The Evolution of Regional Incomes

Levels of Per Capita GDP, 1000-1998

Year

1990 International Dollars

West. Offshoots Western Europe Latin America Asia Africa

Nathan Nunn Economics from a Historical Perspective
Historical Divergence: The Triangular Trade

Nathan Nunn
Economics from a Historical Perspective
Europe, and is quite different in nature from the European growth that took place before 1500. Not all societies with access to the Atlantic show the same pattern of growth, however. The data suggest an important interaction between medieval political institutions and access to the Atlantic: the more rapid economic growth took place in societies with relatively nonabsolutist initial institutions, most notably in Britain and the Netherlands. In contrast, countries where the monarchy was highly absolutist, such as Spain and Portugal, experienced only limited growth in the subsequent centuries, while areas lacking easy access to the Atlantic, even such nonabsolutist states as Venice and Genoa, did not experience any direct or indirect benefits from Atlantic trade.

Figures 1 and 2 illustrate the central thesis of this paper. Figure 1, panel A, shows that urbanization in Western Europe grew significantly faster than in Eastern Europe after 1500. For the purposes of this paper, Western Europe is taken to be all the countries west of the Elbe, i.e., Austria, etc.

Figure 1A. Western Europe, Eastern Europe, and Asia: Urbanization Rates, Weighted by Population, 1300–1850
The Rise of the Atlantic Traders (Acemoglu et al., 2005)

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Figure 1B. Atlantic Traders, West European Countries not Atlantic Traders, and Eastern Europe: Urbanization Rates, Weighted by Population, 1300–1850
Africa’s Slave Trade

Overview of the Slave Trade Out of Africa
Number of slaves

- Width of routes indicates number of slaves transported

Map showing trade routes from Africa to the Americas and Europe.
Africa’s Slave Trade

Nathan Nunn

Economics from a Historical Perspective
<table>
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<th>No. Name of Master</th>
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<th>Sex</th>
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The Slave Trade in Africa (Nunn, 2008)
Plantation Slavery in the Americas

SUGAR CANE PLANTATION.
Partial correlation plot: slavery in 1750 and income in 2000

\[ e \left( \ln \text{per capita GDP, 2000} \mid X \right) \]

\[ e \left( \frac{\text{slaves}}{\text{total population, 1750}} \mid X \right) \]

\[ \text{coef} = -2.63, \text{se} = 0.42, t = -6.23 \]
Traditional Views on Economic Development

1. **Short-run factors like: capital, health, education, and policies.**

2. More fundamental slow-moving factors like: domestic institutions, social norms, or cultural traits.

3. Geography.
Dispersion of Income and Investment (Grier and Grier, 2007)

2.2. Sub-sample results: the rich vs. the developing countries

In this section, we split the sample into two groups; the 22 richest and the 68 developing countries and re-do our analysis of the dispersion of output and of the determinants of the steady state separately for each group. When it comes to output dispersion, the difference between the two groups is striking. As Panels B and C of Fig. 1 show, the rich country income dispersion falls rapidly until 1980 and then remains generally flat after that point with a net decline of about 33%. In contrast, the developing country dispersion rises steadily throughout the sample for a net increase of around 25%.

Obviously, the rich countries' dispersion data exhibit a significant negative trend, while the developing countries' dispersion data exhibit a very strong positive trend.

We now turn to a comparison of the evolution of investment rates in physical and human capital, the key determinants of the steady state in the neoclassical model. These results are shown in Panels B and C of Fig. 2 and in Fig. 6. In both country groupings, the investment and education variables are converging (in the sense that they have a significantly negative time trend), or at least not diverging over time. We do not see the same big difference in the evolution of dispersion of inputs that we saw in the dispersion of output between these two groups.

As per footnote 2, income per worker may be a more appropriate variable for the NGM. We repeat this sub-sample analysis for income per worker and find the same results as those reported in the text for per-capita income. The results are displayed in Appendix B.

As per endnote 3, we redo this experiment using the coefficient of variation (CV) and find the same results. The CV of income is significantly falling in the rich country sample and significantly rising in the developing country sample. These results are presented in Appendix C.

We have followed common practice here and identified the rich countries as the currently rich countries. This creates selection bias in favor of finding convergence, as DeLong (1988) argued. If we choose instead the 22 richest countries in 1960 as our rich group, then both the rich and developing sub-samples significantly diverge over the sample. These results are presented in Appendix D. We thank an anonymous referee for reminding us of this point. Thus, the convergence in inputs and policies along with output in our ex post rich country sub-sample is not unambiguous evidence in favor of the NGM or of any notion of club convergence. We use this split as it is one that many researchers are familiar with and the clashing pattern of convergence between the two groups facilitates searching for relevant explanatory variables in later sections of the paper.
Finally, Panels B and C of Figs. 4 and 5 examine the behavior of government spending and openness across the two country groupings. Again, both sub-samples show significant convergence behavior. When we again consider inflation and the black market premium we find no evidence of divergence over time for either series in either country grouping. The 22 rich countries evolve in a manner consistent with the neoclassical model, but the 68 developing countries present striking evidence against the model.

2.3. What about papers finding conditional convergence?

We have shown that investment rates and economic policies are converging around the world at the same time that output is diverging. Thus, we find no evidence of conditional convergence (assuming a common growth rate of technology) in either our full sample of countries or the 68 developing country sub-sample.12 Yet, there is a literature claiming evidence in favor of

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A. Primary School Enrollment Rates

B. Secondary School Enrollment Rates

(c) Primary schooling

(d) Secondary schooling

---

12 While our results are novel, we are not the only ones questioning the utility of the neoclassical model. Hausmann et al. (2005) argue that the standard growth variables used in the literature are not very helpful in explaining growth accelerations, while Pritchett (2003) argues for a portfolio of models that apply to different stages of the development process.
Dispersion of Policies

Well known papers include Mankiw et al. (1992), Sala-i-Martin (1996), Islam (1995), and Caselli et al. (hereafter CEL, 1996).

While a full blown discussion of the relative merits of our approach compared to the traditional approach is beyond the scope of this present paper, we can note that (1) a lot of the pro-conditional convergence regression evidence is cross-sectional and the cross-sectional growth regression approach has been cogently criticized by Friedman (1992), Quah (1996) and Durlauf (2003), among others; (2) In a panel context, Islam rejects the augmented NGM (by finding a negative and significant coefficient for education), as do CEL. However, they go on to interpret the coefficients of the model with respect to the NGM. In our view, once the underlying theoretical model is rejected, it is difficult to interpret estimated coefficients strictly as the rejected model would prescribe. That is to say, variables they interpret as having level effects may in fact be having growth effects; (3) The regression models all impose parameter homogeneity on the data in a way that our graphical approach does not. Grier and Tullock (1989) test for and reject such homogeneity in the Penn World Tables data; and (4) Lee, Pesaran, and Smith (1997) argue that the data support the idea of idiosyncratic long run growth rates.

3. Thinking outside the (neoclassical) box

To summarize our results to this point, we can say that for our 90 country sample in general and the 68 developing country sub-sample in particular, we see no evidence of either absolute or conditional convergence. In both these samples, output is diverging while the neoclassical determinants of the steady state (and some important policy variables) are converging. In this section, we attempt to turn the analysis from the negative toward the positive by investigating other models or variables that may be consistent with the finding that the rich countries are converging while the others are diverging.

3.1. R&D and technology diffusion

The first case under consideration is that of technological diffusion, where at least part of the diffusion depends on a country's own research and development efforts. Specific relevant papers include Parente and Prescott (1994), Eaton and Kortum (1996), Howitt (2000) and Klenow and Rodríguez-Clare (2005). In these models, with other relevant factors held constant, incomes...
Traditional Views on Economic Development

1. Short-run factors like: capital, health, education, and policies.
2. More fundamental slow-moving factors like: domestic institutions, social norms, or cultural traits.
3. Geography.
Measuring Culture (Henrich et al., 2005)

in the United States (Carpenter et al. 2005; Henrich & Henrich, in press, Ch. 8). Thus, our cross-cultural results are consistent with existing findings on demographic variables. However, there is intriguing evidence that younger children behave more selfishly, but gradually behave more fair-mindedly as they grow older, up to age 22 or so (Harbaugh & Krause 2000; Harbaugh et al. 2002; Murnighan & Saxon 1998). An important exception is that about one-third of autistic children and adults offer nothing in the UG (Hill & Sally 2004); presumably their inability to imagine the reactions of responders leads them to behave, ironically, in accordance with the canonical model.

Behavioral economists have been remarkably successful in explaining the experimental behavior of students by adding social preferences (especially those related to equity, reciprocity, and fairness) to game theoretical models (Camerer 2003; Fehr & Schmidt 1999). Our endeavor aims at the foundation of these proximate models by exploring the nature of non-selfish preferences.

3. The cross-cultural behavioral experiments

Early cross-cultural economic experiments (Cameron 1999; Roth et al. 1991) showed little variation among university students. However, in 1996 a surprising finding broke the consensus: the Machiguenga, slash-and-burn horticulturalists living in the southeastern Peruvian Amazon, behaved much less prosocially than student populations around the world (Henrich 2000). The UG “Machiguenga outlier” sparked curiosity among a group of behavioral scientists: Was this simply an odd result, perhaps due to the unusual circumstances of the experiment, or had Henrich tapped real behavioral differences, perhaps reflecting the distinct economic circumstances or cultural environment of this Amazonian society? In November 1997, the MacArthur Foundation Research Network on the Nature and Origin of Preferences brought 12 experienced field workers and several behavioral economists together in a three-day workshop at UCLA. During this meeting we redesigned the experiments – typically conducted in computer labs at universities – for field implementation in remote areas among nonliterate subjects. Two years later, when all of our team had returned from the field, we reconvened to present, compare, and discuss our findings. Here we summarize the findings to this point (a second phase is currently underway).

3.1. The experiments

Overall, we performed 15 ultimatum, 6 public goods, and 3 dictator games, as well as 2 control experiments in the United States at UCLA and at the University of Michigan. All of our games were played anonymously, in one-shot interactions, and for substantial real stakes (the local equivalent of one or more days' wages). Because the UG was administered everywhere, we will concentrate on these findings and their implications, and make only some references to our other games (see Henrich et al. 2004).

3.2. Ethnographic description

Figure 1 shows the location of each field site, and Table 1 provides some comparative information about the societies discussed here. In selecting these, we included societies both sufficiently similar to the Machiguenga to offer the possibility of replicating the original Machiguenga results, and sufficiently different to explore the effects of cultural diversity on economic behavior. We have included societies from all regions of the world, representing a wide range of economic and social conditions. The specific societies included in our study are shown in Figure 1.
The Ultimatum Game

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Economics from a Historical Perspective
Many people in these societies rely completely on herding, as the Orma, Mongols, and Kazakhs are pastoralists because their economies are typically agro-pastoralist. To illustrate this, the Machiguenga row, for example, shows the modal offer to be 0.15, the secondary mode 0.25, and the mean 0.26.

Economics from a Historical Perspective

Culture and Market Integration (Henrich et al., 2005)

Governing institutions or organizational decision-making of economically independent families that lack any stable sedentary horticulturalists. Similarly, the Aché are classified as sedentary/nomadic because of their recent transition from nomadic foragers to sedentary/horticulturalists. In contrast, the Sangu are labeled as transhumant because they are semi-nomadic, moving between one or two locales in a fixed pattern, often following the good pasture or responding to seasonal rainfall patterns. The Sangu herders move livestock between two or more locales in a fixed pattern, often following the good pasture or responding to seasonal rainfall patterns.

The variability in ultimatum game behavior across the cultures is substantial. Although the “typical” behavior (Fig. 2; Table 2 presents additional detail) among university students from Pittsburgh, Ljubljana (Slovenia), Jerusalem, Tokyo (Roth et al. 1991), and Yogyakarta (Indonesia; Cameron 1999) revealed little group variation. In contrast, the variability in ultimatum game behavior across the societies is much larger, as is illustrated in Figure 2. Whereas mean ultimatum game offers in standard experiments in industrialized societies (e.g., Camerer 2003) range from 26% to 58% – both below and above the middle of the range in our UG results from 15 small-scale societies show substantial cross-cultural variability.

On the responder side of the UG (Figure 3), rejection thresholds are often quite low. The right edge of the lightly shaded horizontal gray bar gives the mean offer for that group. Looking across the Machiguenga row, for example, the mode is 0.15, the secondary mode is 0.25, and the mean is 0.26.

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Historic account suggest that early in the slave trade, those sold into slavery were almost exclusively prisoners of war. Because raids often involved villages raiding other villages, this form of slave procurement often caused relations between villages to turn hostile, even if these villages had previously formed federations or other ties (see for example Inikori, 2000). There are numerous historical accounts, documenting this detrimental effect of the slave trade (see Hubbell, 2001, Azevedo, 1982, Klein, 2001). Heightened conflict between communities over a period of three to four hundred years may have resulted in increased mistrust of those outside of one’s ethnic group.

However, data on the manner of enslavement in the 19th century suggests that by the end of the slave trade, slaves were being taken in a wide variety of different ways. Table 1 reports information of the manner of enslavement for a sample of slaves from Free Town, Sierra Leone. The slaves were interviewed by Sigismund Koelle during the 1840s.

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<th>Manner of Enslavement</th>
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<td>Taken in a war</td>
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<tr>
<td>Kidnapped or seized</td>
<td>40.3%</td>
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<td>Sold/tricked by a relative, friend, etc.</td>
<td>19.4%</td>
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<td>Through a judicial process</td>
<td>16.0%</td>
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Notes: The data are from Sigismund Koelle’s Linguistic Inventory. The sample consists of 144 informants interviewed by Koelle for which their means of enslavement is known.
Origins of Distrust in Africa (Nunn and Wantchekon, 2011)

Atlantic Slave Exports

- 0
- 1 - 50,000
- 50,001 - 100,000
- 10,0001 - 1,000,000
- 1,000,001 - 4,000,000

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Economics from a Historical Perspective
Gender differences in employment and why they matter

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BOX 5.1  Closing the access gap—Recent advances in female labor force participation

Over the past quarter century, women have joined the labor market in increasing numbers, partially closing the gender participation gap (see chapter 1). Between 1980 and 2009, the global rate of female labor force participation rose from 50.2 percent to 51.8 percent, while the male rate fell from 82.0 percent to 77.7 percent. Consequently, gender differentials in labor force participation rates declined from 32 percentage points in 1980 to 26 percentage points in 2009.a

Female labor force participation is lowest in the Middle East and North Africa (26 percent) and South Asia (35 percent) and highest in East Asia and Pacific (64 percent) and Sub-Saharan Africa (61 percent) (box map 5.1.1). Despite large cross-regional differences, participation rates have converged over time as countries and regions that started with very low rates (primarily Latin America and the Middle East and North Africa) experienced large increases and those with higher rates (primarily Europe and Central Asia and East Asia and Pacific) experienced small declines (box figure 5.1.1).

The combined effect of economic development, rising education among women, and declining fertility goes a long way in explaining changes in female participation rates over the past 25 years. Globally, economic development has been accompanied by growing economic opportunities for women (particularly in manufacturing and services). And greater trade openness and economic integration have, in many countries, led to significant growth of export-oriented sectors, with some, such as garments and light manufacturing, employing large numbers of women in recent decades (see chapter 6). Both developments have translated into stronger market incentives for women’s labor force participation in the form of rising demand for female labor and, in some cases, higher absolute and relative wages.

In addition, economic development has been accompanied by improvements in infrastructure, including electricity, water, roads, and transport, which can alleviate time constraints and reduce the...
Gender Norms around the World

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Origins of Gender Norms (Alesina, Giuliano and Nunn, 2013)
Origins of Gender Norms (Alesina, Giuliano and Nunn, 2013)
Traditional Plough Use and FLFP

(e(Female labor force participation in 2000 | X)
−1 0 1
e(Traditional plough use | X)
(coef = −12.401, t−stat = −4.18)

(coef = −12.401, t−stat = −4.18)
Traditional Plough Use and Female Firm Ownership

![Graph showing the relationship between traditional plough use and the share of firms with female ownership. The graph has a line of best fit represented by the equation: \[ \text{Share of firms with female ownership} = -15.241 \times \text{Traditional plough use} - 1 \]. The coefficients are: \( \text{coef} = -15.241 \) and \( t\text{-stat} = -3.75 \).]
Traditional Views on Economic Development

1. Short-run factors like: capital, health, education, and policies.
2. More fundamental slow-moving factors like: domestic institutions, social norms, or cultural traits.
3. Geography.
Geography and Income

The map illustrates the relationship between GDP per capita and the geographical distribution, highlighting areas with different income levels.

**GDP per capita 1995**
- US$450–1,999
- US$2,000–4,999
- US$5,000–9,999
- US$10,000–15,999
- US$16,000–31,100
- No data

The map shows a high correlation between low GDP per capita regions and locations with intense malaria transmission.
Tsetse flies live today in moist savanna and woodlands, regions with > 500 mm of rain a year.

Tsetse flies carry a parasite which can infect livestock and people with trypanosomiasis (sleeping sickness).
Motivated by the discussion above, the empirical analysis focuses on how the TseTse affected agricultural practices, urbanization, institutions, and subsistence strategies. Panels A and B of Figure 4 provide a visual representation of the reduced-form relationship between many of these outcomes and the TSI by plotting their weighted average by TSI quartile. The main estimating equation is presented below and further explores this within-Africa heterogeneity:

\[
\text{Outcome}_j = \alpha + \delta \cdot \text{TSI}_j + X_j' \Omega + \varepsilon_j,
\]

Panel A. TseTse suitability index (1871)
Panel B. Suitability for rainfed agriculture (2002)

Figure 3. TseTse Suitability Index and the Suitability for Rainfed Agriculture

Notes: Panel A shows the historical TseTse suitability index created using climate data from NOAA's 20th Century Reanalysis for the year 1871. Panel B shows the suitability for rainfed agriculture (FAO 2002).

Figure 4. Weighted Average Precolonial Outcomes by Quartile of TSI

Note: These graphs show the weighted average of binary precolonial African outcomes by TSI quartile.
Historical Impacts of Ruggedness

Economics from a Historical Perspective
Historical Impacts of Ruggedness

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Income and Ruggedness among Non–African Countries

\[
\text{Log Real GDP per Person 2000} = \beta + \gamma \times \text{Ruggedness (Box–Cox Transformed)} + \epsilon
\]

(coef. = −.213, t–stat. = −2.38, N = 121)
Historical Impacts of Ruggedness

Income and Ruggedness among African Countries

\( \text{(coef.} = 0.242, \text{t-stat.} = 1.82, \text{N} = 49) \)
Conclusions

We really cannot understand economic development today without thinking about history and how we got here.

Next question: What implications does this have for economic policy moving forward?