Does It Matter Where You Came From? Ancestry Composition and Economic Performance of U.S. Counties, 1850 - 2010

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March 2015
Preliminary. Please do not quote without authors' permission.

Abstract

The United States provides a unique laboratory for understanding how the cultural, institutional and human capital endowments of groups interact and shape economic outcomes. In this paper, we use census micro-sample information to reconstruct the country-of-ancestry distribution for US counties from 1850 to 2010. We also develop a county-level measure of GDP per capita over the same period. Using this novel panel data set, we investigate whether changes in the ancestry composition of a county matter for local economic development and the channels through which the cultural, institutional, and educational legacy of the country of origin affects economic outcomes in the US. Our results show that the evolution of the country-of-origin composition of a county matters. Moreover, the culture, institutions, and human capital that the immigrant groups brought with them and pass on to their children are positively associated with local development in the US. Among these factors, measures of culture play the most important role. Finally, our results suggest that while fractionalization of ancestry groups is positively related with county GDP, fractionalization in attributes such as trust, is negatively related to local economic performance.

JEL classification: J15, N31, N32, O10, Z10
Keywords: Immigration, Ethnicity, Ancestry, Economic Development, Culture, Institutions

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1 Introduction

Over its history the United States of America has absorbed more immigrants than all other nations combined (Barde and Sutch, 2006a). Unlike most countries composed largely of the descendants of immigrants, such as Australia or Argentina, the United States absorbed immigrants in significant numbers from a wide variety of countries (Daniels, 2002, pp. 24-25). These immigrants came to the United States from different parts of the world with diverse histories and cultures. Some were brought against their will as slaves; others decided to come for economic reasons, or seeking religious or political freedom. Once here, the immigrants and their descendents had to negotiate economic, cultural, and institutional relationships with other groups who were there before them or settled after them.

The United States thus provides a unique laboratory for understanding how cultural, institutional, and human capital endowments brought by immigrants from their country of origin and passed on to their offspring shape economic outcomes. To understand the importance and role of different groups, we build two unique new data sources. First, we create the geographical country-of-ancestry distribution for the United States from 1850 to 2010. Using micro samples from the census and building iteratively from previous censuses, we construct the fraction of every county's population that is descended from ancestors who migrated from a particular country or region.[1] Crucially, we produce a stock measure of ancestry, not of the stock of recent migrants, and so can consider the lasting legacy of immigrant groups and their descendents beyond the first generation. Our measure is highly correlated with ethnic mappings based on questions from recent censuses, but unlike such subjective questions, our mapping goes back in time and does not change based on the prevailing cultural attitudes towards ethnicity.

Second, we construct a measure of county-level GDP per person that is consistently measured over the entire period and includes services. While manufacturing and agricultural output have

[1] Since after 1940 the data are reported only for groups of counties, we aggregate the data somewhat to maintain consistency over the entire time period and use such groups as the unit of analysis. We continue to use "county" for short. There are 1154 such county groups as opposed to 3143 counties. Our county groupings approximately correspond to 1980 Public Use Micro Samples Areas (PUMAs), as defined by the census. See the data section and the data appendix for details.

been available at the county level, such measures miss the large and growing service sector, and so undervalue urban areas and miss the important and changing role played by the transportation, distribution, and financial sectors.

Using this novel county-level panel data set, we investigate whether changes in the composition of ancestral origin matter for local economic development and the channels through which the history of the country of origin affects current outcomes in US counties. Our results show that the evolution of the country-of-origin composition of a county matters, even after controlling for unobservable time-invariant county-level effects, state-period effects, county specific trends, population density, and county education. Moreover, the importance of ancestry goes beyond race.

What is it about ancestry that matters? We begin by showing that the estimated effects of individual ancestries are highly correlated with summary measures of economic development of the country of ancestry, both today and in the past. Whatever qualities make some countries more productive are correlated with the impact the descendants of people from those countries have in the US. Since immigrants necessarily leave the geography of their home country behind, these qualities might include their culture, their institutional experience, or the human capital they brought with them and pass on to their children. The individual ancestry effects are positively correlated with measures of culture such as trust in others and thrift, and negatively with the importance given to obedience in children, as measured in recent surveys. They are possivitely correlated as well with measures of state centralization in 1500 (Putterman and Weil, 2010), although we find little evidence that political participation at the time of migration has an impact. The ancestry effects are also positively associated with the human capital immigrants brought with them.

These general conclusions hold also in more parsimonious representations of the relationship between ancestry and local economic development. For each of the variables capturing the endowment immigrants brought with them, we construct a weighted average value for each county using the faction of people from each country of ancestry as weights. We then include these variables as the main explanatory variables for local GDP per capita. While the human capital of immigrants, and measures of origin institutions positively predict county GDP, our results suggest that

measures of cultural attitudes play the dominant role in explaining local development.[2]

Our results show that when the share of people from high income or more trusting countries increases, county GDP per capita increases as well. Yet we also show that since 1850 people from high income countries on average live in poorer counties. This relationship is largely explained by the early settlement patterns of the English, who even today are disproportionately in rural areas in the South, and illustrates how important the panel nature of our data is for understanding the effects of ancestry.

The groups that immigrants and their descendents encounter matter as well. We find that fractionalization, a measure of the diversity of ancestries, is positively associated with local development, whereas cultural fractionalization is negatively associated with it. Increases in the diversity of origin are good for growth as long as the overall cultural attitudes are similar.

Our results provide novel evidence on the fundamental and recurring question of whether the US acts as a "melting pot," quickly absorbing new immigrant groups or whether immigrant groups maintain distinct—and economically important—identities.[3] The significance of our measure of ancestry in explaining local economic development provides further evidence against the pure assimilationist view and in favor of approaches that emphasize the persistence of cultural, social, or human capital traits across generations. If immigrants were quickly integrated and homogenized into the community, then it would be very difficult to make sense of the importance of the ancestry make-up of a county, especially with regard to the groups that arrived long ago.

Our work is closely related to the growing literature on the importance of history for contemporary economic development, as well as studies on migration and its consequences. Recent work has emphasized the importance of institutions and culture in shaping economic outcomes over the

[2]For GDP and and human capital, for which we have more precise historical data, we are careful to associate to each group of immigrants the historical characteristics of the country of origin at the time of emigration. Moreover, in some specifications we allow for the importance of the ancestral characteristics to decay over time to reflect the changes that occurs during the process of social and economic integration in the US.

[3]Following the seminal contribution by Glazer and Moynihan (1963), many authors have argued that the view of the immigration experience as a process of quick assimilation into the US society is inadequate. For a review of the theoretical contributions see Bisin and Verdier (2010). For recent empirical evidence on the persistence of cultural traits beyond the first generation see Borjas (1992), Antecol (2000), Giuliano (2007), Fernández (2007), Fogli and Fernández (2009), and Giavazzi, Petkov, and Schiantarelli (2014).

long run.[4] There are serious challenges in identifying the causal effects of culture or institutions on economic outcomes since they are likely to be co-determined. The patterns of migration may depend upon local characteristics and shocks. In turn, the resulting ancestry composition of each county can affect local economic development. The availability of panel data is a distinguishing feature of our work since it allows us to better distinguish the characteristics of a place from the attributes of the people who live there and so to examine how changes in ancestry are related to economic development. With a panel, for instance, we can allow for unobserved county effects and period-state effects, and so we can control for the time-invariant characteristics of each county, as well as for the formal institutions at the state and federal level, and their time-varying nature. Moreover, we can estimate models with a richer dynamic structure, which may help in addressing the possible correlation between shocks to local development and contemporaneous ancestry composition.

Our paper is also related to the rich literature on the effect of migration on economic outcomes in the US, as well as work examining the determinants and importance of ethnicity and ethnic diversity.[5] Since ethnicity in the US is generally constructed based on some belief about ancestry (Waters, 1990), migration and ethnicity are closely related. The immigration literature typically

[4]See the comprehensive review by Spolaore and Wacziarg (2013) of the evidence on the role of history in economic development, on the fundamental causes of growth and on the relative importance of institutions, culture, and human capital. On the importance of of the ancestral composition of current populations see Spolaore and Wacziarg (2009), Putterman and Weil (2010), and also Comin, Easterly, and Gong (2010), and Ashraf and Galor (2013). On the importance of culture see Putnam, Leonardi, and Nanetti (1993), Guiso, Sapienza, and Zingales (2006), Guiso, Zingales, and Sapienza (2008), Guiso, Sapienza, and Zingales (2013), Nunn and Wantchekon (2011), Alesina, Giuliano, and Nunn (2013) and the review by Fernández (2010). On the role of institutions across countries see Acemoglu, Johnson, and Robinson (2001), and Acemoglu, Johnson, and Robinson (2002), Acemoglu, Johnson, and Robinson (2005), Albouy (2012); see Michalopoulos and Papaioannou (2013) for the role of institutions at the ethnic level; and Banerjee and Iyer (2005) and Dell (2010) for the impact of within country institutions in the past. For the relationship between culture, institutions and economic performance see Tabellini (2008), Tabellini (2010), and the review by Alesina and Giuliano (2013). On human capital see Barro and Lee (1993) and Barro and Lee (1994),and Glaeser et al. (2004) on the relative role of human capital versus institutions. A separate literature has argued for the importance of geography see Diamond (1998) and Bloom and Sachs (1998).

[5]The literature on the effect of immigration is very large. See Borjas (1994) for an early review. See also Card (1990), Altonji and Card (1991), Goldin (1994), Hatton and Williamson (1998), Card (2001), Borjas (2003), Ottaviano and Peri (2012), Ottaviano and Peri (2006), and Peri (2012). That ethnic diversity is related to lower levels of public goods across countries see Easterly and Levine (1997), within the US see Alesina, Baqir, and Easterly (1999), and Alesina and La Ferrara (2000), and in Kenya see Miguel and Gugerty (2005) Ager and Brückner (2013) examine the effect of first generation immigrant flows on fractionalization and polarization within the US. Putterman and Weil (2010) are the only ones that focus on diversity of attributes (as opposed to ethnic diversity) in a cross country setting.

focuses either on the characteristics and outcomes for the *flow* of immigrants or on their effects on labor market outcomes of the residents in the short term. Our focus is instead on the *stock* of ancestry and whether the attributes that immigrants brought with them and may pass on to their children affects outcomes for all residents.

In many ways, our work builds on Putterman and Weil (2010) who show that not accounting for the large population movements across countries since 1500 undervalues the importance of culture and institutions. Putterman and Weil (2010) reconstruct the shares of a given country's ancestors today who came from other countries since 1500 and examine the importance of past history, as modified by migration flows, on current outcomes. Taking into account these flows enhances the ability of measures of early technological or institutional development to explain present outcomes. They conclude that what matters is not only the characteristics of a place, but also the characteristics of the populations that inhabit it. Apart from the obvious difference in the unit of observation and time period, we differ from Putterman and Weil (2010) because their data provides *cross-sectional* information on the accumulated migration flows from 1500 to 2000, while we provide *panel data* evidence on the evolution of the stock of ancestry over time. Therefore, we can asses how the change in the people who inhabit a place affects economic performance controlling for observable and unobservable characteristics.

The structure of the paper is as follows. In Section 2, we describe how we build up the stock measure of ancestry by county from 1850 to 2010 based on census micro-samples. We also discuss the evolution of the distribution of the stock of ancestry by county for the major groups. In Section 3, we outline the construction of GDP per capita at the county level. More details on ancestry vector and GDP construction is contained in detailed data appendices. Section 4 contains the econometric results, while Section 5 concludes.

2 Ancestry in the United States

The variable at the center of our analysis is an Ancestry Vector (AV) which records our estimate of the country or countries of origin of the ancestors of the population living in a county. We build the AV based on questions in the census which ask every person the state or country where she was born. From 1880 to 1970 the census also asks for the place of birth of the person's parents. We construct the AV iteratively using the more detailed information that is available from the census, and starting as far back as possible. For first generation immigrants, or their children, the ancestry is straightforward since we know exactly their ancestry. If the parents come from two different countries or states, we assume that they contribute equally to the ancestry of their children. For example, the child of German and Irish parents is half German, half Irish. If the parents are born in the US, we assign the child the ancestry vector among 20-30 years olds in the year of birth of the child in and the state of birth of the parents. The AV for each period therefore depends on the AV in the past, since internal migrants bring their ancestry with them when they move from state to state and pass it on to their children. Accumulating this information over time for a geographic area, the AV gives, in expectation, the fraction of the people in an area whose ancestors come from a given country. Therefore, the AV is not just the fraction of first generation immigrants as in Ager and Brückner (2013), but instead keeps track of the ancestry of everyone, accounting for internal migration, for the age structure of the population, and for the local variations in where people from different countries originally settled. We give details for how we construct ancestry in the US in appendix A.1.

We can construct ancestry at the county level until 1940. Starting in 1950, the census only reports data for somewhat larger county groups, whose definition changes slightly over time. Because of this, our analysis relies on a definition of county groups that allows us to maintain a consistent geographical unit of analysis from 1850 to 2010. The resulting groups number 1154 and are similar, but not identical to what census defines as PUMAs. The Data Appendix provides additional details. We continue to use county to refer to county groups, except where the specific number of groups is important.

Since the contributions of African-Americans, and the legacy of slavery, are so central to understanding ancestry in the United States, our analysis includes race. We emphasize that any finding we make regarding African-Americans cannot distinguish African culture and institutions from the brutal history of slavery before the Civil War, and the cultural, economic, and political repression that continued for a century and more following Reconstruction.

While nativity was a central concern in the early censuses, other distinctions within country of origin, such as religion or regional origin within a country, were not generally recorded and so we cannot distinguish sub-national groups, even though the distinctions between them may be very important. For example, many of the Russian migrants were Jewish, but since we cannot distinguish these migrants, all Russians are recorded as a single group.

2.1 Ancestry in the US over space and time

There have been immense changes in overall ancestry in the United States and its geographic distribution. Our ancestry measures is representative at the county level and can be combined to give a representation of ancestry in the US as a whole or any sub-regionSince any attempt to construct ancestry at a national level that did not start with the micro-samples and keep track of the internal migration and local population growth would deeply flawed, we believe our estimates are the first consistent estimates of ancestry for the United States both at the national level and at the county level. Moreover, and most importantly, our measure is not a just a summation of immigrants from other countries at different points in time. Our aggregate ancestry vector for the United States and for its sub-regions, down to the county level, provides for the first time a measure of the overall *stock* of ancestry.

American ancestry has become increasingly diverse. Figure 1 shows this evolving diversity for the entire United States. The major groups are shown from the most numerous in 2010 at the bottom, to the least numerous at the top. In 1850 descendents of the original English settlers made up more than 60% of the population. African Americans, most of whom were still slaves, represented a little over 10% of the population, although they were highly concentrated in slave

holding states. A recent wave of Irish migrants had swelled the Irish population, but a large wave of new German immigrants would soon be added to the Germans who had come earlier. Descendants of immigrants from Scotland and the Netherlands made up most of the rest of the population.

The rapid waves of immigration, starting particularly in the 1870s, rapidly transformed the ancestral makeup of the United States. Older ancestral groups were still expanding, but not nearly as rapidly as the newer groups, and so, in a relative sense, the older groups declined substantially. The share of descendants from England fell continuously and rapidly until the 1920s when the borders were largely shut for a generation. Similarly the share of African Americans fell, not because their overall number declined, but because other groups entered. The Germans and Irish expanded in the 1850s and 1860s, as well as new groups starting in the 1880s and 1890s. The new migrants were more diverse than is commonly recognized, with large groups from southern Europe, particularly Italy, from eastern Europe, particularly Poland and Russia, from northern and central Europe including the Austrians and Germans, and from Scandinavian countries such as Sweden, Norway, and Denmark.

After 1920, immigration largely ended until the 1960s, and so changes represent internal differences in population growth and demographic structure. Starting in the 1960s new groups from Mexico and Central and South America started to arrive. Immigrants from Asia arrived as well, with China and India representing the the most important sources, followed by Vietnam. By 2010 the United States had become much more diverse. Figure 2 illustrates this diversity by showing the shares of the groups that make up more that 0.5% of the population for 1870, 1920, 1970 and 2010. These dates capture ancestry at the beginning of the age of migration, as it ended, and after the second period of migration starting in the 1970s. Together the groups shown make up 96% of the population, the rest of which is divided into numerous small ancestries. While descendants from English migrants are still the largest, African Americans also represent a large share, as do descendants from Germany and Ireland. Of particular note, the share of Irish ancestry in 2010 implies that there are more than three times the number of people of Irish descent in the United States than in Ireland in 2010. Despite the relatively small total migration of the English during

the colonial period and after, due to relatively rapid population growth, there are around the same number of people of English descent in the United States as in England.

Although the overall evolution of diversity of the United States is notable, its geographic diversity and its change over time is even more interesting. Figure 3 and 4 show the ancestry shares across the United States for select groups in 1870, 1920, 1970 and 2010. Of course, it is possible to construct such maps for all groups in every decade, but some groups are too small or too concentrated to show up on a map. We show six groups that are historically important or that can be seen visually on a map: African Americans, Germans, Irish, Scandinavian, Italian, and Mexican. The maps tend to visually emphasize large and sparsely populated areas, and so miss the rich diversity of the East Coast. We combine Norway and Sweden,which settled distinct areas, to make the Scandinavian homeland more visible.

Groups have tended to settle together and then slowly spread out. Internal migration has continuously reshaped the ancestral geography of the United States. For example, one can observe the German presence in New York, around Milwaukee and Pennsylvania, and the subsequent spread to the entire Midwest and West, as well as the the heavy German migration to Texas. The original settlement and diffusion of Scandinavian immigrants in the upper Midwest and West is also notable. The Irish, initially concentrated in the cities of the North East, spread out widely over the entire US Italians from New York and Boston spread to the North East but not much beyond, although there is a persistenct presence in California, and a smaller one around New Orleans. Curiously, Italians and Irish made up a large fraction of other counties in the West in 1870 which had very low population. We suspect they were there constructing the railroads, since they move on soon after.

The Great Migration of African Americans from the South to the cities in the rest of the country is clear by comparing 1920 in Figure 3 to 1970 in Figure 4, although the maps tend to make its importance less obvious since they do not show cities well. African Americans are still highly concentrated geographically, and have not seen the slow diffusion that characterizes the descendants of the Germans and Irish.

2.2 Comparison of the ancestry vector to self-reported ethnicity

By construction our Ancestry Vector is an objective, although estimated, measure. While it may contain measurement error, it is an attempt to measure something that could in principal be measured and known exactly: the fraction of the ancestors of the people in a county who were born in a given country or geographic area. While ancestry, as we define it, is objective, ethnicity and race are generally considered social constructs (Nagel, 1994). The concept of ethnicity is continually evolving as groups define themselves and are defined by other groups. Ethnicity not only changes over time, but need not be the same across the country even at a given time. The social construction of ethnicity does not make it any less powerful, but is necessarily an endogenous measure, responding to circumstances, rather than something than can explain other outcomes on its own

Ancestry is not the same as ethnicity, although the two are clearly linked. We do not take our measure of ancestry to be a measure of ethnicity, since ethnicity is constructed by social forces, while ancestry is purely a result of people moving. Instead, we view ancestry as one of the inputs used to construct ethnicity. Indeed, in the United States, it appears to be the primary input.[6] . We briefly examine the relationship between the two in this section, but expect that future work will further enlighten the complex dynamics between them.

Starting in 1980 the census collected information on ethnicity beyond race. Collecting ethnic information is difficult, and the census has changed the way it asks these questions over time. The complex intertwining of ancestry and ethnicity are evident even in the census questions: in 1980 respondents were asked "What is this person's ancestry?" while in 1990, 2000, and the 2010 ACS the questions is "What is this person's ancestry or ethnic origin?" While in 1980 respondents could give multiple ethnicities, in 1990 and 2000 they could give only two. We treat multiple responses the same way as parents from multiple countries: someone who is Irish and French is half of each and so a population made up entirely of only French and Irish produces the same aggregate ethnicity whether or not there is inter-marriage. This analysis focuses on the responses in 2000,

[6]For example, "Social scientists who study ethnicity have long concluded that while ethnicity is based on a *belief* in a common ancestry, ethnicity is primarily a *social* phenomenon, not a biological one ... The belief that members of an ethnic group have that they share a common ancestry may not be a fact" (Waters, 1996). See also Waters (1990).

the last census for which detailed micro-samples are available. The relationship of ethnicity and ancestry is broadly the same for other years.

Ethnicity and our measure of ancestry are highly correlated. Across counties in 2010, the correlation between the fraction that say they are of Irish ancestry and the AV is 0.79; for Italian it is 0.91; for German 0.89; for Mexican (who are often first generation) 0.98; for Norwegian 0.95; Swedish 0.92 (combined, Swedish and Norwegian have a correlation of 0.96 with the combined AV). For African-American the correlation is 0.99. Race and ethnicity are not necessarily the same—even for the same person on the census—and so there can be a distinction between the two, but we are using questions about race to define our AV and so they should be highly correlated.

Because of our use of the racial classifications in the census for African Americans and Native Americans our Ancestry Vector is not entirely free from social construction by the usually dominant group descended from European settlers. Since we start our construction from the 1790 census, and have our first micro-samples in 1850, it is impossible to avoid race and slavery. Race, however, seems to be far less a matter of personal choice as it has become for "white" Americans, and more of an ethnicity imposed from the outside (Waters, 1996).

English ethnicity is the most complicated. The English ancestry includes all ancestries from Britain and Wales, as well as the Scotch-Irish who migrated in waves between 1717 and 1775 (Daniels, 2002, pp. 77-86), well before the the micro-samples, and are counted as English in the first census. English ancestry is substantially larger than those who self-identify as English in the census in almost all counties and the correlation is only 0.31. In the 2000 census, only 5.9% self-report an English ethnicity, while 7.2% give their ethnicity as "American," 19.1% do not report, and 1.4% report "White/Caucasian." Combining all of these other categories with the English and British self-reported ethnicities, there is a 0.93 correlation between our measure of English in the AV and the ethnicities reported in the census. The combined English and other ethnicity is on average larger than the English AV (the average across PUMAs is 8.4 percentage points larger). One interpretation of this evidence, consistent with the constructivist approach to ethnicity (Cornell and Hartmann, 1998, pp. 72-101), is that the dominant ethnicity is English and

so all other ethnicities are defined as different from English. Then many whose ancestry is English do not think of themselves as having an ethnicity since they have the dominant ethnicity.

Further supporting the constructivist approach to ethnicity, ethnicity seems to be self-reinforcing. For several of the larger ancestry groups, where an ancestry is more dominant, people tend to disproportionally self-report into that ethnicity. Where there are more people of German ancestry according to the AV, for example, the fraction self-reporting themselves of German ancestry increases by more than in proportion to the AV. Where the AV says there are many Germans, people are even more likely to self-report as German than the AV would suggest. Where there are few Germans, according to the AV, even fewer people report an ethnicity of German than the AV would suggest. One reason for this tendency may be that by construction the AV can capture the full complexity of ancestry with many small contributions, while a person may consider themselves belonging only to at most one or two ethnicities, a tendency reinforced by the census that only records two ethnicities in 2000. Future work will explore the construction of ethnic identities from the building block of ancestry.

Although our main emphasis is understanding the impact of ancestry on economic outcomes, the construction of our ancestry mapping allows us to settle some popular debates. For example, we construct the first estimates of the overall ancestry share in United States that respects the demography in Figure 6. With it we can lay to rest popular claims that Germans are the largest ethnic group in the United States.[7] Germans may be the largest ethnic group that still feels some self-identity, but the descendents of the migrations from England, who no longer self-identify as ethnically English, are numerically larger.

Similarly, we can offer some historical perspective on the concerns over the expectation that "minorities" will soon be a majority.[8] It has already happened. The English stopped being a

[7]This claim is based on the 2000 census which recorded self-reported ancestry or ethnicity and is repeated in recent articles in *The Economist* (February 7th, "The Silent Majority") and elsewhere.

[8]See the census report "Most Children Younger Than Age 1 are Minorities, Census Bureau Reports" (`https://www.census.gov/newsroom/releases/archives/population/cb12-90.html`) and numerous articles on the Majority-Minority nation from different perspectives (for examples see: William Frey at Brooking: "New Projections Point to a Majority Minority Nation in 2044" (`http://www.brookings.edu/blogs/the-avenue/posts/2014/12/12-majority-minority-nation-2044-frey`), or Hector Cordero-Guzman "The 'majority-minority'

majority of the United States in 1870, although they remain the largest group. The coming of the German, Irish, and Italians to name just three large groups that suffered discrimination when they arrived, has altered the balance. The acceptance of these previously marginalized groups into the "majority" emphasizes just how elastic and endogenous the commonly used notions of ethnicity are, and so the advantage of using our objective measure of ancestry.

3 County GDP from 1850-2010

To understand the impact of ancestry on economic performance, we construct a county level measure of GDP per person. Starting in 1950 measures of income per person are available at a county level. Prior to 1950, however, the census only recorded limited information on manufacturing and agriculture output at a county level. While these measures may be useful for comparing rural counties, as in the study of national banks from 1870-1900 in Fulford (2011), they are inadequate for comparing urban areas where many immigrants settled. The problem is that if some groups disproportionally settled in urban areas where physical output measures systematically underestimate output by ignoring services, for example, then we will underestimate the contribution of these groups. We therefore need to engage in *county* income accounting to recreate a measure of gross domestic product at a county level. To our knowledge this measure is unique in including services as well as manufacturing and agriculture at a county level. The full details for how we construct this measure of county level GDP is in appendix A.2, but we describe it briefly below.

Using information on manufacturing inputs in each county, we construct the nominal value added in manufacturing. The census recorded agricultural output at a county level, but not intermediate inputs. We use historical aggregate statistics at the national level on total output, intermediates and value added in agriculture to obtain a measure of value added in agriculture at the county level, assuming that the ratio of value added to total output in agriculture is the same in each county.

America is coming, so why not get ready?" (`http://www.msnbc.com/melissa-harris-perry/the-majority-minority-america-coming-so-why-not-get-ready`).

Services are the most difficult to value. We use the employment and occupation information collected by the micro-samples from the census for each year to construct employment by broad service category (trade, transportation and public utilities, finance, professional services, personal services, and government). We then calculate nominal valued added oer worker in each service category based on national accounts. We then multiply nominal value added per worker at the national level by the county level employment in each category. This approach allows New York City, with a substantial service sector composed of finance, to have a much higher income from services than a small rural county where services might be mostly employed servants. We follow the same procedure used for services to obtain value added in mining and construction. Excluded from our measure is any value from the existin housing stock, although new housing is captured through construction employment.

We combine the county personal income available from the 1950 onwards with the measure of nominal GDP by county we construct for 1950 to get a ratio of GDP to income at a county level. We apply this county level ratio to the income series to get an estimate of GDP. Effectively, we use the growth rate of personal income at the county level to approximate the growth rate of county level GDP. We then calculate GDP for the same county groups used in constructing the AV vector. Finally, we convert nominal GDP to real GDP using the price deflator from Sutch (2006).

3.1 County GDP over time

Our goal is for each decade to create a measure that correctly captures the relative GDP per person of different counties for the period 1850-2010. Throughout the analysis we include time effects to absorb overall temporal variation. Yet our measure does surprisingly well at capturing aggregate changes. Figure 5 shows real GDP per person as constructed by Sutch (2006), which includes services, and our measure of county GDP summed over all counties and divided by population. Figure 5 suggests that it is doing a very good job of allocating all production in any give year and well approximates the aggregate change over time. Part of the reason for the similarity is that the construction of the historical GDP at the national level relies on many of the same sources we have

used at the county level such as the national estimates of manufacturing and agriculture output, as well as employment in services.

Figure 6 illustrates why it is so important to include services rather than just use the more readily available output numbers. The figure shows the share of value added using our measure for each industry. Even in 1850, services represented around 20% of value added and its share grew rapidly. Moreover, the value added from services tended to be highly concentrated. When we map the share of services in the local economy the share is frequently above 70% for a highly urban area, which can be surrounded by rural areas where the share is less than 30%. Figure 6 also shows that by 1950 our measure matches the sectoral shares in the National Income and Product Accounts nearly exactly and shows similar trends before that.

4 Does ancestry matter and why?

Combining our measure of the ancestry makeup of each county with our measure of county income, we ask whether ancestry matters for local economic development and, if the answer is yes, which attributes brought by the immigrants from the country of origin play an important role. What is crucial about this exercise is that, unlike every other study of ethnicity or ancestry of which we are aware, we have at our disposal a panel of consistent data. Therefore, rather than asking whether the ancestry composition at a given point in time is correlated with the economic performance of an area today, we can ask whether the income of some area changes as its composition changes. Using the panel, we can come closer to evaluating the causal effect of ancestry composition on economic performance, controlling also for unobserved time-invariant county-level characteristics, unobserved characteristics that change by state and year, and even county-specific trends. This reduces the likelihood of endogeneity biases deriving from the omission of important factors that affect both county-level performance and the ancestry composition. Moreover, with panel data, we can better address the issue of simultaneity-reverse causality bias, derived from the fact that ancestry and county-level performance may be jointly determined. In addition to controlling for a

wide range of unobservables, and some observables, in some specification we will allow economic performance to depend upon *lagged* ancestry composition in equations that also include the lagged dependent variable.

4.1 Does ancestry matter?

We begin by investigating whether ancestry is correlated with local economic development in the context of a fairly unrestricted econometric model that allows the effect of each ancestry to be captured by a different coefficient. Our ancestry vector (AV) for a given county group c and time t, is an estimate of the share of that place's population whose ancestors came from a particular country of origin ancestry a out of all possible countries of origin A. Denote the shares π_{ct}^{a} and note that they sum to one by definition. We start with a series of estimates of the effect of ancestry on log county GDP per person y_{ct} of the form:

$$y_{ct} = \theta_c + \lambda_t + \sum_{a=1}^{A} \alpha_a \pi_{ct}^{a} + \gamma X_{ct} + \epsilon_{ct}, \tag{1}$$

which include county-specific effects θ_c and year effects, λ_t, and allow each ancestry to have its own effect α_a. Some specifications include additional controls X_{ct} such as population density to reflect time-varying urbanization rates, the lagged dependent variable, education, and measures of fractionalization. In more general specifications we will also allow for state-specific period effects λ_{st}, for county-specific trends, and for the lagged dependent variable. We combine the English with some of the ancestries that are too small to estimate well individually and normalize the ancestry effects by setting the coefficient on the English and others to zero. The remaining coefficients can then be interpreted as whether replacing the English with that ancestry is associated with a change in GDP per person. Our basic question is whether, even after controlling for observables and unobservables, ancestry still matters.

The results of many variations of equation 1 are shown in Table 1, and Figure 7 shows the individual ancestry coefficients from the simplest specification that only includes county and year

effects which we will examine in greater detail in the next subsection. The first set of regressions in 1 do not have variables other than the ancestries and different county, year, and state effects, and so do not report separate coefficients. The table shows the F-statistic for the joint test that all α_a are zero (each ancestry matters equally for GDP). We separately test the hypothesis that all ancestries other than African American are zero to examine whether the results are purely driven by ancestry related to race. Below each F-statistic we report the probability implied by the test statistics. They are all zero to more decimal places than can fit in the table.

Every form of the estimation strongly rejects that ancestry does not matter. All estimates include county group fixed effects, so the fixed characteristics of the place of settlement is controlled for. We can also ask whether regional trends—which might reflect evolving factors, such as industrial structure, that may be related both to county GDP and ancestry composition—may affect our answer. However, the inclusion of state specific period effects or county group specific trends, leaves the significance of the ancestry composition intact. Our conclusion that ancestry matters are also robust to the adding county income in the previous period $y_{c,t-1}$ as a regressor. One might be concerned that ancestry matters only because it reacts to current shocks, yet ancestry matters even when we include it only at a decade lag. The last several columns include other possible explanatory variables including education, population density, and fractionalization constructed using our ancestry vector (we will return to the issue of fractionalization in Section 4.6). All of these may be a result of ancestry, for example, if some groups put more emphasis on education than others. Similarly, o an increase in density may reflect a higher level of urbanization of the county, resulting in a differential attraction for different immigrant groups. Ancestry continues to matters even after including these controls, and so ancestry matters beyond its relationship to education or urbanization

4.2 Why does ancestry matter? Correlating the ancestry coefficients with country-of-origin characteristics.

We next examine whether the coefficients on the ancestry shares are related to characteristics of the country of origin. Figure 7 shows the coefficients estimated from equation 1 without any additional controls. The effects are sorted by the size of the effect. Since England is excluded, a coefficient of 1 means that replacing one percentage point English with one percentage point of that ancestry increases GDP per person by 1 percent (we include England with a coefficient of zero in the figure for reference). Some groups are estimated very precisely, especially those with large early migrations such as the Germans, Irish, or Italians. Other groups that came more recently are much less well estimated such as Central Americans, sub-continent Indians, or Koreans. Small groups, such as Greeks or the combined Yugoslavia also display large variances.

The availability of panel data for US counties over time is crucial. The right side of Figure 7 shows the ancestry coefficients estimated only using the cross-section in 2010. The coefficients from the cross-section on the right are negatively correlated with those estimated from the panel on the left. Considering only a cross-section, as is the case in almost all studies of ethnicity, ancestry or culture, can give a misleading picture of the importance of ethnicity or ancestry for economic development. For example, our panel estimates show that when the fraction of Italians in a county goes up relative to the English, the GDP per person goes down somewhat. Yet the cross-section on the right shows that Italians tend to live in areas with higher GDP per person than the English.

What do groups bring with them? We examine whether the ancestry coefficients in Figure 7 are related to the characteristics of the country of origin. We divide the examination into four broad categories: economic, social capital or culture, human capital, and institutions. Together with geography, these categories are the fundamental drivers of economic growth that have been proposed in the literature (Acemoglu and Robinson, 2012; Case, 2006, pp. 45-69). Geography of the country of origin is necessarily left behind when migrating, and so can only express itself indirectly through overall economic development, culture, institutions, or human capital. The main limiting factor in the analysis is the availability of information for a broad range of countries over

different time periods. Unlike our data on ancestry and county GDP, which we have carefully constructed based on micro data to be consistent over time and space, the cross-country data, particularly in the distant past is not always available or reliable.

Immigrants arrived at different times and we would like to capture what immigrants brought with them by the conditions in their country of origin at the time of immigration. Doing so requires knowledge of the conditional density of immigration over time so that, for example, the Irish coming in the 1850s reflect a different experience than the Irish in the 1890s, both of whom are different from the Italians in the 1910s. Our ancestry measure captures very well the stock of people whose ancestors came from a country of origin. Since it is a stock, however, changes in it reflect both increases from migration (external and internal), and also natural changes from births and deaths. We therefore turn to immigration records that contain the number of migrants arriving from different countries starting in the 1820s (Department of Homeland Security, 2013) at a national level. Before that we create an approximate density of arrival times for the stock of migrants based on Daniels (2002). The full procedure is described in appendix A.3.

The ancestry effects appear to be closely related to economic conditions in the country of origin as measured by GDP per capita. We think of GDP in the country of origin as a summary measure of all of the cultural, institutional, and human capital elements that lead to economic success at a given time. Migrants from an origin where these elements are present may have brought whatever mix is important for success with them. As Figure 8 shows, the country of origin GDP per person is positively associated with the ancestry coefficient. More specifically, ancestries from countries of origin that had higher GDP in 1870 or in 2010 have a larger coefficient. This is true both for the mainly European ancestries that were important sources of immigration flows before 1924 (see Figure 2) and for all large ancestry groups. Rather than showing GDP in the country of origin at only one point in time, the right hand side panel shows GDP weighted by arrival density. Since groups that arrived earlier, when the highest possible GDP was lower, would have a low average arrival GDP if we simply took the average, we calculate the difference between log GDP per person in the country of origin and log GDP in the US at the time of arrival ($y^a_\tau - y^{US}_\tau$). For a given

ancestry, the arrival weighted log GDP is then:

$$\tilde{y}_t^a = \sum_{\tau=0}^{t} (y_\tau^a - y_\tau^{US})(1-\delta)^{t-\tau} F_t^a(\tau) \tag{2}$$

where $F_t^a(\tau)$ is the arrival density of group a up to time τ (and so, for example, is 0 for $\tau > t$), and δ is the rate of depreciation of the importance of origin GDP. Figure 8 shows the relationships of ancestry coefficients and $\tilde{y}_{2010}^a$ for a depreciation rate of 0 and for a depreciation rate of 0.5% per year. With no depreciation the Dutch (NLD for Netherlands), who came from the richest country at the time of their migration, are an outlier far to the right. With some depreciation, after several centuries of depreciating, the difference has approached zero. With both depreciation rates, the ancestries before 1924 that came from richer countries display a stronger positive association between their coefficients and the country-of-origin GDP. The association is positive using all countries, although the relationship is not significant when some depreciation is allowed for.[9] Summarizing, not only does ancestry matter, but the contribution of different ancestries to GDP in US counties seems to be closely related to the historical economic success of the country of origin, particularly for the source countries that mattered most before 1924.

However, we want to go beyond GDP of the country of origin as a synthetic measure of the endowment brought by immigrants to the US. Immigrants brought with them a set of cultural attributes from the mother country that can affect their ability to function productively in the area where they settle. If those attributes are passed down, at least in part to their descendents, this would contribute to explaining the significance of the ancestry vector. We focus on those values and beliefs that facilitate cooperation, which are often referred to as "social capital" and have been at the center of previous investigations (Guiso, Zingales, and Sapienza, 2008; Tabellini, 2010) To measure cultural attributes we use the World Value Survey which asks a representative sample of respondents in numerous countries a wide variety of questions about their attitudes and beliefs. Optimally, we would want a measure of the culture at the time of departure, but these surveys are

[9]The slope coefficients are estimated using Weighted Least Squares to down-weight the ancestries that are less precisely estimated. We us analytic weights defined as the inverse of the estimated standard deviation for each ancestry coefficient.

available for a larger number of countries only starting in he 1990s. For recent surveys to tell us anything about past culture, one needs to assume that the relative ranking of countries in more recent decades captures, albeit imperfectly, their relative position in earlier times. This would be true, for example, if some cultural attitudes are fixed or very slow changing, or if they responded to common factors that made them move at a similar pace in different countries. We combine the surveys since 1981 and use the answer to several questions that Tabellini (2010) and others have proposed might be important for economic development: generalized trust (Trust), tolerance and respect of others as an important quality that children should have (Respect), obedience as an important quality in children (and possibly a negative characteristic in a world requiring independence), and a feel of control over one's life as an inverse proxy for a fatalism (Control). We will also experiment with measures of thriftiness (Thrift).[10] Following Tabellini (2010) we construct the principal component at the individual level of Trust, Obedience, Respect, and Control as a summary measure of cultural values important for cooperating with others.

In Figure 9 we plot the relationship of the coefficients of the AV vector with Trust, Obedience, the principal component of culture, and Thrift. The coefficients are positively and significantly associated with Trust, the principal component, and Thrift, and negatively and significantly with Obedience. The correlation with Respect and Control is weak, and so we do not show them separately.

In Figure 10 we plot the relationship between the AV vector coefficients with different measures of institutions at the national level and the human capital of immigrants. For institutions we use state history from Putterman and Weil (2010) and the difference in political participation from the United States, weighted by time of arrival, using the measures of historical political participation created by Vanhanen (2012).[11] State history reflects how long a particular state has had centralized government in 1500 and shows a strong possitive association with the ancestry coefficients. Political participation is only positive for the mainly European ancestries before 1924.

[10]The World Values Survey data and variable construction are described in details in the data appendix section A.5.

[11]Measures of executive constraints from Polity IV do not have coverage for key countries going far enough back. The version produce by Acemoglu, Johnson, and Robinson (2005) only covers select European countries.

Political participation may not reflect the differing experiences of immigrants, however. Political participation was low for most countries with large migrations before 1924, and the institutional experience of Italian peasants from its south might have been very different from the Swedish immigrants, even if neither could vote. Moreover, the country-of-origin institution may affect the design and functioning of federal or stateinstitutions, which we control for in the regression, and be a poor proxy for the ability to develop local institutions and make them work effectively.

We also show the correlation with the ratio of the immigrants' education to the overall United States at the time of arrival, whose construction we discuss in appendix A.6, and the ratio of the average years of education in the country of origin at the time of arrival constructed from van Leeuwen and van Leeuwen-Li (2013). The ratio of origin years of education is positively related to the ancestry coefficients for the ancestries before 1924, but shows only a small relationship for all ancestries. The relatively weak relationship with average years of education in a country of origin may be because the human capital of the immigrants is different from the average, or because differences in human capital rapidly disappear in a new setting. We construct the ratio of immigrant education from the census by assuming that the 20-30 year old first generation migrants in a given census represent the education level of the most recent migrants from each country of origin. The education of migrants as of the time of arrival has a much more positive relationship with ancestry. Of particular note are the shift in the education level of recent immigrants such as Indians and Koreans who came from low education countries when they migrated, but the education levels of the migrants was much higher.

4.3 A parsimonious parametrization of the effects of ancestry composition

In this section we examine the effect of ancestry on economic development in a more parsimonious way that allows us to explore other dimensions. In order to do so, we assume that the effect of each ancestry is proportional to some attribute of the country of origin. More specifically, we take some

characteristic z_τ^a measured at the country of origin at time τ and define:

$$\hat{z}_{ct}^{(\tau)} = \sum_{a=1}^{A} \pi_{ct}^a z_\tau^a. \tag{3}$$

We can think of $\hat{z}_{ct}$ as the *expected* or predicted value, across countries of origin, of the endowment of a given characteristic for county group *c* at year *t*. For example, take the simplest form of county-of-origin level of development, the (log) GDP per person in 1870 or $\hat{y}_{ct}^{(1870)}$. Since the GDP in 1870 is constant for any given country, $\hat{y}_{ct}^{(1870)}$ varies only because the ancestry composition varies over counties and over time, but we can think of it as offering a prediction of county income based on the incomes of the country of origin of the county's population in 1870. Similarly, our measures of culture, which come only from recent surveys, vary only because of the ancestry composition in a county. Some characteristics, such as the GDP in the country of origin at the time of arrival vary both with time and ancestral composition. In this case, we form the $\hat{z}_{ct}$ variable using the ancestry weighted average in equation 3, but construct the country-of-origin z_t^a variable at each time t by first weighting the ratio of country-of-origin characteristics by arrival time:

$$\tilde{z}_t^a = \sum_{\tau=0}^{t} (z_\tau^a / z_\tau^{US})^{(1-\delta)^{t-\tau}} F_t^a(\tau)$$

where $F_t^a(\tau)$ is the arrival density of group a up to time τ, and δ is the rate of depreciation of the importance of that characteristic. This formula gives the average ratio of country-of-origin characteristic z by time of arrival. When the depreciation rate is greater than zero the ratio converges to one as the time of arrival gets further away, and so the immigrant group converges to the US. We form the origin GDP-US ratio this way, as well as the migrant-education to US-education ratio, and country-of-origin education to US ratio. We can also form the depreciated differences, as opposed to ratio, using equation 2, which we employ to form the log origin GDP to US ratio, and the difference in arrival political participation.

We then use the constructed variables, alone or in combination as regressors, in the equation for county-level GDP. Our typical regression asks how well we can predict county GDP per person

using the ancestry composition and country-of-origin characteristics, and so takes the form:

$$y_{ct} = \theta_c + \lambda_{st} + \beta \hat{z}_{ct} + \gamma X_{ct} + \epsilon_{ct}, \tag{4}$$

where we include county group and state-year effects. In some specification, $\hat{z}_{ct}$ will be a vector of the expected values of the endowment of several characteristics. Given the more parsimonious representation of the effects of ancestry, we will experiment more fully with the dynamic specification of the equation by including a richer lag structure for the dependent variable and for $\hat{z}_{ct}$. Moreover, since the ancestry vector contains multiple elements, we can construct more complex functions that reflect other aspects of the endowment distribution, such as fractionalization in the characteristics of the country of origin.

The results of a series of regressions of the form in equation 4 including each variable separately are shown in Table 2 where each estimate is from a separate regression. For each predicted variable we present four specifications, all of which include county group fixed effects: (1) with year effects; (2) with state-year effects; (3) with year effects and including the fraction African-American, Native American, and the log population density; (4) with state-year effects and the other controls. Including state-year effects allows states to evolve independently over time and so only relies on variation within state. Since much of the variation in the effect of ancestry is likely to be felt across regions, including state-year effects removes much of the variation, but ensures that the estimates are not driven purely by differential regional trends. We allow African-Americans and Native Americans to have an unrestricted coefficient since the information at the country-of-origin level for African-Americans and Native Americans is necessarily speculative. Where available we assign the values of Ghana, a West African country that was at the heart of the slave trade, to African-Americans, and typically use overall US values for Native Americans. We include population density to allow the urban-rural composition of a county to change over time. Of course, if density grows at the same rate for all counties then its effect is completely captured by the county-group fixed effect and common year effects.

The coefficient of 1870 expected GDP is positive and significant at the 1% level in the specification without the additional controls and marginally significant or even insignificant when adding the controls. In the specification including unobservable county effects that are fixed over time and state effects that vary every decade, changing the composition of a county so that the country-of-origin GDP in 1870 of its residents is one percent higher increases the county's current GDP per person by 0.31%. Since the estimates include county group fixed effects, this estimate is identified as the composition changes over time, not just from the cross-section. The results are similar in terms of significance when using the arrival-weighted GDP, measured as the log difference from the US as of the time of arrival, or the origin GDP to US ratio. If we let the GDP on arrival depreciate even modestly, the effect is significant and positive only in the specification with common year effects. These results suggest that rather than the importance of ancestry coming from conditions of the country of origin at the time of arrival in the US, the importance of ancestral origin is largely a fixed ranking. One such fixed ranking is State History in 1500 from Putterman and Weil (2010) that captures the familiarity with centralized state institutions and shows a pattern of effects on local development similar to those of 1870 GDP, and even more precisely determined. The effect is significant and positive in all specifications, except the one with state-year effects and the additional controls.[12] Political participation as of the time of arrival (measured as the arrival density weighted difference between country of origin fraction voting and the US) does not predict a higher income per person, except in the specification with only common year effects. Actually, it has a negative coefficient in all other variants of the model. Since at the time of migration in the nineteenth and early twentieth century few large origin countries had a widespread franchise, the fraction of people voting may not well capture differences in institutions or political participation.

Measures of cultural attitudes towards working with others, such as Trust, are strongly related to higher county income. Expected Trust is positive and significant at the 1% level in all specifications. Since Trust is measured as the fraction of the population in a country of origin who report

[12]The state history variable is constructed as an index varying from 0 to 1. So a 1 percentage point (0.01) increase in the index brings approximately the same increase as a 1% (0.01) increase in 1870 GDP. We use version 3 depreciating at 5%.

that other people can generally be trusted, the coefficient suggests that an increase in the mix of ancestries that increases the ancestry-weighted trust by one percentage point (0.01) increases the income of a county by 2.6%.

The important role of generalized trust is likely due to its ability to capture and summarize those cultural characteristics that enhance the capacity to cooperate, sometimes called social capital. These characteristics affects the functioning of local institutions, but may also capture the experience of good formal institutions in the mother country and the ability to transport them in the areas where immigrants settle, as good and effective institutions foster the creation of trust. For this reason, trust is likely to capture the effect on economic development of both good culture and good local institutions of the country of origin.

Obedience has a similarly precisely estimated and negative effect in three out of the four specifications. Expected Respect and Control display positive coefficients that are marginally less precisely estimated. Thrift is positively and very significantly related to local development in three out of four specifications. Following Tabellini (2010), we have formed the principal component of Trust, Control, Respect, and Obedience from the individual data, and then taken the average across the respondents of the principal component for each country. The ancestry weighted principal component positively and significantly predicts county GDP in all specifications.

4.4 What matters most?

In the previous section, we have examined country-of-origin characteristics in isolation with the goal of showing that something that people bring with them matters. But what matters most for local economic development? As we have discussed, the panel data nature of our data allows us to address this issue controlling for a rich set of unobservables. However, by looking within the United States and including common year effects or state-year effects, we necessarily remove any effect of national or state institutions and of their evolution. It may well be that such institutions are indeed the ultimate cause of long run growth (Acemoglu, Johnson, and Robinson, 2004). Since state or national institutions are common to the counties in our data, we cannot readily estimate

their importance. Instead, we can ask what characteristics matter differentially across local areas. Local institutions and cultures may be very important for local growth, for example. While states play some role, school funding and quality decisions, zoning, roads, police, and even some levels of the court system are all fundamentally locally determined. The decisions regarding these local institutions, as well as decisions made by locals to invest may be affected by the culture of the local ancestries, their experience with local governance or their human capital on arrival. All of these factors may express themselves both through local institutions and directly through economic activity, for example, if more trusting people are more likely to start businesses, and more trusting people are more willing to invest more in schools that benefit others. Finally, since we include a county group fixed effect, we identify the effects of culture, institutions and human capital essentially because the ancestry composition changes over time. We cannot assess, for instance, whether or not there is a "founder" effect depending upon the ancestry composition at the founding of the county, because it would be absorbed by the fixed effect.

With these caveats in mind, consider Table 3 that combines a selection of the most important measures from Table 2 to examine which matter once they are included together as explanatory variables. We use the principal component of culture, state history, the measure of education at time of arrival created by census records, and a measure of thrift.[13] Since many important differences appear across states rather than within them, we show the results both with common year effects, and with state-specific year effects. Finally, since the inputs to form the ancestry weighted variables for African-American and Native Americans are speculative, we included in some specifications the fraction of each of these groups, as well as the population density to allow for differences between urban and rural areas.

The effect of culture is robustly significant and about the same size across all columns, while the other possibly important variables are not. Depending on the specification State History is sometimes significant and positive, and sometimes not distinguishable from zero. As we argued before, weighted culture may summarize the role of both social capital and the quality of local

[13]We obtained very similar results using expected trust instead of the principal component.

institutions. Conversely, the experience of a centralized state represented by State History may be less relevant in capturing the development and functioning of local institutions. Puzzlingly the ratio of education of the migrants to the US population at their time of arrival is either insignificant or negative when including state-year effects. This relationship does not depend on the speed of depreciation of the difference (δ), and also holds using the country-of-origin years of education. By itself, arrival education is positively related to county GDP in Table 2. We believe the relationship comes from collinearity with culture, and so particularly once the state variation over time is removed, may be picking up a potential non-linear relationship between culture and outcomes.

Including the fraction African Americans and Native Americans still leaves the the principal component of culture significant and of about the same size. The values we assign in constructing the predicted variables for these groups are necessarily imprecise, and it is important to point out that the results are not coming just from the groups. West Africans today have low trust as measured by the World Values survey, at least partially a consequence of the slave trade (Nunn and Wantchekon, 2011). The long-term consequences for trust on the descendents of those actually enslaved may be even more deleterious. While we report the coefficients on the fraction African Americans and Native Americans, since these groups also appear within each of the predicted variables with an an assigned level of trust, for example, the coefficients say little about the groups themselves, but are informative about the values we assigned. Taken together, the coefficients suggest that the assigned values for African Americans are not far off—perhaps because the low trust of West Africans is representative—while the values we assigned for Native Americans are less good.

4.5 Endogeneity: Panel versus cross-section results and dynamic specifications

Migration patterns to the US and within the US clearly respond to economic incentives. In this section, we expand our discussion of the extent to which the estimates of the role of ancestry can be considered causal. We present evidence that suggests that while there may well be still some

concerns about endogeneity, we are likely *under-estimating* the effects of ancestry. To understand the likely biases, we first examine the cross-sectional results in conjunction with the historical evidence on settlement pattern and compare them to the panel estimates that control for county-group effects. We then rely on dynamic specifications to address more fully the issue of simultaneity biases.

4.5.1 Rich ancestries in poor places

Perhaps surprisingly, over the broad sweep of US. history since 1850 people from high-income countries tend to live in lower income counties on average. In Figure 7 we have already shown that the coefficients on individual ancestries obtained by OLS are negatively correlated to the within estimates. Column 1 in Table 4 show that the coefficient on the ancestry-weighted 1870 GDP per person or ancestry-weighted trust is negative when not including fixed effects, while it was positive when controlling for county group fixed effects (see Table 2). The pattern is the same for predicted Trust in column 6 of Table 4. This reversal reflects the fact that, on average, since 1870 people with ancestries from rich countries in 1870 have lived in poorer places. Similarly, people from more trusting countries generally live in poorer counties..

What explains this negative correlation, which is the opposite of the usual selection bias in which prosperous areas attract prosperous people? The big driver of the correlation is historical legacy of settlement, particularly among the English. While the English are a large portion of much of the US, they are highly concentrated in the poor South and Appalachian states which received little migration after their first settlement. Later migrants, such as the Italians or Irish, while poor when they arrived, went to cities and prosperous areas, especially in the North-East. Finally, the great migration of African American from the South to the northern cities means that for most of our sample periods groups originally from countries with a lower GDP are concentrated in richer counties.

The difference between the estimates that use the variation over time within each county and those that rely mostly on on the cross-sectional variation, suggest just how important the avail-

ability of panel data is for understanding the effects of ancestry. Much empirical work on culture or ancestry cannot distinguish between the effect of the place and of the people that live there. The negative cross-sectional relationship between trust or 1870 GDP and county income is likely specific to the settlement patterns in the United States and what part of the frontier was open when a large migration occurred or where a group was forcibly resettled. However, the general point that estimates based on cross-sectional variation do not disentangle the effects of factors inherent in a place such as geography, slow-moving local institutions, or even evolving state or federal institutions, from the effect of the people who live there, is more general.

4.5.2 Dynamic specifications

Since our estimates rely on fixed effects, the identification of the effect of ancestry comes when a change in ancestry is associated with a change in county income. The fixed effects—technically the within transformation—removes all fixed unobserved characteristics of a place. It is not a problem, for example, if the poor immigrants go to cities with ports which requires manual labor, but eventually get absorbed in the local economy. The presence of a port is fixed, and so does not affect the identification. Similarly, if Norwegians go to places in the Upper-Midwest whose cold ecology they recognize, the fixed effect removes climate and geography.

Yet there is still the possibility for selection that depends on characteristics that are not fixed over time, such as shocks that occur at a given point in time or are caused by some time-varying third factor that affects both local development and the ancestry vector. For instance, if some ancestries are attracted with no delay to places with a positive income shock, there may be a simultaneity bias in estimating the effect of the expected (ancestry weighted) attributes brought from the country of origin, as booming counties may attract international or internal migrants from ancestries with "better" or "worse" characteristics. In the former case, the estimated effect of ancestry would be upward biased; in the latter case downward biased. It is probably more likely that a booming county, just like a city, attracts disproportionately immigrants who are poorer, since they are the ones with greater incentives to move. The cross-section supports this observation that

people from poorer countries end up in richer counties on average. A counter argument is that the most mobile people tend to be those with the highest education and geographically diverse social networks, so that it is not possible to arrive at unambiguous conclusions on the direction of the bias.[14]

The problem of selection is closely related to the timing of movement. If a positive shock to county GDP affects the ancestry weighted attributes of the country of origin, for example, by attracting less trusting groups, but the population movement takes some time to occur then the coefficient of expected Trust is a consistent estimate of its effect on local development. There is no simultaneity bias if changes in ancestry occur only with a lag. Alternatively, it could be that the effect of a change in the ancestry composition on local development occurs not immediately, but with a lag, as new migrants take some time to make their contributions felt. In this case, the coefficient on lagged Trust or 1870 GDP captures consistently their effect on local development. Finally, it is possible that current county level GDP depends upon lagged GDP.

We investigate the importance of allowing for these complex dynamics in Table 4. Columns 2 through 5 examine the dynamic relationships with 1870 GDP as a summary measure, while columns 7 through 10 examine the dynamic relationships with Trust. Including the lagged dependent variable has a similar effect to including fixed effects since it controls for many unobservables. Comparing columns 1 to 2, for example, the negative relationship of county income with the 1870 GDP of its inhabitants almost entirely disappears, further confirming the importance of the panel. Columns 3 and 7 then include both the lagged dependent variable and fixed effects. The size of the *long-run* effect of contemporaneous predicted 1870 GDP is very similar to the size of their effect in the static specification.[15] Since the lagged dependent variable allows for possible serial correlation

[14]Note that the problem with selection is here is not that the poor, or rich, within any ancestry are the ones that are more likely to move, if that affects all ancestries equally and so does not affect the estimate of the impact across ancestries. Instead, the problem is that ancestries with specific characteristics may be more mobile on average. For example, suppose ancestries with low trust are more willing to move since they have lower attachment to a local community. Since trust is positively correlated with local development, but low trust ancestries are more likely to move to booming counties, we will tend to underestimate the impact of trust on local development. Low trust people, in this example, are migrating because of the boom, but are not causing it.

[15]The long run effect in the dynamic specification is the $\beta/(1-\rho)$ where ρ is the coefficient on the lag county income.

as well, these results suggest that the estimates are robust to at least basic dynamic effects.

We examine whether the effect of Trust or 1870 GDP changes when included at a lag in columns 4 and 9. While slightly smaller, the coefficients are largely the same as the contemporaneous effect in the previous column. If it takes some time to move following a boom, then the effect of the lag underestimates the effects of ancestry. A boom in one decade is followed by population movements in the next decade, when the county may no longer be booming. Then movements in people tend to follow the booms, and mean reversion suggests changes in ancestry will be associated with a smaller effect on county income. Of course, assuming that it takes a decade for a boom to produce a movement of people, means that the contemporaneous effect of ancestry in column 3 or 8 is consistently estimated, since the delayed response means there is no simultaneity bias. While the similarity between the contemporaneous and lagged coefficients does not rule out any bias from selection, it does suggest that reverse causality is unlikely to be a problem.

Note that the coefficient of the lagged dependent variable is precisely estimated and is around 0.44 in all specifications. This means that county GDP per capita displays conditional beta convergence (the growth rate of county income is higher for countries with lower initial income, controlling for ancestry). Moreover the convergence is very fast, with around 60% of the initial gap cut within a decade, implying a convergence rate per year of about 9%.[16]

Finally, columns 5 and 10 also include county level education and population density as additional regressors, in addition to lagged GDP. Even controlling for county-group-level fixed unobservables, general time-varying state unobservables, education, density, and allowing for a one decade lag of county GDP and so allowing for serial correlation, the effects of the ancestry weighted variables are still significant and close to the same size. Since at least some aspects of ancestry likely express themselves in the fixed effects and in how state effects vary over time, Table 4 suggests that the effect of ancestry is extremely robust.

[16]To see this, consider that with a coefficient on the decade lag equal to ρ the implied coefficient on the one year lag is $\rho^{1/10}$, and so the yearly convergence is approximately $1 - p^{1/10}$. Another way to think about it, is to remember that log-linearization of the neoclassical growth model implies that the coefficient in front of GDP lagged ten periods equal $e^{-\beta t}$, where β denotes the annual rate of convergence. See, Barro and Sala-i Martin (1992).

This discussion so far has assumed that there is important feedback from county GDP per capita to ancestry. We test for such feedback more formally in Table 5 where we allow for a richer dynamic structure of the equation for county GDP by including two lags of log GDP and of predicted Trust or 1870 GDP. Moreover, we also estimate a parallel equation for predicted Trust or 1870 GDP, and examine Granger causality (Granger, 1969; Sims, 1972) in the context of this bivariate model. Granger causality asks whether the lags of each variable can help predict the other variable. At the bottom of the table, we report the F-statistic and its p-value for th test of whether both lags of county GDP per person are jointy zero, and the F-statistic for whether both lags of Trust or 1870 GDP are zero. The first four columns do not include state-year effects, while columns 4 through 8 include state-year effects, and so estimate only off of within-state within-county variation.

Both Trust and 1870 GDP strongly Granger cause county GDP per person. The F-test strongly rejects the hypothesis that both lags are zero for both variables. Moreover, the coefficients are large, and similar in size to the coefficients estimated in previous regressions. We also cannot reject the hypothesis that county GDP also predicts Trust or 1870 GDP. However, the coefficients on the lags of county GDP in both the Trust and 1870 GDP equations are very small, and sometimes negative. For example, taking the sum of the two coefficients on county GDP in column 2 predicting 1870 GDP and considering this equation in isolation, a permanent 1% increase in county GDP is associated with a -0.01% decrease in the ancestry weighted 1870 GDP. Similarly, a permanent 1% increase in county GDP is associated with a 0.0012 point increase in ancestry weighted Trust. Trust varies in principle between 0 and 1, although, as illustrated by Figure 9, for most countries of origin it is between 0.2 and 0.8. Therefore, there appears to be almost no economically significant feedback from county GDP to our ancestry weighted variables.

4.6 Ancestry and diversity

Until now we have examined the average of the attributes people in a county might have received from their ancestors. Yet the *diversity* of ancestries may be as important as the weighted average of

those attributes. We use several measures of diversity. One is the standard fractionalization index that measures the probability that any two individuals chosen from a population will not be of the same group:

$$frac_{c,t} = 1 - \sum_{a=1}^{A} (\pi_{ct}^{a})^2.$$

Recent work has generalized this index by it to incorporate measures of distance (for reference, see Bossert, D'Ambrosio, and La Ferrara (2011) who generalize early work and provide an axiomatic treatment). We define a measure of similarity based on the difference of some country-of-origin measure z between group j and group k as $s_{ct}^{jk} = 1 - |z^j - z^k|/r$ where $r = \max_{j \in \{1...A\}} z^j - \min_{j \in \{1...A\}} z^j$ is the range of values that z can take. As two groups become more similar along the z dimension, their similarity approaches one. Then a generalized fractionalization index is

$$frac_{c,t}^{w} = 1 - \sum_{j=1}^{A} \sum_{k=1}^{A} \pi_{ct}^{j} \pi_{ct}^{k} s_{ct}^{jk}$$

where the w stands for a "weighted" fractionalization.[17] The standard fractionalization index is just the weighted fractionalization index when members of different groups are assumed to be completely dissimilar ($s^{jk} = 0$ for $i \neq j$). We show results based on fractionalization weighted by Trust, but obtain similar results using fractionalization of 1870 GDP.

In Table 6 we report the results obtained when we include measures of fractionalization and Trust weighted fractionalization in estimates of the static equation 4 when expected Trust, State History and human capital are all included. Increases in county diversity in country-of-origin as captured by fractionalization tend to increase county incomes. Increases in Trust weighted fractionalization decrease incomes. The coefficient on the level of Trust is very similar to the estimates without fractionalization (see column 1 of Table 3). Since fractionalization and weighted

[17] Note that the fractionalization index could also be defined using measures of dissimilarity between groups j and k. If $d_{ct}^{jk} = |z^j - z^k|/r$ then $frac_{c,t}^{w} = \sum_{j=1}^{A} \sum_{k=1}^{A} \pi_{ct}^{j} \pi_{ct}^{k} d_{ct}^{jk}$ since the sum over the AV is 1. Although the discussion assumes a fixed x^j for each ancestry, the country-of-origin measure can change over time as well. For example, it is possible to use the density of arrival weighted country-of-origin GDP to calculate the fractionalization at any given time. The double sum over ancestry makes weighted fractionalization somewhat complicated and computationally intensive to calculate weighted fractionalization over the full county-decade panel.

fractionalization are both indices that vary from 0 to 1, the estimated effects are large: an increase in the fractionalization of Trust by one percentage point (0.01) decreases county income by 2.1%. The estimated effects of Trust, fractionalization, and Trust fractionalization are robust to many different specifications such as including state-year effects, the fraction Native American and African-American, population density, and county education levels. The positive impact of fractionalization and negative impact of Trust fractionalization does not come just from diverse and high income cities and is not just a racial effect, nor is it driven by education.

These results capture two different views of diversity. The positive effect of fractionalization suggests that increases in diversity are generally good. As new people with different tastes or ideas come into a county,they open up new opportunities for trade. Yet if those new groups are substantially different along important dimensions such as trust, this may may create conflict and lead to a decrease in the ability to agree on growth enhancing policies at the local level. One can imagine, for example, that a low-trust group moving into a high-trust area may bring down the average trust level (as captured by the ancestry weighted trust), but also make the high trust group less willing to cooperate, at each level of weighted trust.

It is useful to consider where these results may come from and what they represent. The states of Wisconsin, Minnesota, and Iowa have been historically settled by Europeans and so are typically thought of as having low diversity. Yet the groups that settled there are actually relatively diverse even if they have chosen to work together well and so their differences are not emphasized. Sweden annexed and ruled Norway until 1905, and communities of Germans maintained the German language until World War I. Each of these groups settled distinct areas (the Norwegians and Swedish are combined in Figures 3 and 4 but settled distinct areas). Yet all of these groups have high levels of trust and were relatively well off in 1870. As time progressed and the groups mixed increasingly, the diversity increased, but trust diversity did not and the counties with the most diversity saw a positive evolution in economic outcomes for much of US history.

These results help make sense of a tension in the literature that examines ethnic diversity. In the cross-section, both across countries (Easterly and Levine, 1997) and within them (Alesina, Baqir,

and Easterly, 1999; Miguel and Gugerty, 2005) ethnic diversity is related to lower levels of public goods and lower output. Yet diversity can have positive consequences. For example, Ager and Brückner (2013) demonstrate that increased fractionalization of first generation migrants in the United States is positively associated with output, while a tendency towards polarization—when there is an even division between two groups—is negatively associated with output. Putterman and Weil (2010) find that the standard deviation of state history generated by the post-1500 population flows is positively related to the income of countries today.

5 Conclusions

Using micro-samples from the US census since 1850 we have mapped the ancestral distribution of population of US counties, and combined it with consistent estimates of county level GDP per capita. This panel allows us to assess whether what people inherit from their ancestors affects local economic outcomes. The answer is an emphatic *yes*: ancestry matters. After controlling for observed county-level factors, unobserved fixed county factors, state-specific year effects, and even county-specific trends, the changing ancestry composition of US counties is a significant determinant of their economic success. This conclusion is also robust to a richer dynamic specification of the model, in which ethnic diversity is allowed to have an effect on local GDP with a lag and the lagged dependent variable is included. As to which characteristics inherited from the country of origin matter, we find that the effect on local development of the fraction of an individual ancestry in a county reflects the past economic performance of the country of origin, as summarized by 1870 GDP or by the GDP at the time of migration weighted by the size of migration flows. They are also related to a measure of the strength of state level institutions in 1500 and to the educational endowment of the immigrant groups. The effect is also closely related to cultural attributes of the country of origin. In particular, favorable economic outcomes in a county are positively related to generalized trust and thrift, and negatively related to obedience as a desirable characteristic of children. We find that these cultural variables tend to be the most important relative to other factors.

It is likely that culture and institutions are co-determined: better institutions foster cultural characteristics that enhance cooperation (social capital), which, in turn, make institutions function more effectively. For this reason, our measures of culture are likely to capture the effect on economic development of both good culture and the experience and knowledge of good local institutions of the country of origin.

Finally, not only the characteristics of the country of origin matter, but also their diversity. Our results suggest that ancestry fractionalization is positively related to economic development. However, measures of the fractionalization of the cultural endowment brought by immigrants is negatively related to county level GDP. Both the endowments of what people brought with them and passed on to their children and the diversity of these enodwments matter for economic development. These results suggest that it matters where you came from, but also who you came in contact with once you arrived.

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A Data Appendix

This appendix describes the construction of our measure of ancestry at the county or county group level, our measures of county income and product, our construction of country of origin GDP per capita, our creation of the conditional density of immigrant arrival times, our construction of measures of culture from the World Values Survey, and our construction of immigrant education from the census micro-samples.

A.1 Constructing the Ancestry Vector (AV)

A.1.1 Constructing the AV for those who are not African American or indigenous

Approach for 1790-1840 when information is limited. The first census in 1790 collected some information by state on "nationality" but none of the censuses until 1850 collected such information. We use the 1790 census to create the initial state level nationality vector. The census did not collect nationality information again until 1850, so for the initial step we simply allocate the AV for each year between 1800 and 1820 based on the nationality in 1790. One nationality in 1790 is "Hebrew" although it is very small in all cases. We combine Hebrew with German.

From 1820 to 1830 and 1830 to 1840 the government started collecting information on immigrants, their country of origin and the state where they moved (Barde and Sutch, 2006b). We use these values to update the 1790 ancestry vector to account for the immigration flows during these two decades.

Approach for 1850, 1860, 1870, 1980, 1990, and 2000 when no parent data exists, but we have individual data on nativity. Starting in 1850 the census asked the country of birth for those born outside the United States and the state of birth for those born within. Samples from the records have been collected and digitized and are stored in the Integrated Public Use Microdata Series (IPUMS) collected by Ruggles et al. (2010). For most years the sample was 1 in 100 but larger samples (5%) exist for some years and we use those where possible.

For each person in the microsample, we create an ancestry vector. The person receives a one

for the place of birth if he or she is from that foreign country. Starting in 1880 the census also recorded the place of an individuals parents. We describe how we use this information below. Without the parent information, for non-immigrants we use the demographic structure attributing to an individual the AV for the age group between 20 or 30 in the place of birth at the time of her birth. Using those who are 20-30 year older means we attribute to a person the AV of the age group most likely to be her parents. For a non-immigrant who lives in the same state as she was born, we attribute to her the AV for those who were 20-30 in the county where she lives now as of the closest census to her birth. This age group is in their most fertile years and so are the most likely to be her parents. We give non-immigrants who have moved the AV for 20-30 year olds from their state of birth as of the closest census to their birth.

During a period of rapid immigration keeping track of the changing demographics matters. For example, consider someone who was 30 years old in the 1870 census and was born in Suffolk county, Massachusetts which contains Boston. We would not want to give a large probability that she had an Irish ancestry, since there was not yet a large Irish presence in 1840. On the other hand, a 10 year old in 1870 would be much more likely to have an Irish ancestry The combination of more Irish, and more Irish in the 20-30 age group makes Irish ancestry more likely. We create the county average over all individuals to give AV for county and state in that year, as well as the the AV for those age 20-30 (the "parent" AV). Since we have only state level variation until 1850, 1860 is the first year where the parent AV will differ by county. In later years as we move forward with additional microdata, counties become increasingly diverse.

Approach for 1880 to 1970 using parent nativity. From 1880 to 1970 the census also collected information on the birthplace of the parents of each person in the census. We use the same procedure when only the individual birth place is known for the parents, and then give the individual one half of each parent's AV. So $AV_i = 0.5AV(Mother_i) + 0.5AV(Father_i)$. For the foreign born parents we assign them an AV with 1 for the country of birth and zero elsewhere. For native parents, we assign the parent the AV for the age group 20-30 in each parent's state of birth in the closest census of birth. If the parent is born in the same state the individual is living in now, we

assign the parents the county AV for those 20-30 in the birth year. It is common for both parents to be from the same country, in which case the AV is just 1 in the country of origin of both parents.

Approach for 1890 when no individual data exists. Because a fire wiped out all of the individual level 1890 records, we have to use aggregate data published by the census for this year. The NHGIS (Minnesota Population Center, 2011) has collected county level information for a wide range of variables in a number of census years, including 1890, from the published census volumes. These record the place of birth of the foreign born population. For each county the AV is: $AV(\text{County}) = (\text{Fraction Foreign}) * AV(\text{Foreign Born}) + (\text{Fraction Native}) * AV(\text{Natives})$.

Forming the non-immigrant AV is more difficult, since the place of birth is only available at the state level. We use the demographic structure by state in 1880 aged by 10 years to assign weights for birth years—the fraction of the native population born closest to the 1880 census, the 1870 census and so on. Then we assign the native AV over all states as the double sum over state s birthplace (BPL) and year of birth for each age group d:

$$AV(\text{Native born in state}_j) = \sum_{s=1}^{S} \sum_{d=0}^{D} f_{s,j} f_{d,j} AV(s, \text{birthyear of } d)$$

where $f_{s,j}$ is the fraction of the native population in state j born in state s and $f_{d,j}$ is the fraction of birth group d in state j as constructed from 1880.

Approach for 1940. The 1940 census introduced for what appears to be the first time supplemental questions that were asked to only a subset of the population. We will use the question about ancestry in the supplement. The Public Use Microdata Sample then took a sample from the people who answered the supplemental question and their households. Since that would tend to over-sample large households, they first sampled people who had been selected to answer the supplemental question, and then selected the households of that person with probability equal to the inverse of household size. It is an elegant solution since it gave a representative sample of the entire population and ensured that every household had one person who had answered the supplemental questions. The procedure means that selecting only those who have answered the

supplemental questions is no longer representative. We use the sample weights to adjust for the sampling procedure.[18]

A.1.2 African-Americans and indigenous peoples

Race is a very important and sensitive issue in the US, and the evidence suggests that it is not nearly as fixed as is sometimes believed. Since we are primarily interested in the relationship that culture and institutions have with economic outcomes, forced migration and slavery are one potential source of a particular set of culture and institutions. We therefore treat self-identified "black" or African-American Ras its own ancestry group. Although the census questions and culture often use the two interchangeably, we make a distinction between the two terms: "black" is a racial construct, whose definition has changed over time, and we enclose in quotation marks to emphasize it is how someone describes herself or is described by others, rather than anything inherent. African-American is an ancestry and so, like other ancestries, captures only that some fraction of the people in a given area had ancestors who came from Africa.

Treating African-American as an ancestry group of its own assumes it absorbs all other groups; a child with a mother with African ancestry and a father from some other ancestry is African-American as long as she or the census taker identifies herself as such. So someone who is identified by early census takers as "black" or self-identifies as African-American has an AV that contains a 1 for African-American. This approach combines later immigrants from Africa, who were not the descendents of former slaves, with the descendents of former slaves. Significant free migration from African countries does not occur until late in the sample, and it is not clear we can cleanly separate the two groups.

While we admit that this approach ignores many complexities of race in America, we think it is closer to capturing the experience of race in US history. In the long and racist history of the United States, the impositions of outside society have tended to make "black" an absorbing state

[18] See the variables here: `https://usa.ipums.org/usa-action/variables/SLWT#description_section`. A complete description of the 1940 sample is here: `https://usa.ipums.org/usa/voliii/1940samp.shtml`.

and actively worked to prevent intermarriage. The rape of slave women was widespread (Kolchin, 2003, pp. 124-5), and so many African-Americans are the partially descendants of slave holders. Yet children of "black" mothers were still considered "black" and were still slaves (Higginbothham and Kopytoff, 2000). After the Civil War, interracial marriage was still illegal in 17 states in 1967 when the US supreme court struck down anti-miscegenation laws (Kennedy, 2000, p. 62). Such laws had the unseemly consequence that made it necessary legally to define who was prohibited from marrying whom by virtue of their "blood" (Saks, 2000). The strictest rule held that "one drop" of blood of African ancestry made someone "black," although the enforcement was not universal and less strict rules also existed (Kennedy, 2000). Partly as a consequence of this history, intermarriage between "blacks" and "whites" were uncommon until very recently. Intermarriage among all races represented just 3.2% of marriages in 1980, but grew to 8.4% by 2010, and such marriages have quickly grown in acceptance Wang (2012).

Using race, even when intermarriage is common, is not necessarily a problem. Our measures are only meaningful as aggregates, and so as some individuals report themselves to be of mixed race or "Other," the ancestry vector still captures the range of other ancestries. For example, if two children of a mixed race couple report themselves to be of different races, the county aggregate still reflects their mixture between "black" and "white." The aggregate will also correctly capture the mix of ancestries, since the "white" child has the full mix of non-African-American ancestries, while we give the "black" child an African-American ancestry, and the average of them is the appropriate mix of ancestries in the population. What it misses, however, is the endogeneity in the construction of race: if both children consider themselves "black," then we will underestimate the contribution of other ancestries. Both children may consider themselves "black" because they live in an area where the "one drop" rule still prevails socially, and so being "black" is imposed upon them, or because they live in a community where they choose to emphasize one side of their heritage. Until recently, the low rates of intermarriage made this problem largely irrelevant. Increasing intermarriage suggests that this approach of using race as ancestry will be less tenable in the future.

Similar to African Americans, we treat Native Americans as their own ancestry group. Partly due to the legacy of forced settlement into reservations, some counties have a large presence of Native Americans. They are not always recorded well in the early censuses. Where possible, we take self-identified natives as their own ancestry group and assume no mixing. Except for counties with reservations, they are typically a small portion of the population, so this assumption is not particularly strong.

A.1.3 On mixing

Our procedure does not distinguish between complete ancestry mixing and the full separation of ancestries that share the same geography. For example, in a population half German and half Irish, the second generation will have an AV half German and half Irish whether or not all of the Germans marry Germans and all of the Irish marry Irish or there is inter-marriage between Irish and Germans. The AV is thus the appropriate estimate of the expected ancestry of any individual from that population, but does not provide a measure of cultural mixing, only of co-location. For African-Americans the use of race assumes that they are fully African-American.

A.1.4 Aggregation and PUMAs

To protect anonymity, from 1950 onwards the microdata does not typically give counties for the individual records. Usually there is some geographic identifier that combines several counties, although in 1960 only state level information is available. We therefore use the somewhat larger units available in each year to update the county level, but maintain the county as the basic unit of observation. The basic idea is that counties within a group will have a different history and different AV from when we can fully identify them from 1940 and earlier. The new information from each post-1940 census is the same within each group but is applied to an already existing AV. Finally, we aggregate the constructed county level data up to the 1980 Public Use Micro Areas (PUMAs) since these are the most consistently used areas after 1950. In keeping with the terminology starting in

1950, we refer to these somewhat larger aggregates as county groups.[19]

A.2 Constructing county GDP

A.2.1 County manufacturing and agricultural value added 1850-1940

The census recorded for each county the total value of agricultural output and the value of manufacturing output and costs of inputs. We construct nominal value added of manufacturing by subtracting the cost of inputs from the total output. In 1850, the census did not collect manufacturing inputs. We use the average of the 1860 and 1870 county level ratio of outputs to inputs in manufacturing to create inputs. This approach assumes that at a county level the same ratio of inputs to outputs is used in 1850 as in 1860 and 1870.

For agriculture during this period the only local measures that exist are of output, not value added. No good measure at the county level exists of the costs of inputs in agriculture over a long period. Agriculture does have intermediate inputs such as fertilizers as well as agriculture inputs used in the production of other agricultural outputs such a feed corn for cattle and seed. To account for these inputs, we construct a national measure of the ratio of value added to total output by subtracting intermediate inputs from total agricultural output using series K 220 -250 from U.S. Census Bureau (1975). While intermediate inputs were small early on at about 6% in 1850, increasing to nearly 12% by 1900, by 1940 they were nearly 40%. Adjusting for intermediate inputs hastens the relative decline of agriculture after 1900. We apply the ratio between nominal value added and output at the national level to the value of county level agricultural output to obtain an estimate of agricultural value added at the county level.

The census did not collect manufacturing data in 1910, although estimates of it exist at a national level. To create county level manufacturing, we interpolate between 1900 and 1920 using the national growth in manufacturing value added and allocating growth to each decade in the same way we allocated growth in services so that manufacturing value added grows in each decade in

[19] See `https://usa.ipums.org/usa/volii/tgeotools.shtml` for a description of the geographic identifiers used over time.

each county at the same rate it does at the national level.

A.2.2 Using county employment 1850-1940 to construct value added in services, mining and construction

The micro-samples of the decadal census collect information on the occupation codes of the individuals. We allocate the occupations to correspond to the broad NIPA categories, and so create r a measure of the total workers employed in a give industry in each decade. Then we create county level measures of services value added by multiplying county level employment for each service category (trade, transportation and public utilities, finance, professional services, personal services, and government) by the national measure of value added per employee,the construction of which is detailed below. We follow the same procedure for construction and mining.

There are several important difficulties with creating county employment: occupations change over time and some occupations such as legal services that may be classified as a service for an individual are part of manufacturing value added when performed for a manufacturing firm.

In addition, the sexism and racism inherent in the early censuses poses additional difficulties. In 1850 women were not coded as having an occupation. While many women did work solely in domestic production, some women were employed outside the home. Similarly, in 1850 and 1860, slaves were not listed as having an occupation. While both slaves and women were enumerated for political purposes, we do not have information on their occupation. Many, but not all, of the slaves would have been employed in agricultural production, either directly or indirectly so we are not missing their output entirely, only undervaluing the skilled services they did provide.

Since the physical census records from 1890 were largely destroyed by fire, there is no micro-sample from 1890. We linearly interpolate for each county the employment by industry category in 1890 using 1880 and 1900.

A.2.3 Measures of services, mining, and construction at the national level 1850-1960

The construction of value added for services, mining and construction varies by sub-period depending on the information available

Value added per worker by services category 1840-1900. Gallman and Weiss (1969) construct measures of services value added and employment for eight categories at a national level from 1840 to 1900: trade; transportation and public utilities; finance professional services, personal services, government, education, and "hand trades." Hand trades are composed of smithing, shoe repair, and tailoring. These activities are technically manufacturing (they are constructed by hand or *manus*), but by the time formal national accounts were constructed in the 1950s had become part of services. Since the census includes output from the hand trades as manufacturing, we exclude them to avoid double counting. Combined with the Gallman and Weiss (1969) estimates of the labor force in each category, we create a measure of the value added per worker.

Value added per worker by services category 1930-1960. The National Income and Product Accounts (United States Department of Commerce, 1993) break down by industry the product (p. 104) and "persons engaged in production" (p. 122) which includes full time employees, part-time employees, and the self-employed. Since the census samples we use at the county level do not distinguish between full and part-time work or self-employment, the broad measure best matches the county data we use. We use the equivalent tables in United States Department of Commerce (2001) to construct nominal value added per person engaged in production for the post-war period.

Constructing value added for services in 1910 and 1920. No estimates connect the Gallman and Weiss (1969) and United States Department of Commerce (1993) estimates of services value added by category. Since our goal is to correctly capture the relative value of different services, and their relationship to other productive activities, we interpolate the national value added of service categories in 1910 and 1920 based on 1900 and 1930. Since both prices and real activity increased rapidly over the period, the interpolation method matters. Linear interpolation, for example, is not a good choice because overall growth rates differ by decade. Linear interpolation of current dollar values between 1900 and 1930 tends to overstate growth from 1910 to 1920 since overall real GDP

grew faster from 1900 to 1910 than 1910 to 1920 while prices grew faster from 1910 to 1920. So we first convert value added by each service category to real values using the GDP price deflator from Sutch (2006). Then we allocate growth in each decade in each service category from 1900 to 1930 to match the growth of real GDP per capita 1900 to 1930.[20] Note that we do not require the growth in service categories to be the same (some categories had almost no real growth over the period), only that where there is growth the proportion that takes place between 1900 and 1910 be the same as for overall growth. We finally obtain nominal quantities of (national) service value added for 1910 and 1920 by multiplying by the GDP price deflator from Sutch (2006).

Value added for construction and mining. We use the values of mining and contract construction from the National Income and Product Accounts in 1930 and 1940 to construct national value added per worker. From 1880 to 1920 we also use the estimates of Wright (2006) for mining. From 1850 to 1870 we use the ratio of the value added per worker in mining to the value added in transportation in 1880 times the value added per worker in transportation in 1850, 1860, and 1870. This approach assumes that the value added in transportation and mining grow at the same rate from 1850 to 1870. An important part of the value of mineral and fuel extraction comes from transporting it to populated areas. Transportation value added per worker grew at close to the same rate as overall national product per person during the period. Our approach for construction is similar but involves even stronger assumptions. Construction value added per worker before 1930 is simply its ratio to national income per person in 1930 and 1940. This approach assumes that construction value added grows at the same rate as the national economy, and that employment in construction is a good measure of the distribution of construction activity. Construction is a relatively small component of GDP—it composed only 5% of national product in 1950 and our estimates suggest it was smaller before that—and this approach puts a reasonable value on construction.

[20] Let y_{1900} be real national GDP per capita in 1900. Then a fraction $f^y_{1910-1900} = (y_{1910} - y_{1900})/(y_{1930} - y_{1900})$ of that growth took place between 1900 and 1910. We assume the same fraction of growth in each service category took place between 1900 and 1910. So for some service category s we observe value added per person y^s_{1900} and y^s_{1930} then we calculate $y^s_{1910} = f^y_{1910-1900} * (y^s_{1930} - y^s_{1910})$.

A.2.4 Income per capita 1950-2010

Starting in 1950 official statistics report measures of personal income per capita at the county level. We combine the county level income data from the County Data Books (United States Department of Commerce Bureau of the Census, 2012) with the county income from the census in 1980, 1990, 2000, and the combined 2008-2012 American Community Survey collected by Minnesota Population Center (2011). In 1950, the census only reported median household income at the county level, while in other years we have mean income per person. To account for this discrepancy we multiply the 1950 median household income by the mean income to median income ratio in 1960 for each county. This approach is exactly correct if growth from 1950 to 1960 was entirely mean shifting, leaving the distribution unchanged, and family sizes did not change.

A.2.5 County output 1950 and 1960

Starting in 1950, the census micro-samples no longer report the current county of residence so it is no longer possible to construct county employment shares by industry. The City and County Databooks (United States Department of Commerce Bureau of the Census, 2012) provide measures of employment in 1950 and 1960, as well as manufacturing and agricultural products sold.

The manufacturing values in the the Databooks are reported as value added in 1947, 1954, 1958, and 1963. Rather than taking the linear average, which misses the rapid growth during the period, we take the average growth rate in each county from 1947 to 1954, and use the county specific growth rate for three years starting in 1947. We use the same method to update 1958.

The agriculture values in the Databooks give the total value of farm products sold in 1950 and 1959 which we use to construct agriculture in 1960 by multiplying the county value by the nominal national increase in the total output in agriculture from 1959 to 1960 in series K 220-239 in U.S. Census Bureau (1975). Since these values do not include farm products consumed by farm households, we adjust both for value added and consumption using series K 220-239 in U.S. Census Bureau (1975). Own consumption was slightly more than 6% of total farm output in 1950. Of much larger importance is the value of intermediate inputs which were close to 40% of total

output in 1950.

The Databooks report "Mining Industries Employees" in 1939 which we use for 1940 without adjustment, and 1958 and 1963 which we apply to 1960 by taking the county specific linear average. The Databooks report a value added measure of mining in 1963, but we continue to use the employment based measure for consistency with earlier estimates.

In 1950 and 1960, the Databooks report the employees in construction; manufacturing; transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; and overall employment. The reporting in the Databooks for some counties is problematic, since some counties have more employment listed in a given category than overall. To create a less error filled employment variable, we take the larger of civilian and total employment (total employment is not always larger). Personal and professional employees are only reported in 1950, and government employees only in 1970. We use overall employment to construct a residual government and personal employment in 1950 and 1960 by subtracting out the other categories and setting the residual to zero if it would be negative. The residual in 1960 contains both government and personal services, we divide between them using the fraction of personal in personal and government services in 1950.

With employment totals we find a value added of services using the same method as for 1940 and earlier. Using Tables 6.1B for national income by industry and 6.8B "Persons engaged in production" in United States Department of Commerce (2001) gives an average product per employee per industry which combine with employment by industry in each county to create a measure of value added by county by industry.

A.2.6 Combining income and output measures

From 1850 to 1960 we have created something close to GDP per capita for each county. Starting in 1950 we have an income based measure from the census. These two measures are not the same; in each decade from 1950 to 2010, the sum of county aggregate incomes from the census is less than GDP from the national accounts. Income leaves out a number of categories such as owner

occupied rent that are included in GDP. A a county level, moreover, income, which can include profits from activities elsewhere, need not be the same as a measure of the gross domestic product produced in a county. We use the overlap of our income measure and GDP measure in 1950 to combine the two series to create a measure of GDP per capita over the entire time period. We use the ratio of GDP to income in 1950 and update using the county income after that. Effectively, we use the growth rate of personal income at the county level to approximate the growth rate of county level GDP after 1950. Some counties have GDP-to-income ratios that are extreme because the constructed value of county GDP is low. We replace the five counties with a GDP-to-income ratio less that 0.3 with their state average ratio.

Finally, we deflate our constructed measure of county level nominal GDP by the GDP deflator in Sutch (2006), updated using Bureau of Economic Analysis tables on GDP and the GDP deflator.

A.3 Creating a density of arrival times

Immigrants arrived at different times and we would like to reflect what immigrants brought with them by the conditions in their country of origin at the time of immigration. Doing so requires knowledge of the conditional density of immigration over time so that, for example, the Irish coming in the 1850s reflect different experiences than the Irish in the 1890s, both of whom are different from the Italians in the 1910s. Our ancestry measure captures very well the stock of people whose ancestors came from a country of origin. Since it is a stock, however, changes in it reflect both increases from migration, but also natural changes from births and deaths. We therefore turn to immigration records that contain the number of migrants arriving from different countries starting in the 1820s (Department of Homeland Security, 2013) at a national level. In 1850 we create a density of arrival times for the stock of migrants in 1850 based on Daniels (2002). The division is appropriately coarse given the limited information, and so only divides between arrivals in 1650, 1700, 1750, 1800, and 1850. For example, we allocate all of the Netherlands arrivals to 1700, and divide the English migrants to between 1650 and 1750 to reflect the later migration of lowland Scots and Scotch-Irish. Using our ancestry vector and county population, we create

a stock of total population of ancestry a in time t: P_t^a. The immigration records then record the number of migrants I_{t+1}^a from country a over the decade from t to $t+1$. The density $F_t^a(\tau)$ gives the density of arrival times τ of the descendents of the population of ancestry a at time t (which is by definition 0 for all $\tau > t$ since it is a conditional density). We update it based on immigration records using:

$$F_{t+1}^a(\tau) = \frac{(P_{t+1}^a - I_{t+1}^a)F_{t+1}^a(\tau) + I_{t+1}^a 1(\tau = t+1)}{P_{t+1}^a}, \tag{5}$$

where $1(\tau = t+1)$ is an indicator which is one if $\tau = t+1$. This formula updates the density at t by the fraction of new migrants between t and $t+1$ compared to the total stock. For example, the density changes only slightly for the English between 1880 and 1890, despite more than 800,000 migrants because the stock is so large, while the 1.4 million German immigrants significantly shift the arrival density of Germans because of the smaller stock.

We modify this approach slightly for smaller immigrant groups. Immigration records group some countries together and information is not available for all countries. We assign the density of arrival times to similar countries, or from the overall group. For example, we assign the arrival times of "Other Europe" in the immigration records to Iceland. However, the total migration from all of "Other Europe" is larger than our estimates of the population descended from Iceland migrants in most years. We assume that the arrival of migrants is proportional to the larger group (or similar country), and scale the number of migrants so that the population implied by the immigrant records is no larger than the population implied by the census records. In particular, define a projected population that would come from immigration and natural increase from growth rate g:

$$\hat{P_t^a} = \sum_{\tau=t}^{-\infty} (1+g)^{t-\tau} I_\tau^a.$$

$\hat{P_t^a}$ is the population that would occur if all immigrants came and then grew in population at growth rate g. Then define:

$$\omega^a = \max_t \frac{\hat{P_t^a}}{P_t^a}$$

as the maximum ratio of the projected population based on the (too large) immigration records and the population descended from group a. We then define the scaled immigration of the particular group as $\hat{I}_t^a = I_t^a/\omega^a$ which scales the number of migrants to the overall population of that group.[21]

Autria-Hungary and its constituent countries pose a special problem. At least some Czech and Slovak migration (which are record together as Czechoslovakia) appears to be part of the Austrian migration in the immigration records since our ancestry calculations suggest a substantial Czechoslovakia presence from 1900 to 1920, while the immigration records show few migrants. Similarly, Poland was divided among Austria, Hungary, Germany, and Russia in the decades ending in 1900, 1910, and 1920 during a period of peak migration. We assign a fraction of Austrian migration to Czechoslovakia, and a portion of German, Hungarian, and Russian migration to Poland. The fractions are approximate based on the relative populations in 1910.

Several groups have a special set of arrival times that are more or less by assumption. We assign African Americans an arrival of 1750. Significant groups of Native Americans are first counted in the census or forced to move to new areas after 1850. We assign them an "arrival" of 1840, acknowledging that giving an indigenous group an arrival time is problematic, but think of it as representing an approximate density of the start of substantial contact with other groups, with all of its many, often negative, consequences. Puerto Rico similarly represents a complicated situation since Puerto Rican's have been US. citizens since 1917, but the data used to track Puerto Rico the same way as the rest of the US counties is only sporadically available. We allocate a small mainland migration in 1910 and a much larger one in 1960 to match the ancestry population totals.

While the density is approximate it still provides very useful information that matches immigration narratives. For example, the 2010 density gives the average decade of arrival for each ancestry living in 2010. Most Irish are descended from immigrants who arrived in the 1840s, with substantial populations in the 1850s and 1860s, but few afterwards compared to the large popu-

[21]The procedure is slightly more complicated for small countries where measurement error in either our measure based on samples from the census, or immigration statistics can produce very large ω^a. We define ω^a as the maximum ratio of projected to census population when the census population is at least 100,000. If the ancestry never reaches 100,000, we still use the overall maximum. Finally, if this procedure produces an immigration flow larger than our projected population, we set the density equal to 1 in that year.

lation. Based on these calculations, more people of Chinese ancestry are descended from people who migrated from 1860 - 1880 than the second wave of Chinese migration from 1970-2010. Far more migrants came later, but the early migrants had already established a population which grew over time and which we track geographically with the census calculations. Other Asian migrants have come mostly since 1970, except the Japanese who are mostly descended from early migrants.

A.4 Origin Country GDP

This section briefly details how we fill in the gaps left in origin country GDP per person in the Bolt and van Zanden (2013) update of Maddison (1995). Some crucial countries of origin are not available for all dates going back although some information is available. We fill in missing data by making reasonable assumptions about the likely relationship within other countries or the same country on surrounding dates. The most important of these is Ireland which did not obtain independence until 1921, and has only spotty estimates of income separate from the United Kingdom. We use the ratio of Irish to UK GDP in 1921 to fill in dates from 1880 to 1920, and the ratio of Irish to UK in 1870 to fill in dates before that. While this approach will clearly miss Irish specific events such as the potato blight, our goal is to get the relative incomes appropriately.

Little information is available for countries in Africa. Ghana, a British colony, has estimates in 1913 and 1870 and yearly starting in 1950 (Ghana was the first African country to achieve independence in 1957). We linearly interpolate between 1870, 1913, and 1950, but since the value in 1870 is close to subsistence (439 in 1990 $) we set 1850 and 1860 to 439.

The West Indies is a birthplace for a substantial portion of the population in some areas early on. We use the post-1950 Maddison numbers for the Caribbean. We take the ratio of the Caribbean to Jamaica between 1913 and 1950 when there are no overall Caribbean numbers listed, interpolate between years 1900 to 1913, and again use the ratio of Caribbean to Jamaica between 1900 and 1870, and again prior to 1870.

Latvia, Lithuania, and Estonia have some early migration (small overall). They are combined where there is data on them separately, but we use the ratio with overall Eastern Europe to go back

earlier.

Puerto Rico has a special status. It has been a US possession since 1898, and after 1950 there was significant migration to the mainland. We treat Puerto Rico as a separate ancestry recognizing its distinct culture. The ancestors of Puerto Ricans appear to be a combination of Spanish, Africans brought as slaves, and a mix of other immigrants. We assign Puerto Rico its own GDP after 1950, but before that give it the Caribbean GDP adjusted for the Puerto Rico-to-Caribbean ratio in 1950.

The Pacific Islands (a birthplace in the census) as well as American Somoa represent a similar problem to Puerto Rico. We create a Pacific Islands (including Somoa) GDP per capita by taking the ratio of Fiji and Indonesia in 2010 (source: World Bank, 2010 International $PPP) and using the Indonesian GDP going back in time.

We create Latin America GDP before 1870 as the ratio of Argentina, Brazil, and Colombia in 1870 times their average before that. Mexico is always separate, so Latin America excludes Mexico as an ancestry.

Israel is complicated in the past since it had substantial migration to create the modern state. We assign the Lebanon GDP to Israel/Palestine before 1950. Note that Jewish migration from Europe to the US is measured as the country of origin in Europe.

Afghanistan has the India GDP in 1870, and its own after 1950.

For smaller countries (with comparably small migrations) where information is missing we assign them to a comparable larger country. We assign Lichtenstein, Monaco, and Andorra the French GDP; San Marino, Vatican City, Malta, and Cyprus the Italian GDP; Gibraltar the Spain GDP; Lapland n.s. the Finland GDP. All of Eastern Europe n.s., Central Europe n.s., Eastern Europe n.s., and Southern Europe n.s. get the Eastern Europe overall GDP.

A.5 Culture Measures from the World Values Survey

We construct measures of several cultural attitudes from the European Values Survey and the World Values Survey. We use an integrated version of the survey that combines both sources and utilized each of the six waves available between 1981 and 2014. The institutional endowment is inferred

from the answers to six survey questions:

Trust: A measure of generalized trust is estimated from the responses to the question: “Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?” We calculate the proportion of the total respondents from a given nationality that answer that “most people can be trusted.” An alternative response to this question is that one “can’t be too careful.”

Control: As a measure of the attitude towards one’s control over personal circumstances we use the answer to the question: “Some people feel they have completely free choice and control over their lives, while other people feel that what they do has no real effect on what happens to them. Please use this scale where 1 means "none at all" and 10 means "a great deal" to indicate how much freedom of choice and control you feel you have over the way your life turns out.” In particular, we take the average response by nationality for all countries in our dataset.

Respect, Obedience, and Thrift: To measure the attitude toward authority and towards saving behavior we use the following question from the survey: “Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Please choose up to five.“ There are 17 possible qualities listed. We estimate the proportion of people by nationality that respond that “tolerance and respect for other people” is important to measure Respect and the proportion of people that respond that “obedience” is important to measure Obedience. To measure the importance of saving we estimate the proportion of people that respond that “thrift saving money and things” is important.

Holiday: To measure the attitude towards leisure we use the response to the question: “Here are some more aspects of a job that people say are important. Please look at them and tell me which ones you personally think are important in a job?” Similarly to the questions regarding important qualities in children this question has 18 different aspects. We use the fraction of people that respond that “generous holidays” is an important aspect in a job to proxy for the attitude towards leisure.

Following Tabellini (2010) we also form the first principal component of the combined attitudes

Trust, Control, Respect, and Obedience at the individual level, and then take the average of the principal component for each country.

A.6 Immigrant Education

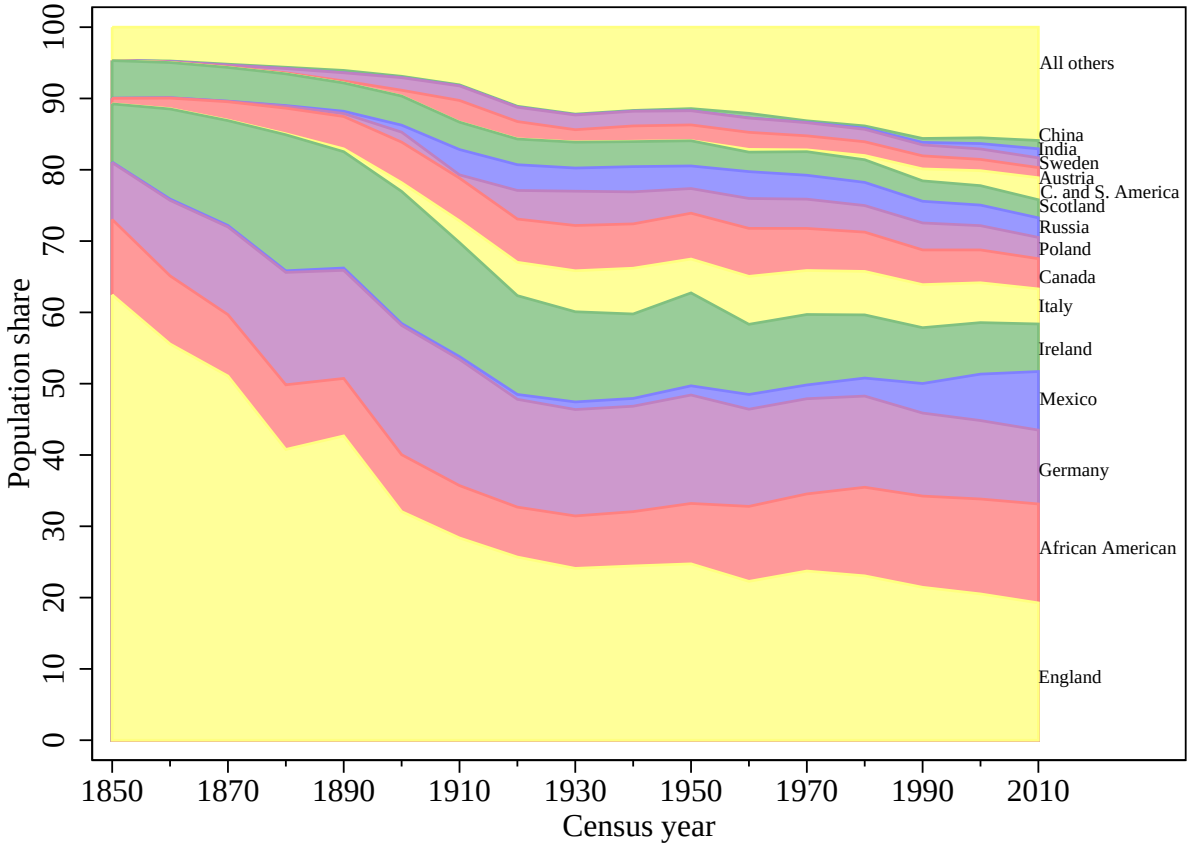
In this section we describe how we measure immigrant education, attempting to capture the human capital compared to the United States at the time, of the immigrants when they arrive. Combined with the density of arrival times, the measure of new immigrant education gives an average arrival weighted education.

The census records the birthplace, so we know the education of immigrants, but does not record the year of arrival. For example, although the census records the Italians who were in the US. in 1910, we do not know which of them arrived between 1900 and 1910. We make the assumption that recent migrants are those who were born in a foreign country and are between 20 and 30 as of the age census. Most of the large waves of migration were primarily among young people, although some migrants brought their families and so came as children. Taking the 20-30 year olds thus mixes some people who came recently with some who may have come as children and so received an their education in the United States. In 1850 we assign the literacy of the 30-40 years olds migrants to the 20-30 year olds migrating in 1830-1840. For 1890 when the census micro-samples were destroyed we assign the literacy of the 30-40 year olds in 1900. For African Americans we use the education level as of 1900 since there were rapid gains in literacy after the civil war which slowed after 1900. For Native Americans we use the literacy levels as of 1900 which is the first year that Native Americans are recorded extensively.

The micro-samples from the census record the education as well as the birthplace. Before 1940 the census only records literacy, while after that it records years of education. Since we want to create a measure that captures the average relative education of migrants, we must combine these disparate measures so that we can compare the relative education of later migrants with early ones. We take the ratio of the 20-30 migrant literacy for each ancestry to the non-migrant US education of 20-30 year olds before 1940, and use years of education starting in 1940.

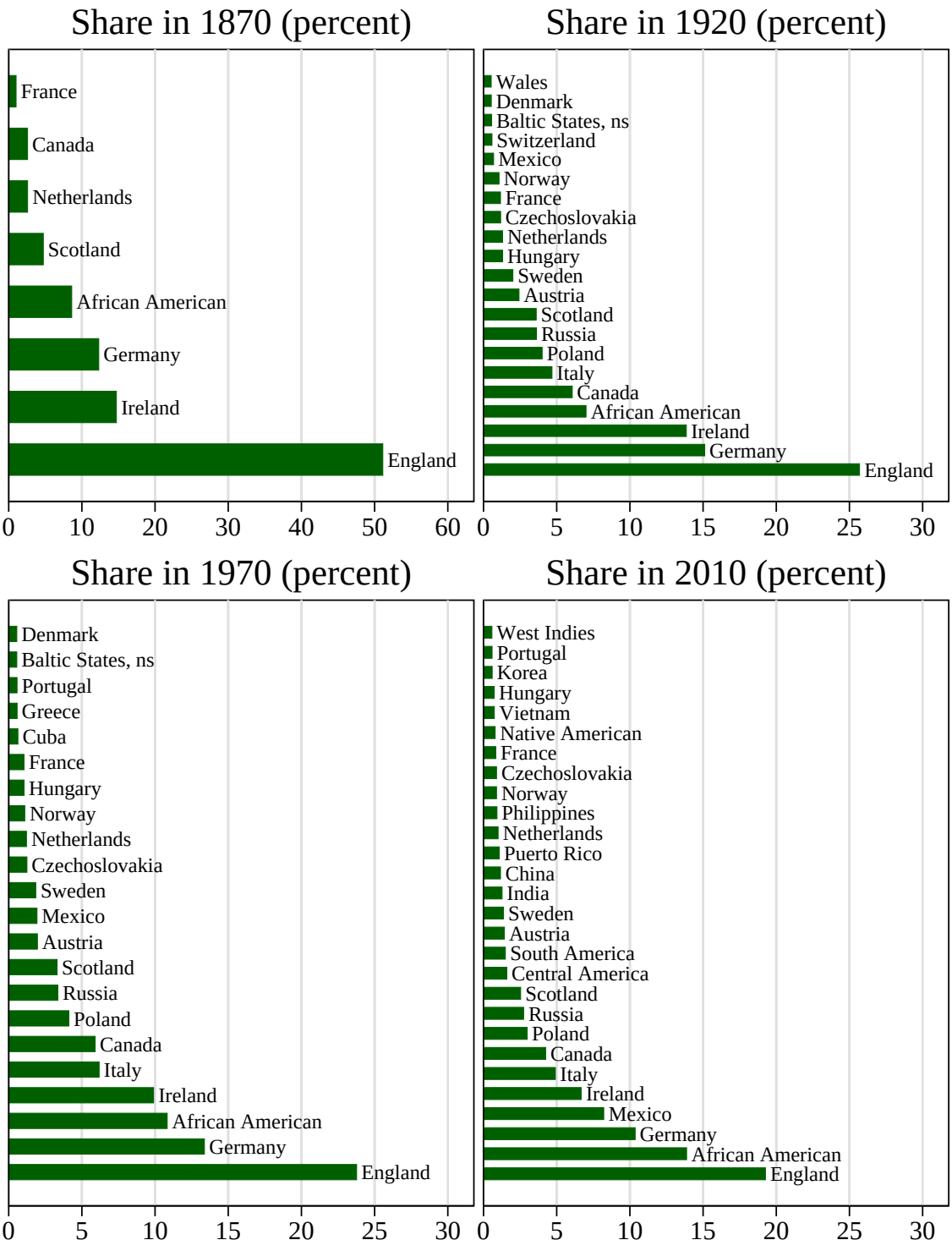
With no adjustment this procedure assumes that the ratio of years of education is the same as the ratio of literacy. Rather than make this strong assumption, we instead adjust the literacy ratio so that it gives the linear prediction of the years of education ratio. To do this we take the demographic groups that are age 30-40, 40-50, and 50-60 in 1940 for whom we observe their education, and compare the literacy of the same ancestry groups who were 20-30, 30-40, and 40-50 in 1930. Regressing the ratio of each age-ancestry groups years of education to the US (measured in 1940) on the same ratio for literacy (measured in 1930) then gives a prediction of how the ratio to US literacy converts to the ratio to US years of education on average. We use this prediction to adjust the literacy ratios before 1940.

Figure 1: Ancestry share in the United States: 1850-2010



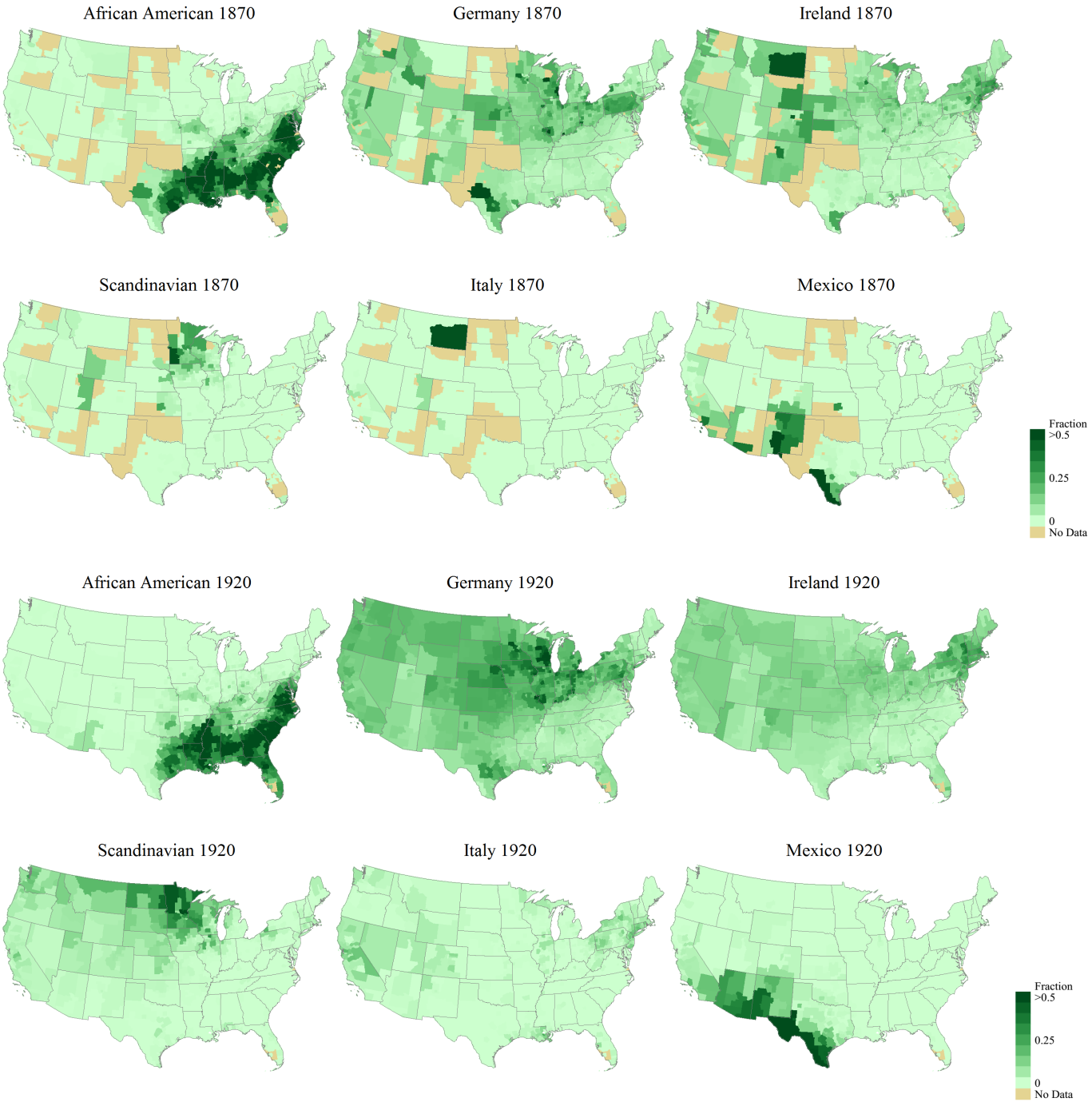
Notes: Shows the aggregate ancestry shares in the US over time. Ancestry shares are created by summing the share in each county weighted by county population. See appendix A.1 for the ancestry construction.

Figure 2: Ancestry share in the United States: 1870, 1920, 1970, and 2010



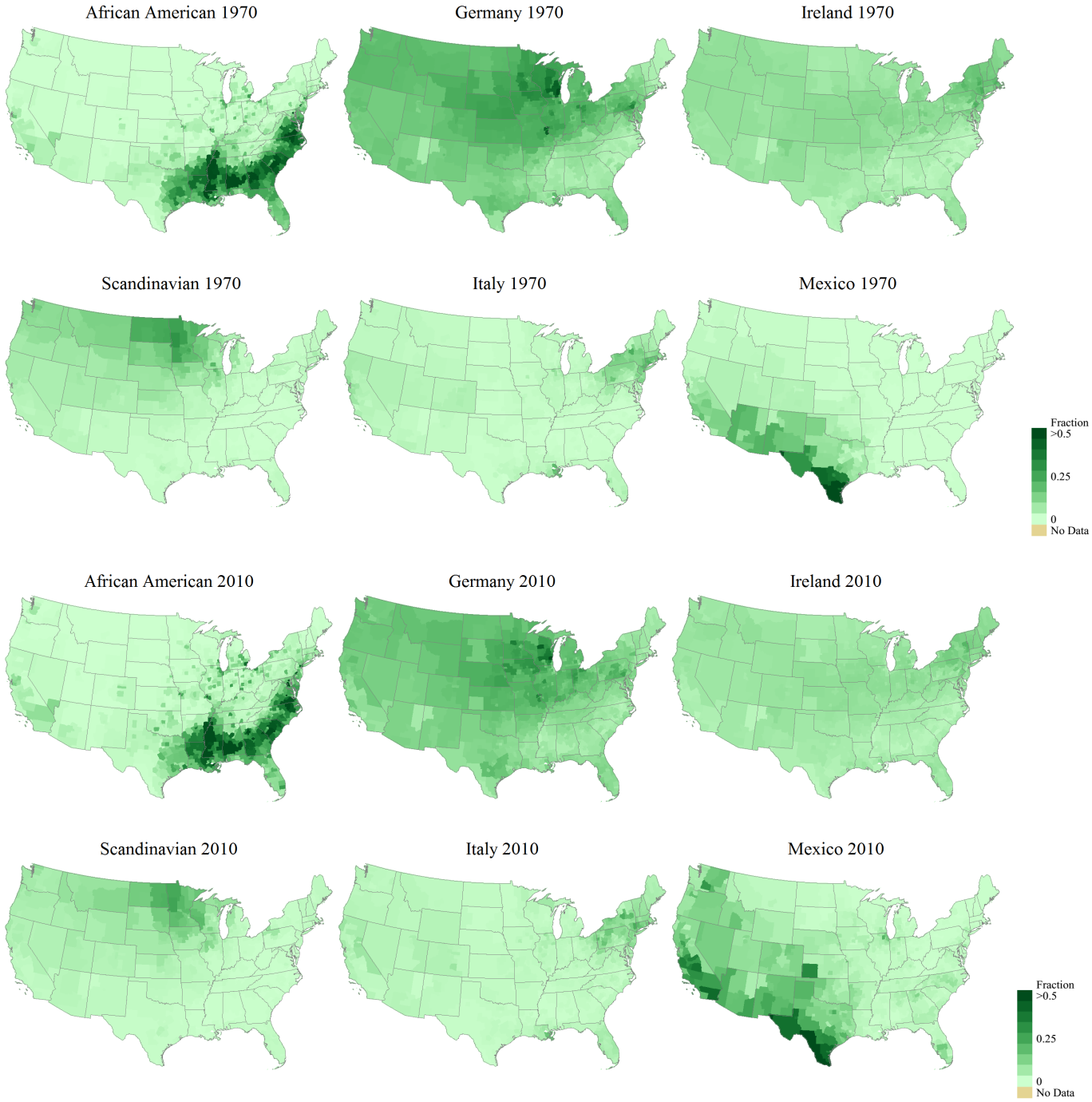
Notes: Shows the aggregate ancestry shares in the US for ancestries with greater that 0.5% of the population. Ancestry shares are created by summing the share in each county weighted by county population in each year. See section 2 and appendix A.1 for the ancestry construction.

Figure 3: Select ancestries in the United States: 1870 and 1920



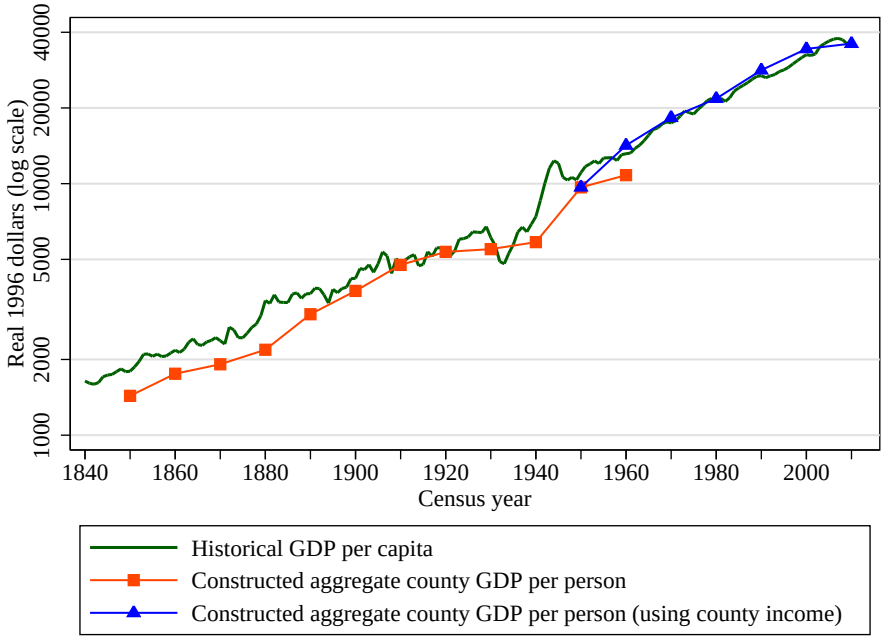
Notes: Scandinavian is the combined Norway and Swedish ancestries. See section 2 and appendix A.1 for the ancestry construction.

Figure 4: Select ancestries in the United States: 1970 and 2010



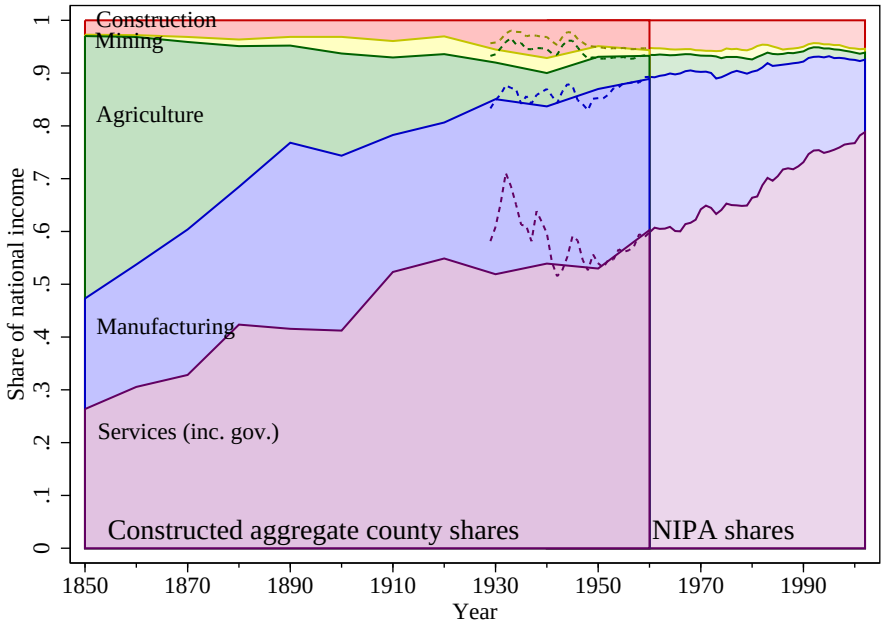
Notes: Scandinavian is the combined Norway and Swedish ancestries. See section 2 and appendix A.1 for the ancestry construction.

Figure 5: GDP and aggregate county GDP per capita: 1840-2010



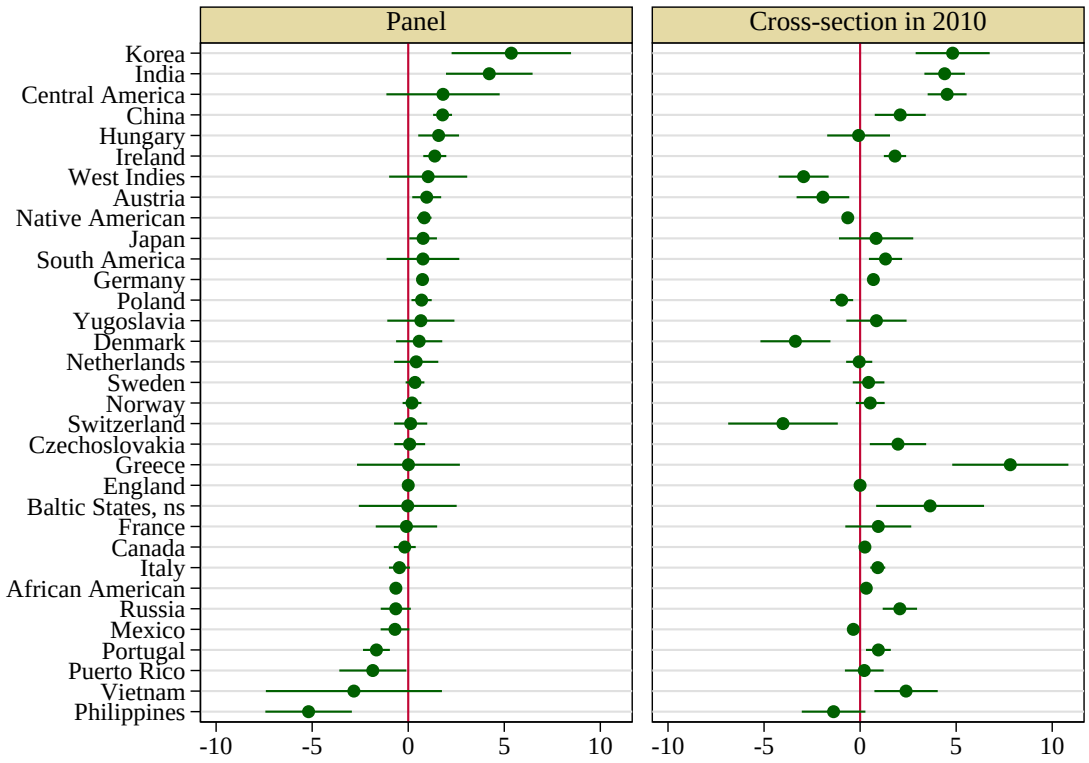
Notes and sources: Historical GDP per capita from Sutch (2006). The constructed aggregate GDP per person and aggregate county income per person are created by totaling the county measures for each year then dividing by population.

Figure 6: Constructed sectoral shares 1850-2010



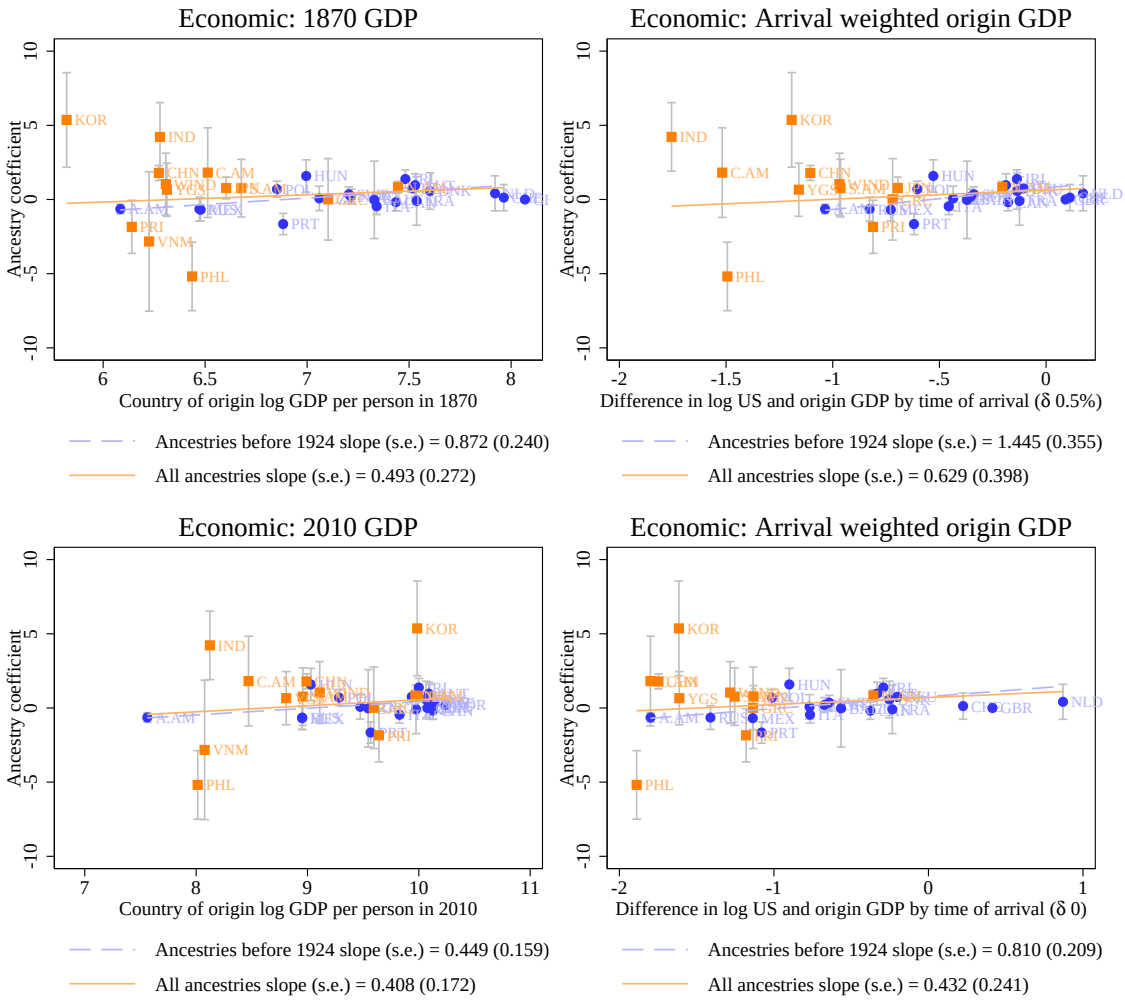
Notes: The shares from 1850 to 1960 are based on our estimates of county GDP totaled over all counties. The National Income and Product (NIPA) shares on the right are the dashed lines in 1929 and the overall shares after 1960 and are based on Carter (2006).

Figure 7: Individual ancestry coefficients



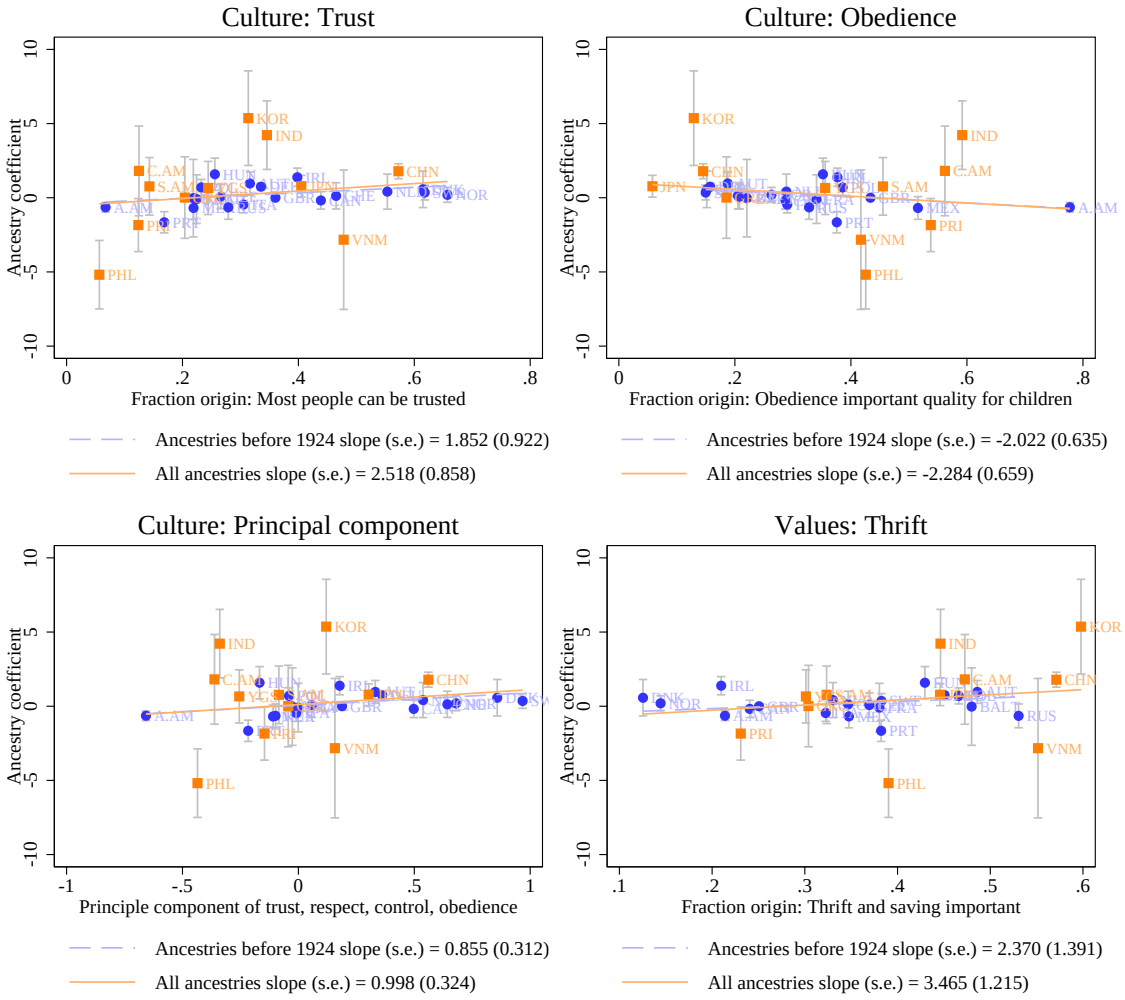
Notes: Shows coefficients estimated for large ancestry groups (excluded group is England) on log county GDP per person in equation 1. A coefficient of 1 means that replacing one percentage point English with one percentage point of that ancestry increases GDP per person by 1 percent. The left panel includes county group specific fixed effects, the right is the estimated only using the 2010 cross-section.

Figure 8: Ancestry and country of origin: Economic



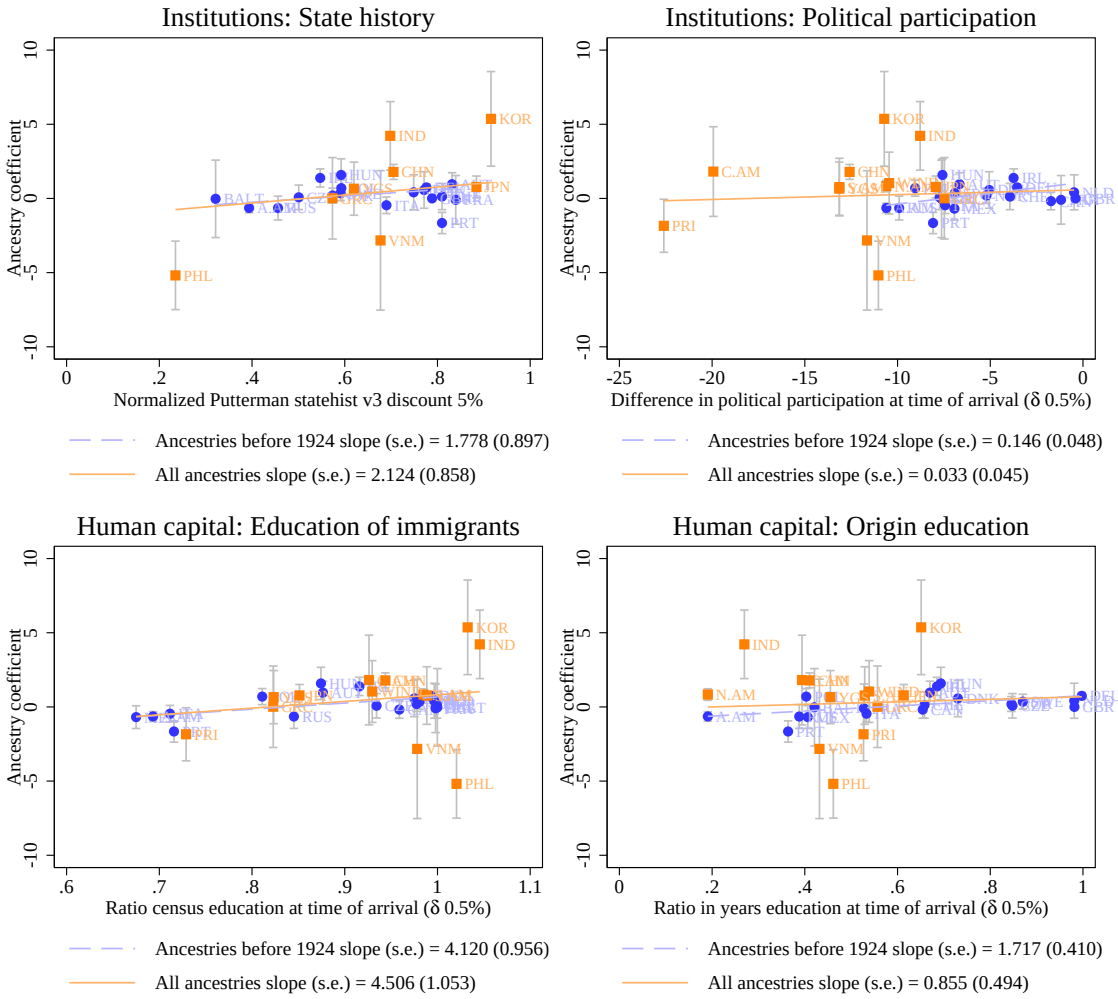
Notes: Shows the relationship between economic variables in the country of origin and the coefficients estimated for large ancestry groups in figure 7 for log county GDP per person including fixed effects in equation 1. The construction of origin GDP is described in Appendix A.4. Arrival density is based on author calculations from Department of Homeland Security (2013).

Figure 9: Ancestry and country of origin: Social capital and culture



Notes: Shows the relationship between cultural variables in the country of origin and the coefficients estimated for large ancestry groups in figure 7 for log county GDP per person including fixed effects in equation 1. The questions are based on the World Values Survey, see appendix A.5.

Figure 10: Ancestry and country of origin: Political and human capital



Notes: Shows the relationship between political and education variables in the country of origin and the coefficients estimated for large ancestry groups in figure 7 for log county GDP per person including fixed effects in equation 1. State history is from Putterman and Weil (2010) and excludes origins that were heavily settled by migrants (the Americas). \Political participation is the percent that could vote in national elections (Vanhanen, 2012), taken as the difference between that group and the US political participation, weighted by the time of arrival with a depreciation rate of 0.2%. Human capital is difference between years of education in origin and US at the time of arrival. Years of education from van Leeuwen and van Leeuwen-Li (2013). Arrival density is based on author calculations from Department of Homeland Security (2013).

Table 1: County GDP per capita and individual ancestries

Dependent	Log(County group income per capita)									
variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Log(income p.c.)				0.400***	0.254***					0.379***
at t-1				(0.00652)	(0.00700)					(0.00672)
Literacy							0.549***	0.459***	0.445***	0.312***
							(0.0335)	(0.0332)	(0.0334)	(0.0344)
Year education							0.0696***	0.0295***	0.0292***	0.0218***
							(0.00457)	(0.00482)	(0.00482)	(0.00421)
Log(density)								0.0898***	0.0888***	0.0304***
								(0.00387)	(0.00387)	(0.00374)
Fractionalization									-0.197***	-0.0804*
									(0.0450)	(0.0421)
F(All ancestry =0)	114.0	45.98	23.63	28.97	12.08	12.39	39.29	44.50	32.47	19.78
probability	0	0	0	0	0	0	0	0	0	0
F(non-AA anc. =0)	63.96	34.46	19.24	16.29	9.821	9.623	32.93	33.99	25.01	12.43
probability	0	0	0	0	0	0	0	0	0	0
State X Year	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County group trends	No	No	Yes	No	Yes	Yes	No	No	No	No
Lag Ancestry	No	No	No	No	No	Yes	No	No	No	No
R^2 (within)	0.962	0.972	0.979	0.980	0.984	0.981	0.972	0.973	0.973	0.980
R^2 (between)	0.488	0.227	0.0614	0.544	0.0740	0.0348	0.440	0.483	0.442	0.703
Observations	18,444	18,444	18,444	17,295	17,295	17,407	18,216	18,207	18,207	17,061
County groups	1,151	1,151	1,151	1,151	1,151	1,151	1,151	1,148	1,148	1,148

Notes: The F-tests test the joint hypothesis that all ancestries (except English, the excluded group) are jointly zero. The Non-AA F tests whether all ancestries except African Americans are jointly insignificant. All regression contain fixed effects for year and county group

Table 2: County GDP per capita and country-of-origin characteristics

	log county GDP per person			
	Each cell from a separate estimation			
1870 GDP weighted	0.722***	0.314***	0.225*	-0.121
by county AV	(0.0720)	(0.0738)	(0.112)	(0.105)
Log origin GDP/US	0.505***	0.214***	0.227**	-0.118*
on arrival ($\delta = 0$)	(0.0495)	(0.0518)	(0.0877)	(0.0609)
Origin GDP/US ratio	0.522***	0.127***	0.151*	-0.267***
on arrival ($\delta = 0$)	(0.0663)	(0.0396)	(0.0900)	(0.0708)
Migrant education/US	0.812***	0.0865	0.140	-1.246***
ratio at arrival ($\delta = 0$)	(0.124)	(0.0823)	(0.180)	(0.247)
Origin country education	0.874***	0.326***	0.148	-0.414**
US ratio at arrival ($\delta = 0$)	(0.125)	(0.0837)	(0.190)	(0.163)
State history in 1500	1.815***	0.773***	0.601**	-0.335
	(0.224)	(0.195)	(0.267)	(0.225)
Arrival political	0.0673***	-0.0271**	-0.0591**	-0.137***
participation	(0.0160)	(0.0107)	(0.0231)	(0.0217)
Trust	2.587***	1.343***	2.889***	1.234***
	(0.386)	(0.302)	(0.615)	(0.372)
Obedience	-1.948***	-1.276***	-0.615	-2.100***
	(0.289)	(0.270)	(0.545)	(0.344)
Respect	0.546***	0.201**	0.595**	-0.297
	(0.180)	(0.0961)	(0.295)	(0.310)
Control	0.0344**	0.0150	0.135***	0.0218
	(0.0164)	(0.00956)	(0.0399)	(0.0308)
Principal comp.	1.453***	0.896***	1.326***	0.994***
culture	(0.133)	(0.127)	(0.326)	(0.190)
Thrift	1.380***	1.751***	-0.377	2.063***
	(0.471)	(0.386)	(0.768)	(0.404)
Observations	16713	16,713	16,713	16,713
Year X State FE	No	Yes	No	Yes
Other controls	No	No	Yes	Yes
County groups	1151	1151	1151	1151

Notes: Other controls include the fraction African American, the fraction Native American, and the log population density. All regressions include county group effects and state-year effects and errors are allowed to cluster at the state level. All independent variables are constructed at the county group level by weighted country-of-origin characteristics by the ancestry vector as in equation 3.

Table 3: County GDP per capita and combined country-of-origin characteristics

Dependent	Log(County group income per capita)							
variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Principal comp.	1.407***	1.615***	1.371***	1.521***	1.466***	1.529***	1.369***	1.502***
culture	(0.172)	(0.158)	(0.326)	(0.277)	(0.168)	(0.162)	(0.330)	(0.277)
State history in 1500	0.216	0.208	0.768**	0.766***	0.296	0.0249	0.775**	0.655***
	(0.313)	(0.251)	(0.320)	(0.208)	(0.368)	(0.270)	(0.340)	(0.214)
Migrant education/US	-0.00322	-1.591***	-0.240	-1.741***	-0.0876	-1.462***	-0.266	-1.628***
ratio at arrival ($\delta = 0$)	(0.195)	(0.237)	(0.199)	(0.213)	(0.232)	(0.263)	(0.232)	(0.228)
Thrift in origin					-0.549	0.864*	-0.209	0.995**
					(0.786)	(0.433)	(0.804)	(0.377)
Log pop. density			0.0375**	0.0689***			0.0377**	0.0666***
			(0.0175)	(0.0119)			(0.0180)	(0.0116)
Frac African-American			0.0109	-0.0504			-0.0244	0.0661
			(0.381)	(0.304)			(0.383)	(0.313)
Frac. Native-American			1.842***	1.736***			1.786***	1.964***
			(0.322)	(0.259)			(0.309)	(0.297)
Observations	16,713	16,713	16,704	16,704	16,713	16,713	16,704	16,704
R-squared	0.961	0.973	0.962	0.974	0.961	0.973	0.962	0.974
State X Year FE	No	Yes	No	Yes	No	Yes	No	Yes
County group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County groups	1151	1151	1148	1148	1151	1151	1148	1148

Notes: All regressions include county group effects and and standard errors are allowed to cluster at the state level. All independent variables are constructed at the county group level by weighted country-of-origin characteristics by the ancestry vector as in equation 3.

Table 4: Country GDP per capita and ancestry: omitting county group effects and dynamic specifications

	Log(County group income per capita)									
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
1870 GDP weighted	-0.336***	-0.0258***	0.271***		0.233***					
by county AV	(0.0137)	(0.00889)	(0.0180)		(0.0198)					
One decade				0.200***						
lag				(0.0182)						
Trust weighted						-0.507***	0.117***	1.065***		0.535***
by county AV						(0.0574)	(0.0365)	(0.0583)		(0.130)
One decade									0.820***	
lag									(0.0566)	
Decade lag of log		0.741***	0.447***	0.442***	0.433***		0.742***	0.433***	0.435***	0.416***
county GDP		(0.00488)	(0.00656)	(0.00661)	(0.00679)		(0.00481)	(0.00658)	(0.00661)	(0.00681)
County literacy					0.239***					0.201***
					(0.0370)					(0.0355)
County years educ.					0.0256***					0.0159***
					(0.00413)					(0.00412)
County log density					0.0140***					0.0161***
					(0.00360)					(0.00353)
Observations	16,713	16,494	16,494	16,488	16,260	16,747	16,521	16,521	16,521	16,260
R-squared	0.939	0.976	0.979	0.979	0.979	0.937	0.975	0.979	0.979	0.979
State X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County group FE	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
County groups			1151	1151	1148	1148		1151	1151	1148

Notes: All regressions include a one decade lag of the dependent variable. Columns 1 and 5 do not include county group fixed effects.

Table 5: Granger Causality of county GDP per capita and predicted 1870 GDP or Trust

	log County GDP	log 1870 GDP	log County GDP	Trust	log County GDP	log 1870 GDP	log County GDP	Trust
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Decade lag of log	0.499***	0.00831	0.510***	0.0133***	0.464***	0.00910	0.450***	0.00795***
county GDP	(0.0238)	(0.00533)	(0.0283)	(0.00292)	(0.0247)	(0.00561)	(0.0261)	(0.00242)
Two decade lag of log	0.0633***	-0.0185***	0.0545***	-0.00124	0.0678***	-0.0114***	0.0631***	-0.000469
county GDP	(0.0118)	(0.00408)	(0.0122)	(0.00162)	(0.0101)	(0.00417)	(0.00969)	(0.00128)
Decade lag of	0.254***	0.772***			0.131**	0.732***		
weighted 1870 GDP	(0.0505)	(0.0492)			(0.0542)	(0.0456)		
Two decade lag	0.271***	0.0749**			0.139***	0.0664**		
weighted 1870 GDP	(0.0651)	(0.0322)			(0.0492)	(0.0313)		
Decade lag of			1.039***	0.486***			0.566***	0.400***
weighted Trust			(0.174)	(0.0693)			(0.144)	(0.0725)
Two decade lag of			0.643***	0.198***			0.592***	0.184***
weighted Trust			(0.152)	(0.0248)			(0.128)	(0.0202)
Observations	16,106	16,097	16,169	16,187	16,106	16,097	16,169	16,187
R-squared	0.977	0.826	0.976	0.554	0.982	0.880	0.982	0.666
Year X State FE	No	No	No	No	Yes	Yes	Yes	Yes
County group FE	No	No	No	No	No	No	No	No
F-test for joint significance								
Lags county GDP	354.8	11.96	226.0	11.10	312.2	5.268	249.0	5.563
p-value	0	0	0	0.000106	0	0	3.58e-07	0.00665
Lags Trust or 1870 GDP	116.0	1435	32.38	82.29	15.33	432.1	20.40	47.92
p-value	0	5.91e-05	1.09e-09	0	6.76e-06	0.00847	0	0

Notes: All regressions include county group effects and state-year effects and errors are allowed to cluster at the state level.

Table 6: County GDP per capita and diversity

Dependent	Log(County group income per capita)							
variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Trust weighted	0.405**	0.884***	1.283***	1.424***	0.520***	0.897***	1.279***	1.440***
by county AV	(0.162)	(0.123)	(0.254)	(0.173)	(0.140)	(0.110)	(0.224)	(0.166)
Fractionalization	1.101***	1.002***	1.408***	1.044***	0.992***	0.929***	1.277***	1.005***
	(0.167)	(0.135)	(0.209)	(0.152)	(0.150)	(0.129)	(0.190)	(0.139)
Trust weighted	-2.665***	-1.670***	-3.230***	-1.832***	-2.482***	-1.767***	-2.940***	-1.925***
fractionalization	(0.490)	(0.316)	(0.510)	(0.304)	(0.429)	(0.304)	(0.428)	(0.296)
State history in 1500	0.529**	0.448	1.352***	1.197***	0.546**	0.443*	1.320***	1.157***
	(0.257)	(0.275)	(0.350)	(0.291)	(0.246)	(0.255)	(0.295)	(0.287)
Migrant education/US	0.0495	-1.269***	0.0133	-1.374***	-1.053***	-1.742***	-1.054***	-1.796***
ratio at arrival ($\delta = 0$)	(0.185)	(0.233)	(0.206)	(0.209)	(0.211)	(0.248)	(0.192)	(0.241)
County literacy					1.084***	0.701***	1.033***	0.634***
					(0.126)	(0.139)	(0.107)	(0.123)
County years educ.					0.0457***	0.0633***	0.0397***	0.0371**
					(0.0113)	(0.0164)	(0.0118)	(0.0180)
County log density			0.0393**	0.0696***			0.0243	0.0588***
			(0.0188)	(0.0159)			(0.0175)	(0.0169)
Fraction African-			1.578***	0.841***			1.378***	0.830***
American			(0.437)	(0.233)			(0.375)	(0.226)
Fraction Native-			1.404***	1.562***			1.383***	1.444***
American			(0.355)	(0.332)			(0.345)	(0.334)
Observations	16,713	16,713	16,704	16,704	16,485	16,485	16,476	16,476
R-squared	0.964	0.974	0.965	0.975	0.966	0.974	0.966	0.975
State X Year	No	Yes	No	Yes	No	Yes	No	Yes
County group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County groups	1151	1151	1148	1148	1151	1151	1148	1148

Notes: All regressions include county group effects and standard errors are allowed to cluster at the state level. All independent variables are constructed at the county group level by weighted country-of-origin characteristics by the ancestry vector as in equation 3 and fractionalization in section 4.6.