

Indian Identity, Poverty and Colonial Development in Mexico

Preliminary

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ABSTRACT

The *encomienda* was the institutional arrangement whereby Indians, as vassals of the Crown, were entrusted to a private individual, the *encomendero*, who could levy tribute from them. This foundational institution set the terms of interaction of Indians with the Spanish world. While many explanations have been offered for the social exclusion and the persistence of poverty among indigenous peoples, this paper highlights the role of the earliest institution established by the Spanish colonial rulers, the *encomienda*, in the preservation of indigenous identities. Using Geographic Information Systems (GIS) to reconstruct settlement patterns in the distant past, I explore the endogenous role of ethnic identity in the destitution of indigenous peoples in Mexico. For the purpose of econometric identification I take advantage of the variance in institutional heritages arising from the *encomienda*. I propose that Indian communities strategically chose to preserve their long-term ethnicity as a response of the effects of exploitation on the hands of the *encomienda* holding Conquistadores. Indian ethnic identity was used as a survival strategy in the places where exploitation was most prevalent. As a reaction to the rapacity of private *encomenderos*, communities that had suffered the most protected themselves by limiting interactions with the outside world. A linguistic barrier was the best way to protect the community. And the barrier was further enhanced by geographic insulation. In contrast, assimilation to the outside world proceeded in the *encomiendas* held by the Crown, administered by *corregidores* (i.e. co-rulers) in relatively benign neglect. Indians in the possession of the Crown were willing to make the linguistic and cultural investments to transform their identities and become part of the Spanish colonial society.

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1. Introduction.

The descendants of the original inhabitants of the Americas live, for the most part, in conditions of abject poverty. The Chiapas uprising in 1994 brought the plight of Indians in Mexico to wide international attention, only to be followed some years later by the rise of indigenous political mobilizations in Bolivia and Ecuador.¹ Despite their recent political empowerment, Indians in Latin America have been ancestrally poor. Statistically there is an extremely high correlation between ethnic identity and income.² While many explanations have been offered for the social exclusion and the persistence of poverty among indigenous peoples, this paper highlights the role of the earliest institution established by the Spanish colonial rulers, the *encomienda*, in the preservation of indigenous identities. Using Geographic Information Systems (GIS) to reconstruct settlement patterns in the distant past, I explore the endogenous role of ethnic identity in the destitution of indigenous peoples in Mexico. For the purpose of econometric identification I take advantage of the variance in institutional heritages arising from the *encomienda*.

The territoriality of poverty and Indian identity is central to this inquiry. A striking feature of indigenous populations is that they tend to live in relatively remote, environmentally harsh mountainous areas. The spatial distribution of income suggests that hundreds of thousands of ethnically distinct peoples, usually referred to as Indians,³ are probably caught in geographic poverty traps. In this isolated places communities are often organized according to customary laws and traditional authority, rather than so called “modern” institutional arrangements. Have indigenous peoples always inhabited inhospitable places, or were they pushed to the periphery by the encroachment of colonial settlers? What mechanisms allow or hinder ethnically distinct groups living in poverty to escape from the precarious natural geographic environments where they live? These are some of the questions this research project seeks to answer.

¹ Political scientists have paid much recent attention to the empowerment of ethnically distinct parties through what Madrid (2008) calls “the rise of ethnopopulism”. See Yashar (2005) and Van Cott (2005). On the Chiapas uprising see the superb treatment by Trejo (2009).

² Hall and Patrinos (2005) have found, among other things, that between 1994 and 2004 poverty has not been reduced among indigenous peoples in Latin America; that indigenous people recover more slowly from economic crises; that indigenous people, especially women and children, continue to have less access to basic health services; and that being indigenous significantly increases an individual’s probability of being poor.

³ In what follows I will refer to the indigenous population or original peoples of Mexico as “Indian”. The term “original peoples” stresses being a descendent of the native inhabitants before contact with the Europeans. It highlights with the plural “peoples” the diversity of linguistically and cultural distinct groups. The governments emerging from the Mexican Revolution abused the term “indigenous” in their rhetoric. After the Chiapas uprising it became politically correct in Mexico to use the term “Indian” as an alternative. “Indian” was the term used by the Spanish Crown during the colonial period. Indian groups are primarily distinguished by their linguistic, rather than their genetic distinctiveness. In the empirical work I will use a linguistic criterion to categorize inhabitants as Indian, as measured by municipal level census information.

I draw upon a vibrant research agenda on the causes of underdevelopment pioneered by Acemoglu, Johnson and Robinson (henceforth AJR, 2001). The AJR explanation offers as an answer to the revival of geographic explanations of underdevelopment.⁴ Their account provides an institutional mechanism linking colonialism to poverty. Inspired by the work of Engerman and Sokoloff (2000), they argue that colonial rulers established different sets of institutions depending on their goals, seeking either to settle the conquered lands or to extract valuable resources. Hence, AJR argue that the colonial experience produced a “reversal of fortune” whereby sparsely populated places that were poor in 1500 were ruled by settlers who established institutions facilitating the protection of rights; while wealthy possessions endowed with native labor and natural resources were characterized by extractive institutions. By the time countries became independent in the 19th century these institutional heritages either allowed or prevented them from reaping the benefits of technological change and world trade.

In a critical review of this research, Coatsworth (2005) has noted that: “the first question [to ask] is whether the evidence available will permit a systematic investigation of the precise mechanisms that link colonial society, politics, and institutions to economic performance during and beyond the colonial era” (p. 143). Thus, the challenge of explaining the impact of colonialism on poverty is to a large extent one of marshalling good empirical evidence to test hypotheses. A second challenge is to tease out inferences of causality, since most of the variables involved in this line of research are highly endogenous (Przeworski, 2004). While AJR provide an impressive reconstruction of cross-national institutional variation, using European settler mortality as an instrumental variable for current institutions, historians and other scholars have rightly criticized the work for being too sweeping in its generalizations. A related critique is that AJR does not take within country variation into account. Institutional heritages – extractive and non-extractive – may coexist in a country, accounting for internal spatial patterns of poverty and inequality. This is an area of vibrant research and debate, using sub-national historical data to explore developmental outcomes and institutional variation.⁵

⁴ See the seminal contribution of Gallup, Sachs and Mellinger (1999) and the widely acclaimed book by Diamond (1997). For a contribution linking geography, genetic distance and ethnic fragmentation (arguably playing a determinant role in development) see Spolaore and Wacziarg (2006). The notion that geography matters insofar as it becomes embedded in political institutions is not a completely novel, since even the geographic determinism Montesquieu considered the idea that while nature shaped different temperaments and cultures political arrangements were ultimately what determined the fate of nations. For critical views see Przeworski (2004); Coatsworth (2005) and Lange et al. (2006).

⁵ This literature is extensive and growing. Acemoglu et al. (2008) explore the formation of political power and landed elites in Cudinarca, Colombia; Nunn (2007) and Nunn and Wantchekon (2009) explore the role of African slavery in current institutional heritages; Naritomi et al. (2008) study the impact of the cycles of sugar production and gold extraction in Brazilian municipal institutions and development; Bombonis (2008) looks into the role of land concentration in Puerto Rico; Garcia Jimeno (2008) analyzes slavery in Colombia; Sacerdote and Frey (2008) find a surprising positive effect of

In this paper I report ongoing research for a book project that seeks to contribute to this growing literature by exploring the role of colonial political institutions in determining spatial patterns of ethnicity in Mexico, and its links to poverty and social inequality. The question I focus on is why an Indian identity, instead of a mestizo or Spanish one, was maintained in most poor Mexican municipalities. The classic book on colonial Latin America, Lockhart and Schwartz (1984) presented Hispanization (understood as the loss of indigenous culture) as a gradual process that advanced steadily throughout the colonial period, and would continue thereafter. Laitin (1995), in contrast, has studied the retention of identity among marginal minorities as a “tipping game”, in which assimilation only occurs when a critical mass of individuals overcome the costs of being members of the non-marginal society. Laitin suggests that geographic isolation lowers the cost of boundary maintenance (p.48), and thus might make tipping phenomena less likely. My account of ethnicity as a constructed identity is similar to Laitin’s (1995) view, although I suggest that collective memories of interaction between marginal groups and their dominant society might play a larger role.

The main argument is that geographic poverty traps in Mexico today can be traced to the patterns of political and social organization of the indigenous peoples established by the conquerors during the first century of the colonial period. The combined shocks of war, epidemics, forced labor, drought, migration and the general disruption of pre-Hispanic society resulted in the decimation of the original populations. By the 1650s as little as ten percent of the original peoples had survived in the New Spain (Cook and Borah, 1948). The first century of the colonial period was marked by the establishment of a peculiar institution, the *encomienda*, which “entrusted” Indian communities to the colonists, collecting from them both tribute and labor. The Spanish Crown and the religious orders opposed the *encomienda*, for reasons related both to a modernizing imperative of preventing Conquistadores from becoming feudal lords in the new lands; and a humanist vision of what this institution meant for the treatment of Indians as human beings. *Encomiendas* pitted the Crown against the Conquistadores, and were eventually abolished in Central Mexico by the 17th century, although they survived longer in the Northern frontier and in the Yucatan peninsula.

I propose that Indian communities strategically chose to preserve their long-term ethnicity as a response of the effects of exploitation on the hands of the *encomienda* holding Conquistadores. Indian ethnic identity was used as a survival strategy in the places where exploitation was most prevalent. As a reaction to the rapacity of private *encomenderos*, communities that had suffered the most protected themselves by limiting interactions with the outside world. A linguistic barrier was the best way to protect the community. And the barrier was further enhanced by geographic insulation. In contrast, assimilation to the outside world proceeded in the *encomiendas* held by the Crown, administered by *corregidores* (i.e. co-rulers) in relatively benign neglect. Indians in the

colonialism in the development of islands; Dell (2008) analyzes the impact of the Mit’a as a form of forced labor in the development of Peru and Bolivia; Jha (2009) provides an account of the impact of Moslem traders in peaceful ethnic interactions in India; while Iyer (2002) and Banerjee and Iyer (2005) study indirect rule and its impact on land tenure in India.

possession of the Crown were willing to make the linguistic and cultural investments to transform their identities and become part of the Spanish colonial society.

Thus in my account the geography of ethnic identity determines poverty today because Hispanization was only feasible in places where the contact with the colonists had produced palpable benefits to the Indians. Towns preserving an Indian identity became zones of refuge (Aguirre Beltran, 1960), allowing for the survival of indigenous peoples through their insulation from colonists. As Indian communities recovered from the demographic catastrophe of the first century, the Crown engaged in an ambitious project of social engineering, relocating surviving populations into thousands of towns (*pueblos de indios*), which are the precedents of Mexico's modern municipalities.⁶ The relatively autonomous Indian towns were meant to provide the conditions for orderly political life (*vivir en policia*, referring to living in a polis). Private *encomiendas* were eliminated, as all towns became Crown *corregimientos*. Thousands of towns preserved, however, a collective memory of exploitation under the hands of Conquistadores. They kept in isolation both culturally and economically. This isolation ultimately undermined opportunities for those communities to reap the benefits of modern economic growth in the 19th and 20th centuries.

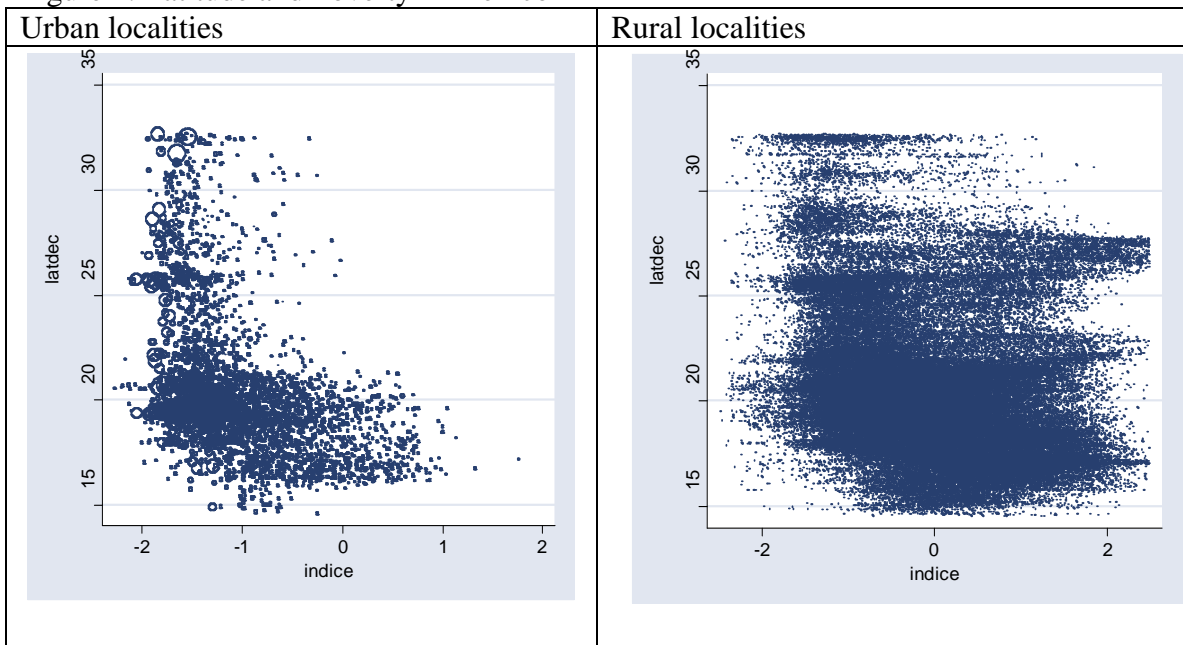
This paper is organized reporting the content of planned book chapters. The next section discusses the territoriality of the distribution of poverty in Mexico, showing how indigenous identity is strongly correlated with poverty, and that poor communities are concentrated in geographically distinct places. The third section uses GIS tools to reconstruct the geographic distribution of poverty before the colonial period, by using the network of major archeological sites during the classic period of Maya and Mesoamerican civilizations. This reconstruction of poverty at the time of contact provides a baseline of the territorial patterns of development among original peoples. This baseline allows one to control for pre-existing patterns of poverty when assessing the independent impact of ethnicity on poverty. The fourth section discusses *encomiendas* and a crucial source of institutional variation in the 16th century, related to whether Indian communities were kept by private conquistadores or protected by the Crown. That section explains the mechanism through which *encomiendas* may account for the preservation of Indian identities today. The fifth section provides econometric estimates of the impact of ethnicity on development in Mexico. It uses *encomienda* types and the networks of convents founded by religious orders as instruments for indigenous identity. The analysis shows that ethnicity explains poverty today, even when controlling for factors such as the initial patterns of development at the time of contact or intervening developments during the 17th and 19th centuries, namely the organization of colonial society around silver mining activities and the economic impact of railroad infrastructure. The final section reports some of the additional research ongoing for the project.

⁶ These relocations were called *reducciones*, and they resulted in the establishment, by the end of the colonial period, of around 4500 *pueblos de indios* enjoying a relatively large degree of local autonomy (Tanck de Estrada, 2005).

2. The territorial distribution of poverty

The stylized fact often presented in the popular press and even academic discussions regarding regional inequality in Mexico is that the country is divided along a North-South cleavage (Economist, 2008). Figure 1 shows two scatterplots of poverty in Mexican localities, according to the latitude band where they are located. The scatterplot on the left shows only urban localities defined as towns or cities with more than 5000 inhabitants, where the size of the circle is relative to population. The one on the right shows rural localities with more than 5 inhabitants. Poverty is measured as an index of unsatisfied basic needs based on the 2005 census, as calculated by CONEVAL, an independent federal agency in charge of measuring and evaluating poverty trends in Mexico. The horizontal axis of the graph presents the latitude band, while the vertical axis shows the poverty rate, measured as a standardized score. As it can be seen, there is virtually no urban locality with a poverty rate above the national mean (set at 0) in the North of the country (above 22 degrees latitude). There is also a clear clustering of poverty in the South, which can be noticed by the greater concentration of poor localities below the 20 degrees latitude band (mostly the states of Guerrero, Oaxaca and Chiapas).

Figure 1. Latitude and Poverty in Mexico



The graph does suggest a high correlation between latitude and poverty.⁷ But close inspection reveals that the core of Mexico's territory and the overwhelming majority of localities in the central highlands of the country span the whole range of poverty levels. The spatial distribution of poverty in Mexico can be better described by the notion of geographic poverty traps (Jalan and Ravallion, 2002), than as a stylized contrast between a wealthy North and a poor indigenous South. Although there is a clear

⁷ Sachs and Gallup (2000) and Diamond (2000) can be credited for the revival of interest in geographic explanations of development.

correlation between poverty and latitude (i.e., distance to the equator), the spread of poverty also has a strong correlation with longitude (the East is poorer than the West) and rainfall (humid tropical areas tend to have greater poverty rates). Geographic isolation also plays a critical role in accounting for the geographic spread of poverty. Greater poverty is found in places at the bottom of deep valleys surrounded by high mountains, unless the naturally rugged terrain -which characterizes much of Mexico- is overcome by modern means of transportation, such as railroad tracks or highways. Population dynamics and settlement patterns are also intimately related to poverty. Even though there are large numbers of poor people living in cities, poverty is more prevalent in scattered and sparsely populated areas. To get a better sense of the role of geography accounting for the territorial patterns of poverty, table 1 presents a set of OLS estimations.

The first column reports a regression where the spread of poverty is “accounted” for by 32 state fixed effects and a spatial lag (second order) of the poverty rate in the surrounding municipalities surrounding. There is no substantive interpretation for that first estimation, but it provides a baseline of how much of the variance in poverty can be accounted for (a relatively high R^2 of 0.43), simply by noting that states in Mexico have different poverty rates, and that poor places tend to cluster together (captured by the spatial lag).

The second estimation is more interesting, excluding state fixed effects, providing substantive geographic indicators regarding the way in which states may vary from one another. This estimation includes what is often referred to as a “natural geography”: attributes of places that are generally given by the natural environment.⁸ This estimation using natural geography accounts for around one third of the variance in the municipal profile of poverty. Higher places seem to be less poor; rough terrain, measured through the standard deviation of altitude, seems to be associated with more poverty rates; places by the coast have less poverty; the South is poorer than the North and the East is poorer than the West; and places with more rainfall are poorer.

The third column adds “human geography”: modifications to the natural terrain that make some places more connected than others, creating particular configurations in the settlement patterns of human groups. This includes a dummy variable that identifies the municipalities that are state capitals, and hence the seats of government in each state; the average Euclidean (straight line) distance of municipalities to cities with more than 100,000 inhabitants, railroad lines or major highways; and the two components of population density, namely the (logged) population of the municipality and the land size measured in square kilometers. All these variables are endogenous to poverty, but it is important to note that they are related to processes that for the most part were set in motion in the distant past, not the last decades or even the last century. This estimation accounts for far more variance than the state fixed effects model.

⁸ Although it is important to acknowledge that over long time frames human activity can also modify climatic variables.

Table 1. The Impact of Natural and Human Geography on Poverty

	(1)	(2)	(3)	(4)
	State fixed effects	Natural Geography	Human Geography	Ethnicity
Spatial lag	0.052 (0.056)	0.265 (0.054)**	0.171 (0.043)**	0.143 (0.039)**
Altitude (km)		-0.893 (0.375)*	-0.486 (0.29)	-0.309 (0.252)
Rugged Terrain (sd)		0.95 (0.377)*	0.603 (0.291)*	0.426 (0.2529)
Coastline (1/0)		-0.697 (0.073)**	-0.51 (0.070)**	-0.327 (0.060)**
North (000 km)		-0.963 (0.069)**	-0.705 (0.070)**	-0.676 (0.064)**
East (000 km)		0.509 (0.054)**	0.575 (0.050)**	0.194 (0.050)**
Rainfall (mm)		0.762 (0.100)**	0.887 (0.081)**	0.713 (0.072)**
Temperature (oC)		-0.014 (0.003)**	-0.004 (0.002)	-0.001 (0.002)
Capital (1/0)			-0.392 (0.108)**	-0.356 (0.084)**
Distance City (km)			0.002 (0.000)**	0.001 (0.000)*
Distance Rail (km)			0.004 (0.001)**	0.003 (0.001)**
Distance Highway (km)			0.019 (0.001)**	0.012 (0.001)**
Population (log)			-0.213 (0.012)**	-0.213 (0.012)**
Land Area (000 km ²)			0.046 (0.011)**	0.036 (0.010)**
Indian Language (%)				0.636 (0.082)**
Constant	0.768 (0.036)**	-0.432 (0.160)**	0.651 (0.195)**	1.476 (0.225)**
Observations	2425	2425	2370	2370
R-squared	0.43	0.33	0.58	0.65
Robust standard errors in parentheses				
* significant at 5% level; ** significant at 1% level				

The final estimation in table 1 adds ethnic identity to human geography: the percentage of Indians as defined by the national statistical office, INEGI, as those that speak an indigenous language. In Mexico there is no available statistics of indigenous populations defined through self-adscription. The Comision Nacional para el Desarrollo de los Pueblos Indigenas (CDI) counts around 10 million Mexicans as indigenous, although only 6 million of them actually speak an indigenous language. Thus the linguistic marker might underestimate indigenous peoples, although the territorial spread of the population with a distinct Indian ethnicity is probably highly correlated with the

linguistic criterion. Indigenous identity is probably also a consequence of poverty, since richer households are more likely to learn Spanish, in order to not be excluded from many economic opportunities. Indigenous peoples are also more likely to live far from cities, highways and railroads; to be concentrated in the South of the country and in rugged mountain ranges. In short, the ethnicity variable is collinear with the human and natural geographic variables, as well as endogenous to poverty.

Notwithstanding the problem endogeneity raises for econometric identification, and hence causal inference, indigenous identity is by far the most highly correlated with poverty of all the variables included in estimation 4. The bivariate correlation of ethnicity to poverty is 0.58. The next closest variable is latitude, which has a 0.5 correlation. The estimation in column 4 includes natural geography, human geography and ethnicity, which together account for two thirds of the variance in poverty profiles in the country.

But is indigenous identity a cause of poverty? This is the central question we turn to in section 4. Before addressing this issue, it is important to know something rather basic: have Indian communities in Mexico always been poor? Are the development patterns we see today simply a reflection of the settlement patterns of non-Indian (Spanish and mestizo) peoples in areas of the country that afforded better economic opportunities? Or did colonialism produce a “reversal of fortune”, in which Indian communities that were rich in the past became poor today. To address this issue the next section uses GIS to reconstruct the geographic profile of wealth and poverty in pre-Hispanic societies.

3. Pre-existing poverty profiles

The historical record is not complete enough in order to know the initial condition of indigenous populations in Mesoamerica before the conquest. Smith (2005) suggests there might have been around 1000 cities in Mesoamerica at the time of contact, but he only can assemble a relatively complete archeological record to account for the size of 9 percent of them. He notes that pre-Hispanic cities were clearly the centers of political power. He also notes that their location was not so much dictated by purely environmental conditions, but rather by the networks of trade, war and human communication. Efforts have been made to account in a comprehensive way for the location of archeological sites and reconstructing through them the spread of human population in specific Mesoamerican regions.⁹ But no systematic data providing a good sense of population density covering the whole of present day Mexico exists.

⁹ In particular, Witschey and Brown (2001 and 2002) have used GIS to locate archeological sites in the Yucatan peninsula in their Electronic Map of Ancient Maya Sites (<http://mayagis.smv.org/>). Their work in progress should eventually provide not only a better understanding of the link between the settlement patterns and the natural environment, the size of those settlements but also of the political organization of the region (inferred from the assignment of formal place names in emblem glyphs found in stelae at the sites). In the valley of Oaxaca Kowalewski (1997) has reconstructed the demographic dynamics since the early settlement of the region. He matches spatially the archeological record and colonial historical sources in order to understand population change as a response to political changes in the prominence of specific urban centers. In

In fact, the dearth of data on the actual population size of the Aztec Empire and the other lordships (señorios) in 1521 is one of the reasons behind the disagreements among historians regarding the extent of the population decline among the native population during the 16th century. Advances in Geographic Information Systems (GIS) open up new avenues to address this issue. As a proxy for the territorial variation in the level of development in pre-conquest times in this section I calculate a geographic distance of each municipality to the 170 archeological sites administered by Mexico's Instituto Nacional de Antropología e Historia (INAH) that can be visited by the public. These pre-Hispanic cities cover but a fraction of the 37,500 registered archeological sites in Mexico.¹⁰ But the advantage of using the most visible sites today is that the priority given to excavate and opening them to the public gives an implicit ranking of their relative importance.

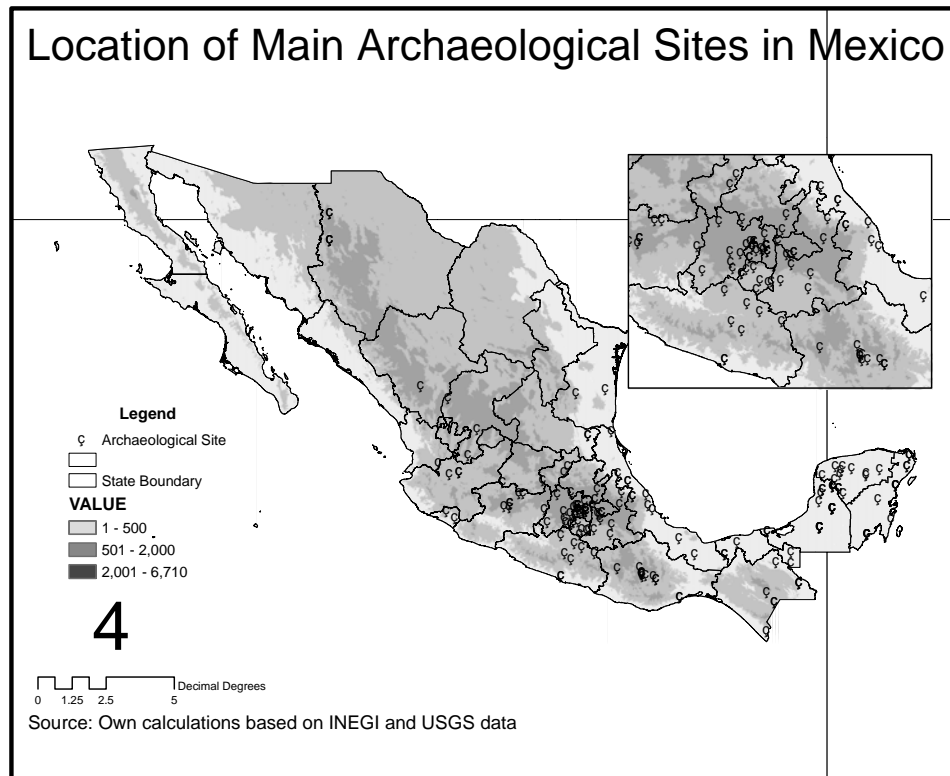
Surely there are major sites waiting to be discovered, and other magnificent sites, particularly in the Maya region, have not been open to the public due to their inaccessibility. But a selection bias arising from undiscovered sites is rather muted by the fact that I use as the proxy for level of development the geographic distance of a municipality to the closest archeological site, rather than whether or not a municipality has a site within it. A major undiscovered site is most likely to be found in the neighborhood of existing ones, so that the problem of "missing sites" is more one of measurement error in the distance metric, rather than selecting out the closeness of a municipality to places that constituted major urban centers in pre-conquest times.

Map 1 shows the location of the 170 archeological sites used in the calculation. It is clear that most of the sites are in the central highlands, but there is also an important area of settlement in the Gulf of Mexico. The map reveals a relatively dense network of Maya Cities, not just in the lowlands of the Yucatan peninsula but into the tropical rainforest of the Peten and Chiapas. Other major archeological sites are dispersed in the Tarascan areas to the West of the country, which were not part of the "core" of the Aztec empire, and are often regarded as part of the Chichimec (i.e. barbarian) frontier. The settlements in the North in fact extend as far as Casas Grandes in the state of Chihuahua. Thus, the image of a nomadic North of hunter-gatherers contrasted with settled agriculture in the South is more nuanced. Most of these archeological sites reach their peak in the so-called classic period before the year 900, to be followed by decline, particularly in the Maya region.

the valley of Toluca, Tomaszewski (2005) combines information from the Mendoza Codex on tributary towns of the Aztec Empire with Geographic Information Systems in order to reconstruct the most likely relationship between urban areas at the time of the conquest.

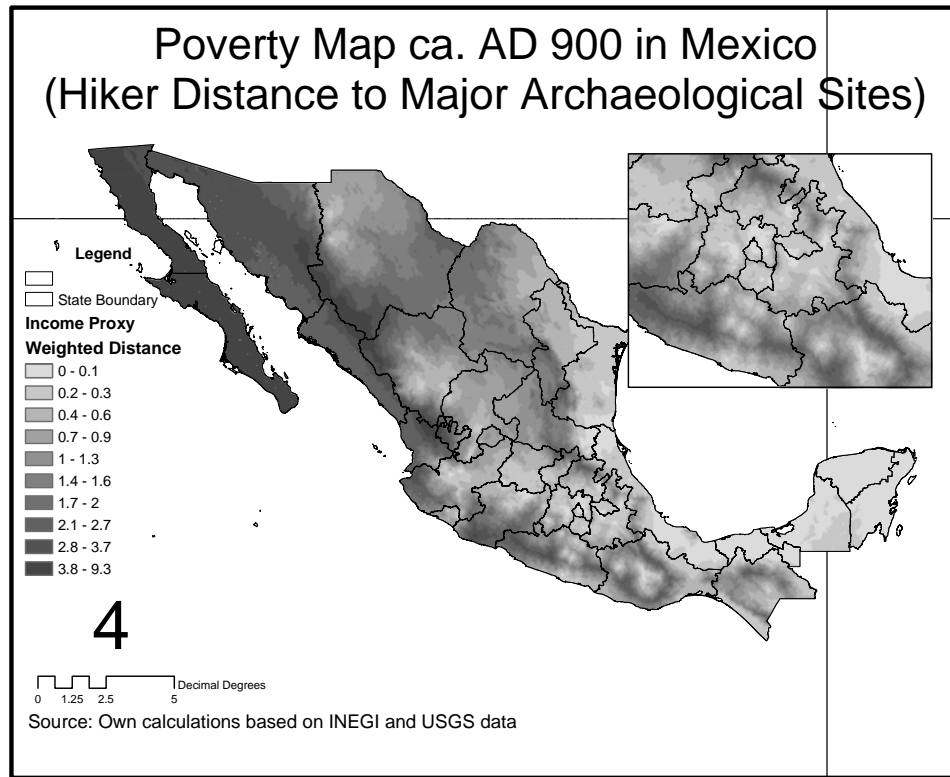
¹⁰ The INAH has a project under way using GIS to map all these sites in the country (<http://www.arqueologia.inah.gob.mx/html/cnar24.html>). The preliminary data shows a very large concentration of sites, as one should expect, in the central highlands of Mesoamerica and the Yucatan peninsula. But there are also many sites registered in the peninsula of Baja California or the fertile coastal plains in the Pacific (what is today Sinaloa). That pattern suggests that the full registry of sites does not rank the relative importance and likely concentration of population in each site.

Map 1



In order to calculate a meaningful geographic distance to these pre-Colonial urban centers, which organized the networks of trade and political power, I use the slope of the terrain as calculated through the ArcGIS cost distance tool. The slope of the terrain provides a “hiker” distance. The altitude raster used is the Digital Elevation Model GTOPO30 from USGS. Distance is not Euclidean (as in the distances to cities, railroads and highways used in the previous section), but modifying surface as a function of the slope of the terrain, measured in degrees. Map 2 displays this hiker distance to the archeological sites. I use this as a proxy for the territorial profile of poverty sometime before the year 900. The darker shaded areas can be thought of as relatively poor regions. While the lighter shaded areas were relatively rich.

Map 2



The 170 archeological sites do not necessarily correspond to the exact places with urban concentration at the moment of the conquest. Nevertheless, the Aztec, Tarascan and Mixtec cultures peaking during the post-classic period contribute to the largest share of the sites included. But the most crucial issue is that trading routes and concentrations of population remained in place even after the decline of the great classic cultures. The validity of the use of this variable as a proxy for the relative spatial development of present day municipalities a thousand years ago depends of establishing that the network of power and trade in Mesoamerica (Blanton et al. 1996) did not shift radically after the classic period. Sanders and Webster (1988) suggest a very large degree of continuity in what they call the urban tradition in Mesoamerica, despite invasions or changes in lineages. If we believe that historically there is a very high correlation between income and urbanization, the hiker distance to major archeological sites should be a relatively reasonable estimation of development in pre-Colonial times.

The map suggests a relatively mixed picture if compared with poverty maps today. Places that are mired in poverty today were sometimes rich in the 16th century; but many of the rich places then remain rich today. The North is clearly richer today than in the pre-Hispanic past. But there was no reversal of fortune in the AJR sense. More likely, there was exploitation by the conquistadores across the board, both in relatively poor and sparsely populated areas as well as in rich densely settled sedentary centers of power in the Aztec empire or the Tarascan, Zapotec or other señorios. As I argue below, the institutions inherited from the colonial past, specifically the *encomienda*, may account for

the patterns of poverty traps today, by creating different conditions for the accumulation of wealth and for taking advantage of the networks of trade and investment created by the colonial settlers. But the *encomiendas* were not only located in the richer core areas of sedentary pre-Hispanic life.

4. Colonial institutions: the *encomienda*

The *encomienda* is often discussed as a labor exploitative arrangement, somewhere between slavery and serfdom. Simpson (1960) defines the *encomienda* as “the delegation of the royal power to collect the tribute from, and to use the personal services of the King’s vassals (xiii). In this classic definition the *encomienda* is both a form of taxation and a mechanism to control labor. However, as the colonial period progressed, a distinction was made between the right to use Indian labor in what came to be known as the *repartimiento*, and the collection of tribute which became the core feature of the *encomienda*. The Franciscan Friar Bartolome de las Casas, in his plea for recognizing the equal rights of Indians, can be credited with providing what is still today the more compelling view of the evils of the institution. He argued that the *encomienda* played a dramatic role in the decimation of the Taino population in the island of Hispaniola.¹¹

Since the early years of the system, an important debate emerged as to whether the *encomienda* was responsible for the demographic catastrophe that had already wiped out the Indians from Cuba and Hispaniola, and was decimating the population of the New Spain. Epidemiological processes were surely most relevant during the pests of 1645 and 1675. Spanish conquerors were accustomed to observing large demographic collapses, but it is clear that by the late 16th century the question of how to enable the Indians to survive had become a major issue. More than 50 years ago, scholars within what is often referred to as the Berkeley school of historical demography (Borah, 1951; Borah and Cook, 1964; Cook and Simpson, 1948; Cook and Borah, 1963) painstakingly collected and analyzed demographic and tribute data from colonial archives, which transformed the way in which scholars understood the impact of the conquest in the New World. Even “low counters” have accepted that the aftermath of the conquest was characterized by an extremely large mortality (Henige, 1998). And this mortality is often linked to the “virgin soil” hypothesis: namely, the notion that original peoples in the Americas did not have the necessary immunity to resist the new diseases brought by the Europeans (Dobyns, 1983; Diamond, 1997; Mann, 2005).

Livi-Bacci (2008) has argued, using plausible demographic models, that devastating epidemics cannot be the full story of what happened with the indigenous peoples after the conquest. Other factors, including shifts in marriage patterns, decreases in fertility rates, as well as little understood limits on potential demographic rebounds in

¹¹ Using modern economic theory Yeager (1995) argues that the developmental effects of the *encomienda* can be understood as consequences of an institution that depleted human capital and restricted labor mobility. Moreover, he argues that the institution did not provide incentives for investment, given that second generation encomenderos could not pass their possessions to their heirs, so *encomienda* holders made every effort to extract as much as possible, as quickly as possible.

the years between epidemics, probably played a rather prominent role in the debacle. Furthermore, tree ring reconstructions of rainfall patterns in North America suggest that climatic conditions differed substantially across regions (Stahle, et al.), making different population groups more or less vulnerable to the epidemics due to their conjunction with droughts. Furthermore, the variance in natural geography surely determined differential demographic evolutions across places. Migration patterns may have also affected the differential rates of demographic decline, given the dislocation of war; the reconstitution and resettlement of surviving populations; and the colonization of the nomadic frontier by specific indigenous groups, most notably the Tlaxcaltecas.

Regardless of the debates concerning the initial level of population, there is no question that the first century of colonial history led to the reduction of the Indian population to probably less than one tenth of its pre-Columbian levels (Cook and Simpson, 1948).¹² The debates concern more the impact of the institutional form as compared to the natural environment and the diseases. The state institutions the Spanish encountered when they arrived to Mexico-Tenochtitlan were highly fragmented, and did not span the whole territory of what later became colonial Mexico. The Aztec Empire did not conquer the predominantly nomadic groups inhabiting the so-called Chichimec frontier in what is now Northern Mexico.¹³ Even within the Empire, power was highly decentralized into the local communities, called *altepetl*. Those political structures were highly hierarchical and political power was based on war and tribute collection (Florescano, 2010).

When the Spanish defeated the Aztecs, they inherited administrative and political structures that allowed them to collect tribute and indirectly rule local communities. They also accommodated the local nobility, particularly many enemies of the Aztec Empire, establishing a Pax Hispaniola that unified a core of the country into a single political unit. The *encomienda* was the crucial political institution through which this was achieved. Soldiers were rewarded for their services with access to slaves in the initial years, and then tribute and Indian services. *Encomiendas* were not held only by conquistadores, but also by the Indian nobility: for example, the daughters of Moctezuma possessed rich *encomiendas* in the Valley of Mexico.

Perhaps the clearest manifestation of the capacity of the government in the new jurisdiction, the Kingdom of New Spain, was the systematic compilation of information,

¹² Mota y Escobar Information from 1602-05 in Visits towns as Bishop of Guadalajara: “Y aunque ahora están todos poblados, tampoco se puede saber le número de vecinos de cada pueblo, lo uno por ser muy común entre ellos el despoblarse e irse de una provincia a otra, o irse a servir a los españoles a las minas, o a las vaquerias, o a las carreterías o a las labranzas; lo otro porque suelen a tiempos venir unas enfermedades que entre ellos son contagiosas de que mueren mucha cantidad, y asi no es cosa fija ni se puede tener por tal, el número que aquí pondremos en los pueblos de indios con lista particular de ellos y de los tributarios que ahora hay segun los libros de tasaciones. P. 34-35.

¹³ Resistance to Aztec rule also prevailed among the Tarasc, Zapotec, Mixtec and Yopitzinc lordships along the Pacific Coast, and in large pockets within the central highlands, including Meztitlan, Tototepec and Tlaxcala (Byam Davies, 1968).

periodically sent to the Crown regarding the characteristics of its subjects.¹⁴ The wealth of censuses and geographic descriptions provide quite precise locations of human settlements, among other things. This allowed Cook and Simpson (1948) to provide rather comprehensive population data and *encomienda* lists for the New Spain during the 16th century. The collection of tribute led to efforts by both *encomenderos* and the Crown to have reliable knowledge of the tax base.

Most of the initial European settlers became *encomenderos*. According to Zavala (1973, p. 229), 577 out of 1385 Spaniards living in the New Spain upon the arrival of Viceroy Antonio de Mendoza in 1535 held private *encomiendas*.¹⁵ By 1550 the *Summa de Visitas* accounts for 910 towns, but it distinguishes two types of *encomiendas*, depending on their holder. This source suggests that the Crown possessed slightly over one third of them (304 towns to the Crown, vs. 537 in private hands). The Crown's cosmographer, Lopez de Velasco [1894] reports more or less that same proportion in 1560.

The Crown held some *Encomiendas* since the very beginning of the conquest, in the Spanish cities, some mining regions, and coastal towns and ports.¹⁶ But the most important *encomendero* was Hernan Cortez, who in 1532 claimed to possess the towns of Coyacan, Tacubaya and Toluca (and their sujetos or dependencies), Cuernavaca, Tezpoztlan, Yautepec, Tepoztlan, Yecapixtla, Cuilapan, Oaxaca (plus twelve dependent towns in the Valley), Etlá, Tlacuilabacoya, Tehuantepec, Jalapa, La Rinconada, Cotaxtla, Tuxtla and Tepeaca (Simpson, 1966; p.165-66). Cortez controlled in his perpetual fiefdom some of the most productive and densely populated areas of the colony: major towns around Mexico City, the whole valleys of Oaxaca and Toluca, the present state of Morelos, the isthmus of Tehuantepec, Southern Chiapas and some of the critical towns lying on the trade routes in Veracruz. These towns accounted for perhaps 7 percent of the

¹⁴ The Crown tried to gather comprehensive information of its possessions, through several surveys called the *Relaciones Geograficas* (Cline, 1964 and 1972), the *Summa de Visitas*, and the *Libro de las Tasaciones*, among other sources detailed in Cook and Simpson (1948) and Cook and Borah (1963).

¹⁵ Himmerich and Valencia (1991) have been able to reconstruct the origins and some of the biographical details of most of them (506).

¹⁶ In particular, in 1532 the First Audiencia instructed that the towns of Texcoco, Zacatula, Guatepeque, Totupeque, Huitzilán; the regions of Soconusco and Tlaxcala (exempt from tribute as a reward for its loyalty during the conquest); Acapulco and Cempoala (for shipbuilding); Tamazula and Cuilapan (and their mines); all the places by the sea, and, in general, all the Spanish cities, were to remain in the Crown (Zavala, 1973:231).

total population at the time;¹⁷ while the towns in the Crown, including Tlaxcala which paid no tribute, probably comprised 13 percent of the population of Central Mexico.¹⁸

According to the New Laws of 1542, following the recommendations of Bartolome de las Casas, *encomiendas* should have passed to the Crown when the original holders passed away (chapter xxx). These provisions were, however, revoked in 1545 upon the complaints and arguments of the conquistadores, who saw their way of life and the stability of the political arrangement of the colonies threatened.¹⁹ Nonetheless, some towns in the possession of colonial administrators and churchmen were affected.²⁰ As years went by the Crown gradually possessed more towns as the heirs of the *encomenderos* died, and their *encomiendas* escheated to the Crown.

I reconstruct the territorial spread of *encomiendas* in the New Spain (i.e. what is today mainly central Mexico) on the basis of the compilation done by Cook and Simpson (1948). For the Yucatan peninsula I use the information provided by Gerhart (1982). In

¹⁷ Sidestepping the lively debates regarding the population figures from this early period, the number is arrived to by calculating 5 inhabitants per each of the 61 thousand tributaries estimated by Simpson (1966) for 1560-70 in these towns, divided by 4.4 million inhabitants in Central Mexico, from Cook and Simpson (1948).

¹⁸ Using data from Cook and Simpson (1948) by 1565 there were probably 75 thousand survivors in Tenochtitlan-Tlaltelolco; 84 thousand in Texcoco; 400 thousand in Tlaxcala, and perhaps some additional 20 thousand in the rest of the Crown possessions of 1532.

¹⁹ In an undated document (issued after the new laws and before their suspension, provided by Hackett, 1926), the *procuradores* (attorneys) of New Spain gave 25 reasons for why they should be granted perpetual *encomienda*, rather than the rights to use Indians in *repartimientos*. It is worth to quote them at some length: "Rather it has been learned by experience that in many towns that were under *encomiendas*, when the Spaniards died and the towns were placed under your Majesty, vines and fruit trees and orchards and mulberries and other crops and cattle that were left there were torn out and cut away by the Indians themselves, so that no vestige or sign remained" p. 137...."for the *corregidor*, being a hireling, has no care for anything but his salary and that he be paid on time, nor does it trouble him whether there is loss or gain, for the next year he will be given another *corregimiento*" p. 135... "the Spaniards, seeing that they and their children are to live there and their posterity is to be perpetuated, that they shall treat the Indians with kindness and love and show them every charity, for the benefits that they are to receive from them, and because without them they cannot support themselves." p. 133. The document argues that in *encomiendas* Indians received better treatment because there was only one master, while in crown towns the *alguaciles*, *corregidores* and other all try to be masters. P.139; and that if more wealth was generated, Indians will also have salaries, and the Crown's fifth will be larger. P.141. The remarkable thing of this document is how closely it resembles the logic of many arguments made in neoclassical economic theories of property rights.

²⁰ Zavala (1966: p. 232-33) reports that although 42 towns were to be affected, only the following 13 towns were actually transferred to the Crown: Tepeaca, Xacona, Tula, Totolapa, Tabalilpa, Tenayuca, Coatepeque, Tonala, Ocuytucu, Guaniqueo, Talistaca, Ixtlabaca, Tlatlauca and Suchiaca. These towns accounted perhaps for around 150 thousand inhabitants (27.4 thousand pesos in tribute, plus in kind).

each case the process involved identifying encomiendas from the available lists, finding their present day location, either on the basis of maps provided by those authors or looking up the place names and orthographic variations in the Archivo Historico de Localidades, a historical gazetteer of Mexican place names produced by the national statistics office, INEGI. When maps were available they were scanned, projected and geocoded with ArcGIS.

For the North and West of the country I went through a somewhat different process. The Kingdom of Nueva Galicia to the West was poorly governed. Under the guise of fighting hostile Indians, Nuño de Guzman and his henchmen ravaged the territory with slaving expeditions. This reduced the population density dramatically in some areas, particularly the Huasteca region. By the 1590s the wealth of the newly found mining sites was developed in an accelerated and haphazard manner, creating floating populations that were not so easily counted, let alone exploited for labor or taxed for tribute. Slaves, both native and imported from Africa and the Caribbean, were used in the mines; although wage employment soon became the main form of labor relations in the Reales de Minas. Indians, impoverished Spaniards, and mestizos migrated to the mining areas (Pachuca and Taxco in the South; Zacatecas, Chihuahua and Guanajuato in the North), attracted by the rush of opportunities. I used several historical sources to establish the location of encomiendas in Nueva Galicia, which were cross-referenced when possible with data in Simpson (1966), Cook and Simpson (1948), Cook and Borah (1963) and Lopez de Velazco (1894).

The territories beyond Nueva Galicia (New Santander, New Leon, New Vizcaya, Coahuila, Sinaloa, Sonora, Alta and Baja California, Texas and New Mexico) remained a weakly administered frontier. A common misconception is to think that because of the limits in the reach of the Aztec expansion, and the delay in control of those lands by the Crown, there was no *encomienda* institution in the North. Nothing could be further from the truth (Cuello, 1988).²¹ The *encomienda* was used among the New Mexico Pueblo communities with similar characteristics to those found in central Mexico; and elsewhere in the North it acquired a diffuse configuration, often exploiting labor in a seasonal manner, according to nomadic migration routes. The Northern *encomienda* persisted in many places until the 18th century (as in the Yucatan peninsula), far beyond the formal abolition decreed by the Nuevas Leyes de Indias (1660).

The lack of state penetration through the administrative apparatus of the Crown in the North often meant that the line between *encomienda* and slavery was often blurred. Conquistadores and their descendants claimed the right to use labor from various native groups, often using the excuse of their hostility to enslave them. The governors of the Northern territories granted hundreds of *encomiendas*, especially in Nuevo Leon, Saltillo, Panuco and Culiacan. Cuello (1988) notes that the *encomiendas* of Nuevo Leon operated in an environment of almost pure lawlessness (p.691). The indictment of harshness of *encomiendas* in the North is well summarized by Gerhart (1982):

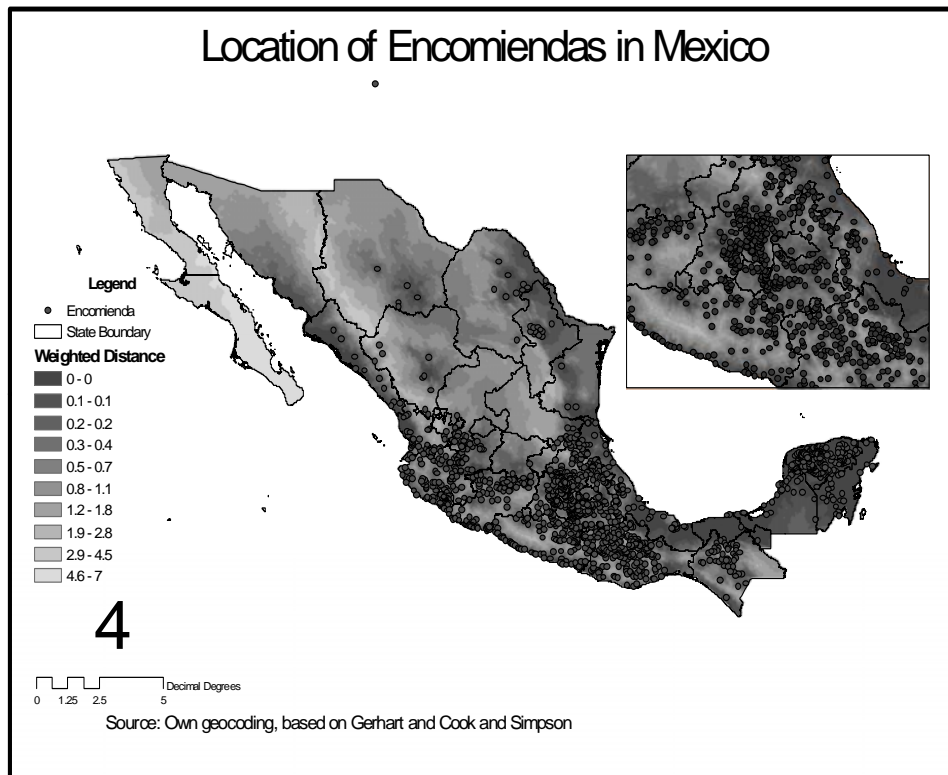
Surely in no part of Spanish America was there greater abuse of the [encomienda] institution than here [Nuevo Leon]. Carvajal [the first governor granting encomiendas, who arrived in 1581] arrived with considerable experience as a

²¹ I thank Andres Resendez for pointing me in the right direction on this issue.

slave hunter in the Huasteca, and the pattern he imposed varied little under his successors. The Indians were hunted like animals and chained together until they could be sold or put to work by their encomendero. Every law concerning humane treatment of natives was disobeyed, nor was there any effort usually made to Christianize them. (p.345).

The Franciscan and Jesuit missions opposed *encomiendas*, succeeding in preventing them from emerging in some areas, such as Sonora, the Californias and Maipimi. Other areas were spared the *encomienda* when native or settler Indians became the armed defenders of the frontier. But by and large, the *encomienda* in the North had a disproportionate geographic effect beyond the specific areas where it functioned.²²

Map 3



In order to trace the *encomiendas* in the North, I rely primarily on Gerhardt (1982), whose detailed maps allowed me to locate *encomiendas* that were not identified in other sources. I have approximate geographic locations for some *encomiendas* that are reported along specific rivers, and for some other areas I rely on reports that indicate they

²² For example, while one may locate *encomiendas* in the San Buenaventura valley, this was primarily a recruitment center, where natives were captured coming from the vast territory of Coahuila to the North.

were close to some specific town. However, the mapping is by far less reliable than the one for New Spain.²³

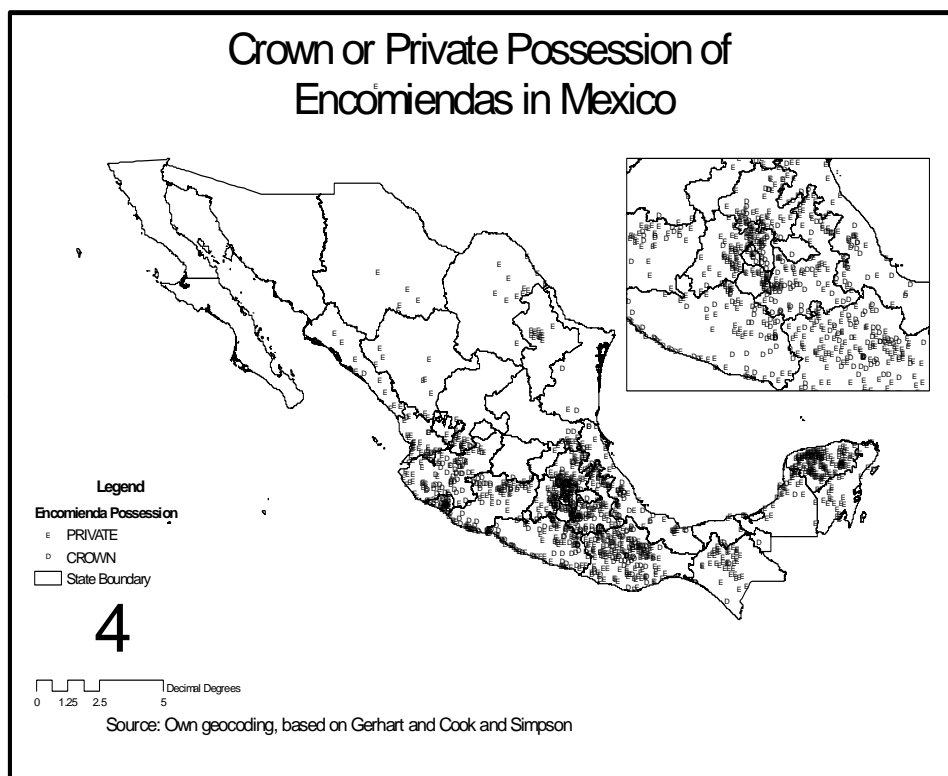
Map 3 shows the location of the *encomiendas* I could reconstruct from the various sources at around 1560, shading the areas according to the hiker distance. The lighter shaded areas had little *encomienda* activity, while the darker areas are those where *encomiendas* were found either in the specific location or in close vicinity. Most of these settlements were granted in *encomienda* to private conquistadores (around 700 that can be geographically located). The *encomenderos* possessed short time horizons, as the literature and the debates since Bartolome de las Casas have clearly expressed. But they often also became partners of the native nobility for the exploitation of Indian labor. The *encomendero* was interested in extracting as much tribute as possible, even inflating the census records in order to justify larger exactions, in little time. He was not concerned about creating a governance structure that would substitute the institutions of the local political unit, the *altepetl* (cah in the Maya or *ñuu* in the Mixtec regions) dominated by the local nobility. The local nobility, in turn, partnered with the *encomenderos* sharing in the spoils, while retaining the traditional structures of authority.²⁴

In 300 or so settlements held by the Crown the institutional structure in place was far less exploitative. The Crown possessed a longer time horizon, and contracted an administrator (the *corregidor*) who would obtain a salary, plus additional benefits he could exact. As the mining and cattle raising areas developed, the Crown was motivated to allow for labor mobility. The Crown repeatedly moderated the tribute expected from its possessions as petitions were filed (the *Libro de las Tasaciones* includes hundreds of examples), while the subjects of private *encomiendas* only would file suits and petitions in the most extreme cases of abuse. The church also benefited from moderation in the extraction of resources by the Crown, since then it was more feasible to obtain *repartimientos* (i.e. labor assigned to them) and village contributions to build their monasteries and churches.

Map 4

²³ For example, while I know that hundreds of *encomiendas* were granted in Nuevo Leon and Saltillo, I am only able to indicate a handful.

²⁴ The traces of those institutional of indirect rule under the private *encomenderos* may still be observed in the power of *caciques* during the long era of PRI hegemony; although this is just a hypothesis that should be tested empirically.



Simpson (1966) notes a key distinction in the demographic fate of *encomiendas* depending on whether they were given to private parties or the Crown. He provides evidence that within some regions (the provinces of Avalos and Tlaxcala) the demographic collapse was muted in Crown possessions. He suggests that crown settlements were exploited less intensely, and had a greater chance for their population to survive the epidemics of the century. Map 4 shows the location of the encomiendas at around 1560 according to whether held in private hands or by the Crown.

The initial demographic collapse was followed, according to Kubler (1948) by a rapid population recovery. But by the time of a new epidemic of *cocolitzli* (most likely bubonic plague, which was not brought by the Spaniards) in 1574, the exploitative institutions in private *encomiendas* had been in place for several decades. Little provision of public goods was made in those highly exploited places to attenuate the combined devastating effects the epidemic and drought. In the settlements controlled by the Crown, in contrast, there was a greater possibility of survival, to some extent because the towns had become more integrated into the networks of the Spanish towns, and also because the population in those towns was probably healthier and better fed.

Hispanization proceeded in subsequent decades in a differential manner, depending on the nature of the inherited colonial institutions. In the places of private *encomiendas*, remaining Indian, even after the abolition of the *encomienda*, became a strategy to prevent future abuse. The harsh experience of the first decades of colonization marked these towns as places that would have little interaction with the outside world, in rugged mountains and deep valleys, that would eventually be bypassed by the

establishment of mule roads, railroads in the 19th century, or highways in the 20th. In the *encomiendas* held by the Crown, instead, the prior experience was less traumatic, and the interaction with the Spanish world more productive. Labor eventually became employed in cattle ranches and haciendas, and towns gradually lost their Indian character. Spanish vecinos settled in those towns in some small number, but the self identification of mestizos and even Indians as Spanish became possible, given the incentives of the interactions with the overall colonial economic system.

The expansion of mining centers and cattle raising in the North added another layer on this social dynamic. The mines demanded labor, which initially was rounded up through the enslavement of nomadic groups. *Encomiendas* in the North became purely private affairs, far more exploitative than those in the Center of the country, leading to the same outcome so feared by Bartolome de las Casas from the experience in Hispaniola and Cuba: the native population was for the most part wiped out, which made the North a land of new Hispanized Indian and mestizo settlers coming from the Central areas of the country, as well as Spaniards.²⁵ Hence, the difference between Crown and private *encomiendas* provides a plausible mechanism that accounts for the preservation of identities, and the connection between Indian ethnicity and poverty. However, a more systematic test of the argument is needed, which is provided in the next section.

5. Estimating effects of identity on poverty

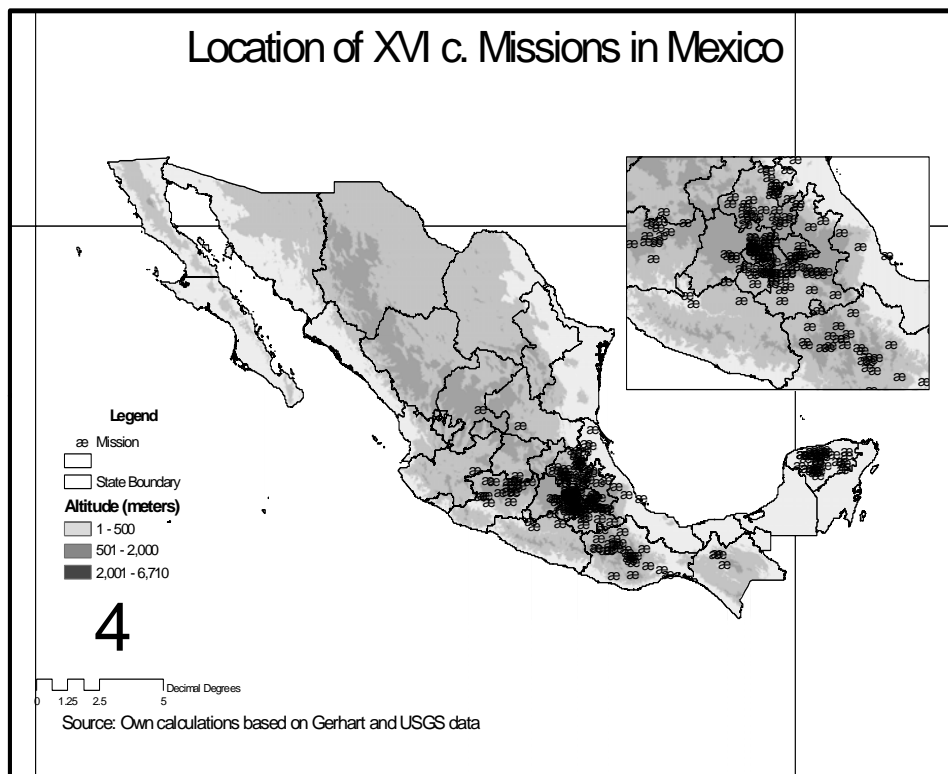
In order to identify econometrically the relationship between Indian ethnicity and development, I use an instrumental variables approach. Given that Indian identity is probably endogenous to poverty, I use variation in encomienda holding as an instrument that predicts ethnicity today. The previous section discussed data on the variation and geographic spread of the earliest colonial political institution, namely the system of tribute payment (and sometimes force labor) known as the *encomienda*. Since its inception the institution was attacked by the missionaries, most famously by Fray Cristobal de las Casas, for its inhuman treatment of Indians. As previously discussed, the Crown attempted to abolish the *encomiendas* in 1542 but failed to do so. It eventually succeeded in eliminating most of them by 1602 (although many *encomiendas* survived in Northern Mexico and the Yucatan peninsula).

I take advantage of the institutional variation that generated two types of *encomiendas*: those entrusted to *Conquistadores* and their next descendent; and those administered by the Crown. *Encomiendas* were supposed to revert to the Crown upon the death of a Conquistador if he had no heir, or after “two lives”, that is, when the son or daughter of the Conquistador died. By the 1550s around one third of the *encomiendas* had passed to the control of the Crown. If the death of *encomenderos* can be taken to be a random variable, this variation can be used as an instrument for the persistence of Indian identities today. As it turns out, geographic patterns of *encomienda* holding are good predictors of ethnicity today even though they are uncorrelated with the geography of poverty.

²⁵ This was in sharp contrast to Peru *encomenderos* (Lockhart and Schwartz, 1984 p.95) where the mit'a and the mines happened to coincide with the original settlements.

A second instrument I use for identification is an estimation of the distribution and concentration of indigenous populations across the territory of the New Spain in the first decades of the conquest. I calculate hiker path distances to the main centers of evangelization. Three religious orders (Franciscan, Dominican and Augustine) competed during the first few decades of the colonial period to convert Indian populations to Christianity. The centers of this conversion activity were networks of Convents that were established primarily in heavily populated areas (Kubler, 1948). The places with the largest concentration of Indian populations were those closest to the convents. Map 5 displays the location of those convents. Most convents are located in the Central highlands. There are virtually no convents in the Pacific Coast, while there is a dense network of convents in what is today a relatively unpopulated area in the Huasteca (Northwest close to the Gulf of Mexico). There are no missions indicated in the North, because I have only included the earliest convents, and not the expansion of Franciscan convents towards California and New Mexico or the estates established by the Jesuits in the 17th century. The estimated hiker distance is a strong predictor of ethnicity today, but uncorrelated to the territorial spread of poverty.

Map 5



The dependent variable in the estimations is *Paliha* (*Pobreza alimentaria por habitante*), the spread of poverty measured as a headcount index of the share of

municipal population that does not have enough income to cover a minimal caloric intake. This variable was calculated by CONEVAL using census information and income distribution surveys, and is estimated for the year 2002. The following specification is estimated, followed by the addition of some controls discussed below:

$$\text{Paliha}_{2000} = \beta_0 + \beta_1 \text{Palihalag} + \beta_2 \text{Indg90} + \beta_3 \text{Hikerarq}_{900} + \beta_4 \text{Riversdum} + \beta_5 \text{Coastline} + \beta_6 \text{AltitudSD} + \beta_7 \text{Altitudmed} + \beta_8 \text{Latitude} + \text{CONTROLS}$$

Instrumented variable: Indg90

Instruments: Privatedum, Crowndum, Hikerconv

The independent variables are measured as follows:

Indg90 measures the percentage of indigenous people in each municipality according to whether they spoke an indigenous language in the 1990 population census. This includes both monolingual and bilingual speakers. This is the variable that is instrumented in the estimation.

Palihalag is a spatial lag of extreme poverty, as measured by CONEVAL, in neighboring municipalities. This is calculated using GeoDA with a matrix that includes up to two contiguous units (i.e. the neighboring municipalities and the neighbors of those municipalities).

Hikerarq is a measure of urbanization in the prehispanic period, as a proxy of the territorial spread of income in the initial period before the conquest. It measures the hiker distance to the 170 main archeological sites administered by the Instituto Nacional de Antropología e Historia (INAH) that can be visited in Mexico (excluding two sites of prehistoric cave paintings). It is calculated with ArcGIS as the municipal average of an index taking the slope of the terrain measured in degrees as a linear function that modifies the Euclidean distance between any point and the closest archeological site measured in kilometers.

Riversdum is a dummy variable indicating whether a major river runs through the municipality. The major rivers included are based on ESRI's shapefile of Mexico data.

Coastline is a dummy variable indicating whether a municipality is located next to the coast. This is calculated on the basis of ESRI's Mexico shapefile.

Altitudsd is the standard deviation of altitude, measured in meters. Altitudes were calculated on the basis of a raster file from the USGS at 30 arc seconds.

Altitudmed is the median altitude in each municipality, measured in meters. This also comes from USGS.

Lat is latitude measured in degrees, using the centroid of each municipality.

The instruments are:

Hikerconv is the mean hiker distance of each municipality to the closest Augustine, Dominican or Franciscan convent established during the first century of colonization. It is calculated in a similar way to *Hikerarq*

Privatedum is a dummy variable regarding whether within the borders of the modern municipality a private encomienda was granted.

Crowndum is a dummy variable regarding whether within the borders of the modern municipality an encomienda was in the hands of the Crown. It is possible for both private and Crown encomiendas to coexist in the same municipality.

The first column in Table 2 shows an OLS estimation of the determinants of the territorial spread of poverty according to this specification. The estimation suggests that poverty is more prevalent in the South of the country (one degree lower latitude increases poverty rates by around 4 percentage points), in places at relatively low altitudes, with rough terrains. The municipalities in the coastline and with rivers seem to be relatively more developed. The control for preexisting poverty suggests a positive relationship, in that places that were relatively far from urban areas in the pre-Hispanic period are also poor today. The size of the estimated coefficient is, however, very small, suggesting a very weak effect. The endogenous variable of indigenous identity suggests a strong relationship between Indian identity and poverty: for every 10 percent more Indian language speakers, 3.4 percent more households are predicted to fall into extreme poverty. But this coefficient is problematic in terms of providing a relatively sound inference.

Table 2

	OLS	First Stage	IV Natural Geography	IV Human Geography	IV State Fixed Effects
indg90	0.342*** 25.5		0.259** 2.15	0.431*** 3.97	0.404* 1.89
palihalag	0.0149*** 3.8	0.00915 1.53	0.0156*** 3.82	0.0140*** 3.5	0.00152 0.39
hikerarq	0.0753*** 11.6	0.116*** 7.64	0.0825*** 6.74	0.0267** 2.55	0.0443* 1.81
riversdum	-0.0459*** -4.06	-0.139*** -8.15	-0.0575*** -2.83	-0.0509*** -2.61	-0.0143 -0.69
coastline	-0.128*** -6.89	-0.249*** -8.79	-0.149*** -4.15	-0.115*** -3.44	-0.0801* -1.92
altitudsd	0.000232*** 6.92	0.0000918* 1.76	0.000239*** 6.76	0.000217*** 6.11	0.000198*** 2.76
altitudmed	-0.0000161*** -2.91	-0.000102*** -12.4	-0.0000246* -1.83	0.00000104 0.089	0.0000215 1.52
lat	-0.0374*** -25.1	-0.0323*** -13.8	-0.0402*** -9.14	-0.0269*** -7.51	-0.0270*** -3.38
privatedum		0.0719*** 4.92			
crowndum		-0.0369* -1.84			
hikerconv		-0.0281** -2.23			
hikercity				0.0263*** 4.79	0.0341*** 4.37
diskmrail				0.00127*** 6.48	0.00139*** 5.4
Constant	1.141*** 34.4	0.954*** 19.1	1.225*** 9.74	0.877*** 8.5	0.813*** 8.78
Observations	2386 0.55	2387 0.22	2386 0.54	2386 0.56	2386 0.63

The second and third columns then show the instrumental variable estimation of the effects of ethnicity. Column 2 reports the first stage of the estimation while column 3 shows the An overidentification test regressing the independent variables on the residuals of the first stage equation suggest that the instruments are valid. Moreover, the instruments offer quite a bit of leverage in the estimation of the share of indigenous population today. Figure 2 simulates the effect of the coefficient of the private and crown encomiendas on the share of indigenous peoples. The lines represent the 95% confidence interval of the estimated shares. The figure also simulates the effect of having no encomienda, which is the baseline category. Although the error bands are large, a private encomienda increases the share of indigenous population as compared to one controlled by the Crown.

Figure 2

Institutional Variation and Indian Identity

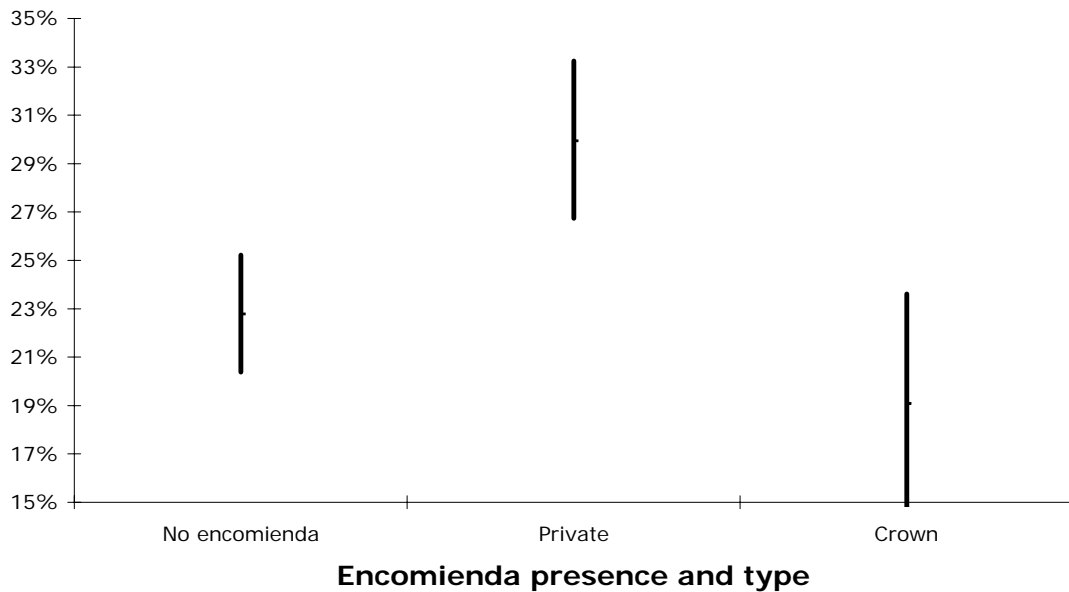
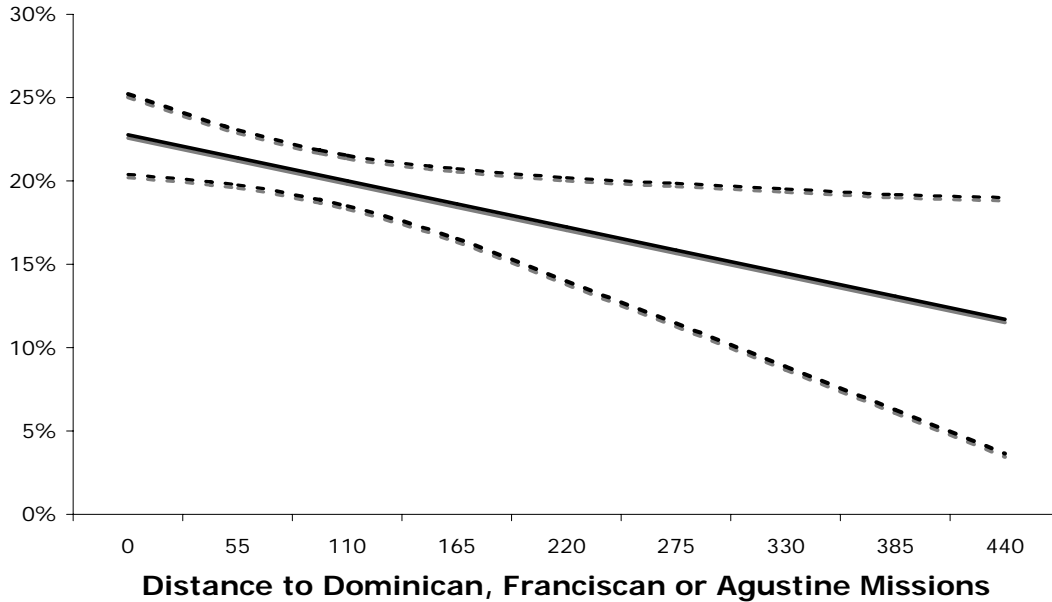


Figure 3 shows the simulation of the hiker distance to convents that enables the identification of indigenous identity. The horizontal axis shows the distance measured in kilometers, while the vertical axis is the share of population that is Indian according to the linguistic criterion. The highest percentage of around 25 percent is found in places where convents are located (0 distance). As the convents are farther away this share declines to a range in the teens.

Figure 3

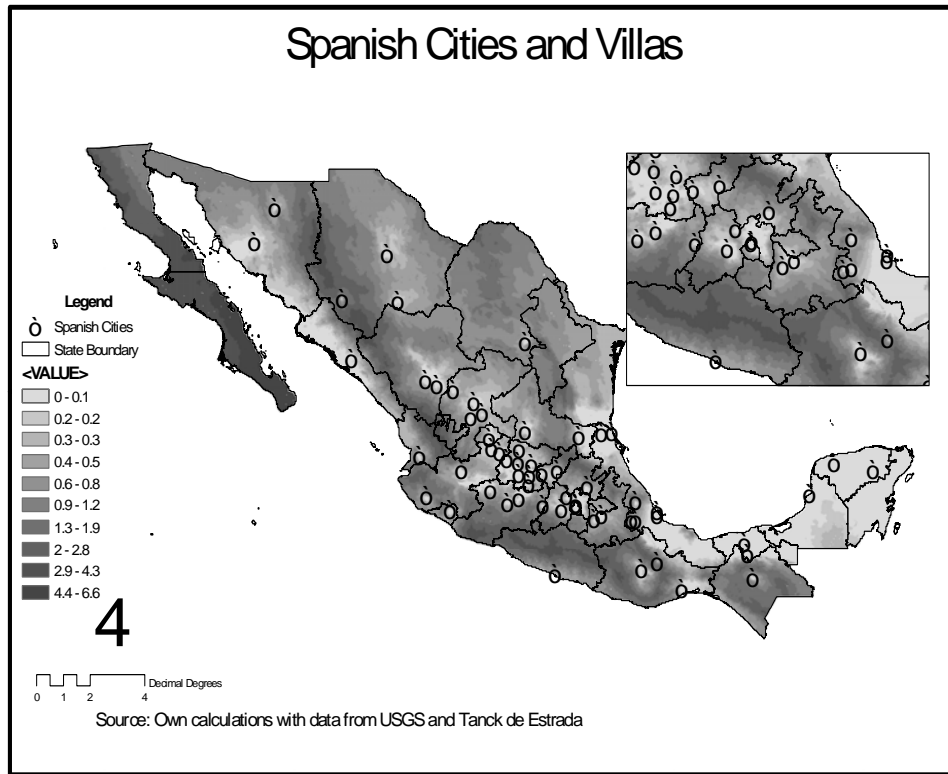
Indigenous Identity Predicted by 16th c. Conversion



Although I have established thus far that the variation in *encomienda* institutions left its trace in the formation of ethnicity, a major concern in this long duree econometric work is the possibility of omitted variable bias. The analysis must include variables that measure initial conditions. In particular, it is important to control for the pre-existing patterns of poverty before the Conquest. But there are also factors that may have affected the territorial patterns of development in the intervening years. In particular, the impact of the colonial mining economy, and the process of modernization in the 19th century may be important forces that have determined the territorial spread of poverty, beyond the initial impacts of the colonial order. In order to control for such factors I estimate hiker distances of each municipality to the 60 autonomous Spanish cities which structured mining activity and ports; and the distance to the railroads built in the late 19th century.

To get an idea of how mining transformed colonization of the North in particular, map 6 shows the pattern of cities that the Spanish founded throughout what is today Mexico. Those cities were different from Indian towns because their charters made them have an equal standing to any city in Spain. They were the places where Spaniards should settle, and although they also contained Indian and increasingly mestizo populations, they were the centers of the Spanish economy organized around mining and livestock activities.

Map 6



The estimations that include both the hiker distance to the Spanish cities and the distance to the railroad lines developed in the 19th century are included in the fourth column of table 2. They both are statistically significant, suggesting that poverty profiles today depend on how far a municipality is from the infrastructure facilities and the network of urban centers. The inclusion of these variables does not weaken the effect of ethnicity (instrumented), but in fact makes its magnitude even larger. The size of the coefficient suggests that for each 10 percent more indigenous population poverty rates are 4.3 percentage points higher. The final estimation includes both the hiker distance to cities and railroads and dummies for state fixed effects, in order to see whether the coefficient estimated for Indian identity holds within each state. The inclusion of these fixed effects weakens some of the geographic variables because the variation in features such as the spatial lag, rivers or coastline is well accounted for by the peculiarities of each state. But the most remarkable aspect of this last estimation is that the size of the coefficient for ethnic identity remains relatively the same as without state fixed effects.

7. Conclusions

Contrary to a common perception that portrays Mexico as a tropical country, most of the Indian and Spanish populations were concentrated, ever since pre-Colombian times, in the temperate highlands, where the disease environment was less severe than in the coastline. The conquest meant that the native population faced new diseases brought

by the colonists. The Indian population was decimated, and recurrent epidemics, droughts and famines occurred throughout the colonial period. But much of the demographic decline was man-made, as famously argued by Bartolome de las Casas. Indian slavery, *encomienda* and *repartimiento* allowed the conquistadores to exploit and control scarce labor in their possessions. Sometimes the Crown and the friars protected the surviving population. And the Spanish colonists adapted the pre-existing Mesoamerican structures of authority for their own. But the Crown also brought new institutions for local government (the municipality and cabildos, and the principle of self ruled Spanish cities). The tax structure was initially based on the Indian tribute (Cortez took over the tribute rolls which survive to this day as the *Matricula de Tributos*), but it gradually shifted in favor of taxes on trade (the *alcabala*, which mostly taxed the Spanish and mestizo population, since it was in the Spanish cities where most trade in goods was taking place) and, of course the taxing of silver production.

In spite of the demographic catastrophe, colonial society was not trapped in a Malthusian trap. Land became an abundant factor of production, new technologies for farming and mining were introduced, the colonial period saw the introduction of European crops and livestock, and the surviving Indian population witnessed an improvement in diet intake. They consumed far more protein than their Mesoamerican ancestors. Hence, population increased in the colonial period, as observed by Alexander von Humboldt in 1811.

In general, the coasts and plains of equatorial America should be looked upon as healthy, notwithstanding the excessive heat of the sun. Individuals come to maturity, particularly those who approach to old age, have little to fear from these regions, of which the unhealthiness has been unjustifiably exaggerated. The chief mortality is among the children and young people, particularly where the climate is at once very warm and very humid. Tertian fevers are the scourge of these countries, adorned by nature with the most vigorous vegetation and rich in every useful production. This scourge is so much the more cruel, as the natives abandon in the most shocking manner all those who are affected. The children especially fall victims to this neglect. In these hot and humid regions the mortality is so great that the population makes no sensible progress, while in the cold regions of New Spain (and these regions compose the greatest part of the kingdom) the proportion of the births to the deaths is as 190 to 100 or even 200 to 100.

But the fruits of development were unevenly distributed. The human settlement patterns of today were primarily created in the second half of the colonial period through well-ordered cities and towns planned according to a utopian vision of urbanism. As mining developed, new Spanish cities were founded in what had previously been the nomadic fringe of the Aztec empire, shifting the sources of wealth and revenue extraction from indigenous labor to silver extraction and the economic activities of the haciendas surrounding the mines. In the meantime, indigenous towns retained a certain degree of autonomy and self-rule, but became geographically isolated, and hence excluded from the flows of technology and trade.

7. References (very incomplete!)

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