consistent with the gradual replacement of Moriscos with Christians since the Christian conquest. However, these estimated cross-sectional relationships may also reflect unobserved district characteristics.

\textsuperscript{21}Population density is defined as the number of households per square kilometer (1572 - 1730) and the number of individuals per square kilometer divided by 4.5 (1768 - 1786).
Between 1609 and 1622, population declined substantially in Morisco districts. Population also declined in Christian districts, reflecting migration to Morisco districts. However, migration was insufficient to equalize the percent population decline across districts. Through 1786, population density remained persistently lower in Morisco districts than in Christian districts.22

Figure 2, panel B, reports average log tithes per km$^2$ in Morisco and Christian districts, normalized to zero in 1609. After 1609, this proxy for the value of agricultural output declined in Morisco districts relative to Christian districts. Agricultural output remained relatively lower through the 17th century and converged through the 18th.

Figure 2, panel C, reports average log tithes per capita in Morisco and Christian districts, normalized to zero in 1609. This outcome variable is more approximated because the denominator is only measured in nine time periods; annual population data is interpolated following the solid line in panel A. Output per capita increased immediately in both Morisco and Christian districts after 1609, consistent with a declining population and fixed production factors. Output per capita increased more in Morisco districts and remained higher through 1786, perhaps increasingly so.

The Moriscos’ expulsion may affect all districts to some degree, but the subsequent empirical analysis is focused on estimating the relative impact on districts with a greater Morisco population share in 1609. Rather than attempt to recover the aggregate impact of the expulsion, this comparison tests predicted impacts from a plausibly exogenous relative decline in population.

IV Empirical Methodology

The main empirical specifications estimate year-specific differences between districts with a greater Morisco population share in 1609 and districts with a lower Morisco population share in 1609, relative to district differences in a base year of 1609. In the simplest specification, outcome $Y$ in district $d$ and year $t$ is regressed on the district’s Morisco population share in 1609, region-year fixed effects, and district fixed effects:

$$Y_{dt} = \beta_t \text{MoriscoShare}_d + \alpha_{rt} + \alpha_d + \epsilon_{dt}$$ (1)

Note that $\beta$ is allowed to vary by year, so each estimated $\beta$ is interpreted as the average difference between 100% Morisco districts and 0% Morisco districts in that year relative to the omitted base year of 1609. The main identification assumption is that, if not for the

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22 Aggregate increases in population after 1730 may partly reflect an inaccurate conversion between “number of households” and “number of individuals,” though the empirical analysis is focused mainly on the relative comparison between Morisco and Christian districts.
Moriscos’ expulsion, districts with a greater Morisco population share in 1609 would have changed similarly to other districts in the same region.

In practice, further specifications control for district characteristics ($X_d$) that may predict differential changes between districts with high-Morisco and low-Morisco districts:

\[
Y_{dt} = \beta_t \text{MoriscoShare}_d + \alpha_{rt} + \alpha_d + \theta_t X_d + \epsilon_{ct}
\]

Alternative specifications control for changes over each year that are correlated with distance to the City of Valencia, distance to the coast, terrain ruggedness, and longitude and latitude.

For the statistical inference in all specifications, standard errors are clustered at the district level to adjust for heteroskedasticity and within-district correlation over time. The regressions are weighted by district population in 1609, so the estimates reflect changes for the average settlement in 1609.\(^{23}\)

V Results

V.A Baseline Results

Figure 3, panel A, reports estimated changes in log population in a formerly 100% Morisco district, relative to changes in a formerly 0% Morisco district. From estimating equation (1), the solid line reports that former-Morisco districts experienced a 0.80 log point or 55% relative decline in population from 1609 to 1622. The dashed lines report 95% confidence intervals around the estimates. The declines in population are statistically significant in each time period, reversing a statistically significant relative increase in population prior to the expulsion.

Figure 3, panel B, reports estimated relative changes in the log value of tithes, as a proxy for the log value of agricultural output. From 1609 to 1614, output declined relatively by 0.39 log points in former-Morisco districts, with a standard error of 0.09 log points.\(^{24}\) Annual declines in output are each statistically significant through the late 1600’s, and even more so if one considers their joint significance by pooling across years. By the 18th century, output mostly recovered in former-Morisco districts. By contrast, Morisco and Christian districts experienced similar output trends prior to 1609.

Figure 3, panel C, reports estimated relative changes in the log value of tithes per capita. From 1609 to 1614, this proxy for output per capita increased relatively by 0.40 log points in

\(^{23}\)If there is a 40% population decline in one district and a 70% population decline in another district that is initially half the size, the implied region-wide population decline is 50%. This region-wide population decline is given by the average district-level population decline, weighting by initial district population. Thus, the empirical results are focused on changes in economic conditions for the average person.

\(^{24}\)Note that data are omitted from 1610 to 1613, as some tithe prices reflect pre-expulsion collection auctions.
former-Morisco districts, with a standard error of 0.19 log points. The estimated immediate effects are sensitive to how population is interpolated between 1614 and 1622; the current estimates make a conservative assumption that population is constant between 1614 and 1622 (as in panel A of Figure 2), though population was likely lower in early years and output per capita higher. Output per capita continues on a pre-expulsion negative trend through the 1630’s, and then trends higher for the next 100 years.

Due to the long time horizon, the estimated coefficients are difficult to summarize and display in tables. Rather than impose a particular polynomial parameterization or combine time periods into bins, the main pattern of results is apparent in the figures.

V.B Robustness to Alternative Specifications

Alternative specifications explore the baseline results’ robustness, estimating versions of equation (2). Figure 4 reports estimated relative changes in log population, controlling for inherent district characteristics that may be correlated with differential changes in each year. Panel A controls for distance to the City of Valencia and distance to the coast, interacted with year.\(^{25}\) Panel B controls for average terrain slope, interacted with year.\(^{26}\) Panel C controls for latitude and longitude, interacted with year.\(^{27}\) Panel D includes all controls from panels A – C, interacted with year. Figures 5 and 6 report estimates from the same specifications for log tithes and log tithes per capita, respectively.

Across all specifications, the estimates in Figures 4 – 6 are quite similar to the baseline estimates. Some specifications report less of an immediate increase in output per capita (Figure 6, panels B and D); pooling across years, however, an upward mean shift after 1609 is in contrast to a negative trend before 1609.\(^{28}\)

V.C Interpretation

Following the 1609 expulsion of Moriscos, Christians partly filled the subsequent need for agricultural labor in districts with a greater initial Morisco population share. Though extractive institutions in former-Morisco districts became applied to Christians, an increase in the land-to-labor ratio compensated Christians with higher pre-tax income per capita.

This episode suggests, in part, why extractive institutions may persist for centuries through the Malthusian era. Extractive institutions lower population density but maintain long-run income per capita. While peasants benefit in the short-run from the removal of high tax rates, demographic responses impose large negative externalities through a de-

\(^{25}\) Shortest geographic distance is measured from a district’s centroid.

\(^{26}\) Average slope within a tithing area is calculated from GTOPO30 data on elevation.

\(^{27}\) Latitude and longitude are measured at a district’s centroid.

\(^{28}\) We also expect the initial change in output per capita to be downward biased, as population is conservatively assumed to be constant from 1614 to 1622.
crease in the land-to-labor ratio. Peasants internalize benefits from an increase in their own family size, but in a large society nearly all of the demographic response occurs in other families. Institutional reform becomes more appealing as demographic responses slow, or as peasants are able to coordinate and internalize benefits from other families’ increased sizes.

Population remained lower in former-Morisco districts through 1786, consistent with extractive institutions limiting Malthusian-style demographic responses. Due to a decline in labor availability, output declined initially.

Output per capita increased initially, reflecting an increase in the land-to-labor ratio. Output per capita partly converged over the next 20-30 years, however, which may reflect a depreciating capital stock. If Moriscos’ capital stock was complementary with the relative abundance of labor prior to the expulsion, then the return to capital would have fallen and led to capital depreciation. Indeed, shortly after the expulsion, capital stocks appear to have depreciated in former-Morisco areas (Casey 2008).\textsuperscript{29}

Over a longer period of time, output and output per capita began to increase in former-Morisco districts. From 1640 to 1740, output per capita increased relatively in former-Morisco districts by roughly 0.4% per year, which is unusually fast growth in the Malthusian era. One explanation is that persistent labor scarcity, not typically seen in the Malthusian era, led to increased capital investment and/or long-run technological adaptation. Malthusian economies may generally respond faster to labor scarcity through demographic changes; when this demographic channel is shut down by extractive institutions, however, capital investment and technology have the opportunity to respond. Unfortunately, data are unavailable for capital stocks or production methods, so it is not possible to observe directly this margin of adjustment.

\textbf{VI Conclusion}

To Come.

\textsuperscript{29}By the 1640’s, a seigniorial administrator attempted to incentivize the upkeep of physical structures that were in “ruin and a terrible state” (Ciscar 1975, p. 159).
References


Salvador, E. 1998. “La Cuestión de los Censales y la Expulsión de los Moriscos Valen-
cianos.” *Estudis*, 24: 127-146.

Figure 1. Sample Districts, Shaded by Morisco Population Share in 1609

Notes: The 96 sample districts are defined according to tithing areas of the Archbishopric of Valencia in the 17th century. The thin lines create more than 96 distinct polygons because some sample districts are non-contiguous. Thicker lines denote nine regional boundaries, as defined by Ardit (1987). The population is 0% Morisco in 31 districts (shaded white), between 0% and 100% Morisco in 40 districts (shaded light gray), and 100% Morisco in 25 districts (shaded medium gray). The City of Valencia is in the Northeast, in a cross-hashed non-tithing area, and the coastline is to the East. Two small tithing districts with unavailable population data are cross-hashed.
Figure 2. Average Outcomes in Morisco Districts and Christian Districts, relative to 1609

Panel A. Log Population per square kilometer

Panel B. Log Output (Tithes) per square kilometer

Panel C. Log Output (Tithes) per capita

Notes: Insert from text.
Figure 3. Estimated Changes in District Outcomes, by 1609 Morisco Population Share

Panel A. Log Population

Panel B. Log Output (Tithes)

Panel C. Log Output (Tithes) per capita

Notes: Insert from text.
Figure 4. Robustness to Alternative Specifications: Estimated Relative Changes in Log Population

Panel A. Controlling for Distance to Valencia and the Coast

Panel B. Controlling for Terrain Ruggedness

Panel C. Controlling for Latitude and Longitude

Panel D. Controlling for Variables from Panels A – C

Notes: Insert from text.
Figure 5. Robustness to Alternative Specifications: Estimated Relative Changes in Log Output (Tithes)
Panel A. Controlling for Distance to Valencia and the Coast
Panel B. Controlling for Terrain Ruggedness
Panel C. Controlling for Latitude and Longitude
Panel D. Controlling for Variables from Panels A – C

Notes: Insert from text.
Figure 6. Robustness to Alternative Specifications: Estimated Relative Changes in Log Output (Tithes) per capita
Panel A. Controlling for Distance to Valencia and the Coast
Panel B. Controlling for Terrain Ruggedness
Panel C. Controlling for Latitude and Longitude
Panel D. Controlling for Variables from Panels A – C

Notes: Insert from text.