The long economic and political shadow of history - Volume I: A Global View

Edited by
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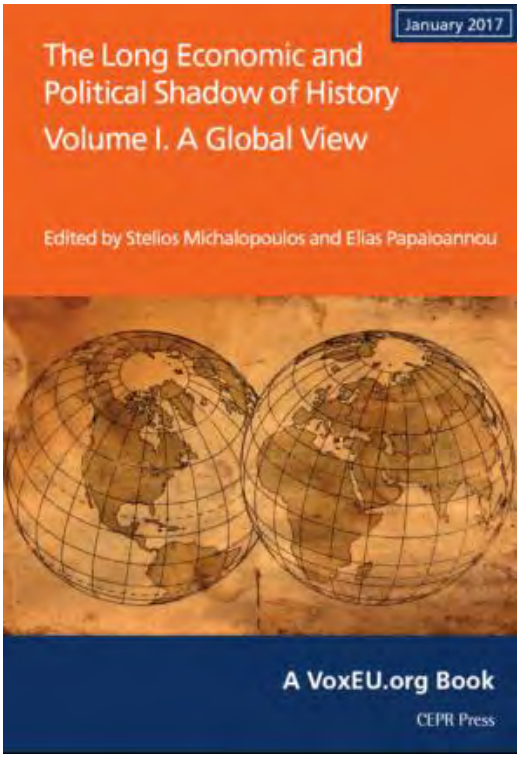
A VoxEU.org eBook

January 2017



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Foreword

The origins and implications of important events have long been studied by historians. Over the recent decades, economists have realised the importance of incorporating these insights into their research agenda. By using this cross-disciplinary approach, a fascinating body of new research on economics examines the influence of historical events on various aspects of the economy and polity.

In this eBook, which is the first volume of three, the authors seek an understanding of the deep factors shaping development of economic and political structures across the globe. The authors span a period of ancient to modern history; this e-Book series summarises research studying the long-lasting importance of events such as the Neolithic Revolution; Africa's slave trade; the Columbian exchange; the Protestant Reformation; the Enlightenment; Nazi occupation; the holocaust and communism. In discussing these events, the chapters summarise new insights on how colonisation; geography; legal systems, culture and genetic diversity have contributed to the large and growing variation in economic and political performance around the world.

The authors envisage the future of economics in this area as inter-disciplinary. By evaluating geographical, sociological, anthropological and political factors, they hope to provide a new research agenda for the discipline of economics. Building on the works covered in this book, new research should blend historical data, anthropological maps, and information on land endowments, with high-quality geo-referenced big-data proxies of development.

CEPR is grateful to Professors Stelios Michalopoulos and Elias Papaioannou for their joint editorship of this eBook series. CEPR is also grateful to the authors of the eBook chapters. Some are global thought leaders, others are established scholars employed at the very best academic institutions in Europe and the United States, while some chapters are authored by promising, talented and energetic young scholars. Our thanks

also go to Sophie Roughton and Simran Bola for their excellent and swift handling of its production. CEPR, which takes no institutional positions on economic policy matters, is delighted to provide a platform for an exchange of views on this crucially important topic, the legacy of important historical events on contemporary development.

Tessa Ogden

Chief Executive Officer, CEPR

January 2017

i Series Introduction: Historical legacies and contemporary development

Stelios Michalopoulos and Elias Papaioannou
Brown University and CEPR; London Business School and CEPR

Study the past if you would define the future.

Confucius

We are made by history.

Martin Luther King, Jr.

1 The emergence of New Economic History

Those 18th and 19th century philosophers who shaped economic thought (David Ricardo, Adam Smith, Karl Marx, John Stuart Mill), in company with early 20th century scholars such as John Maynard Keynes and Joseph Schumpeter, believed in the blending of core economic ideas (value maximisation, incentives, market laws) with history. Political economy – as economics was referred to at the time – was a discipline that combined elements from a wide array of social sciences and interpreted them with its new tools. Yet, efforts to draw insights from history and related disciplines with which to shed light on economic questions lost steam during the latter part of the last century.

The neoclassical approach would leave little room for a deeper understanding of important historical events in the growth process, such as colonisation, institutional changes and cultural traits that most people would instinctively see as fundamental drivers of comparative development. Not modelling explicitly the role of history, geography-ecology, and culture (religion, beliefs, family ties, norms), led to these features being viewed empirically as a 'residual' of the growth process driven by capital deepening, either in the physical sense of tools and machines or in the human sense of education and health. And while new growth theories show how small

differences in initial endowments may translate into large differences when it comes to urbanisation, agglomeration, and well-being, they were agnostic on the origins of these initial conditions, naturally rooted in the historical record. But economists' disregard for history was not confined to the growth literature or macroeconomics. The total number of published economic history papers in 'top' general-interest journals declined (McCloskey 1976, Abramitzky 2015), as economists moved from relatively simple, intuitive theories and applied methods to more complex, often esoteric, mathematical models and elaborate quantitative-econometric empirical approaches (see also Temin 2013).[1] However, since the late 1990s there has been a revival; a 'new economic history' literature has emerged that studies important historical episodes, with the goal of tracing their consequences on contemporary outcomes. This new literature applies economic models and econometric techniques to examine the shadow that history casts over various aspects of the economy and the polity.[2]

As is typical with history, the process of being 'rediscovered' among economists – learning from the past and uncovering its legacy – has been gradual; and clearly there were important works of economic history between the 1950s and 1990s, such as Douglass North's *Structure and Change in Economic History* in 1981 and Avner Greif's work on the interplay of culture and institutions (Greif 1993, 1994). Yet, the tipping point seems to be a trio of influential works that appeared in the late 1990s. Acemoglu *et al*. (2001, 2002, 2005) put forward the '*colonial origins of comparative development*' thesis, where the type of colonial strategy and early colonial institutions influenced subsequent economic and political development. The '*law and finance*' works of La Porta, Lopez de-Silanes, Shleifer, and Vishny (1997, 1998, 2006) showed that legal origins transplanted during colonisation have a significant bearing on contemporary

1 The origin of this paradigm shift seems to be the publication of Paul Samuelson's revolutionary textbook, The Foundations of Economic Analysis in 1947. While the use of mathematics goes back to Alfred Marshall, John Hicks, Edgeworth, and others, Samuelson is rightly credited for trying to synthesise and mathematically formalise economic reasoning (see Temin 2013).

2 The global financial meltdown of 2007-2009 and the associated deep recession renewed the interest of macro-economists working on business cycles, monetary and fiscal policy in economic history. Somewhat paradoxically, as "dynamic macro" didn't have much of an interest in history, two of the main protagonists of policymaking in the aftermath of the crisis, Ben Bernanke and Christina Romer, were among the best scholars of the Great Depression and other historical crisis periods.

contractual institutions and finance. Engerman and Sokoloff (1997, 2002) argued that colonial-era inequality, shaped by the type of colonial strategy employed (mining, plantations), explains the divergent development paths of Southern and Northern America. The analysis of historical events was also fuelled by important theoretical contributions; the development of 'unified growth theory' (Galor and Weil 1999, 2000, Galor 2011) which brought to the foreground the study of pre-industrial (Malthusian) and modern economies in a unified framework; and the game-theoretic modelling of both institutions and 'class struggles' (Acemoglu and Robinson 2000, 2001). For a textbook treatment see Acemoglu and Robinson (2006) and Besley and Persson's (2011) that study jointly the co-evolution of economic and political development, through the lens of ethnic fragmentation, inequality and conflict, which, in turn, may be shaped by geographic, cultural or historical forces.

At the same time, the profession was greatly influenced by Jared Diamond's magnum opus, *Guns, Germs, and Steel*. Blending insights from geography, biology (zoology), cultural anthropology, sociology, and even archaeology, Diamond provided a powerful thesis on economic and political development over the long run. While Diamond stressed the importance of geography-ecology in shaping institutional, political, and societal traits, which in turn impact development, in parallel work David S. Landes (1998) stressed the role of family ties, religion, beliefs and norms, arguing forcefully that "*culture makes all the difference*". Besides their original contributions, these works also brought to the forefront old ideas that had been side-lined – for example, Max Weber's thesis on the importance of Protestantism in the Industrial and Commercial Revolution, or Friedrich Hayek's ideas linking legal-origin traditions to economic freedom and prosperity.

The new economic history follows an inter-disciplinary approach, integrating historical narratives and insights from other-than-economics social sciences (mostly sociology, political science and anthropology) with mathematical models, and formally tests long-standing, influential conjectures with econometric techniques. This eBook series summarises contributions aimed at uncovering *The long economic and political shadow of history*[3]. Some of the themes of these works transcend continents (like colonisation),

3 Nunn (2009, 2014) provides a thorough overview of this body of research. See also Spolaore and Wacziarg (2014).

some are regional (e.g., the spread of Protestantism in Europe or the slave trades in Africa), while others are country(ies)-specific (e.g., the French Revolution's impact in France and Germany, the impact of the Holocaust in Russia, the Nazi occupation of Italy, and the impact of communism). The works covered in this eBook series differ in their focus. Some stress the role of cultural traits, such as religion (e.g., Becker and Woessman 2009) and beliefs (Voigtländer and Voth 2012, Grosfeld and Zhuravskaya 2013); others emphasise the importance of 'early' institutional structures, related to colonial practices (Naritomi, Soares, and Assunção 2012), colonial 'indirect-rule' (Acemoglu, Reed, and Robinson 2014, Iyer 2011), 'forced labour' systems (Dell 2010, Lowes and Montero 2016) and the forced placement of indigenous tribes in special reserves (Dippel 2013); others stress the impact of the environment, geography, and ecology (e.g., Hornbeck and Naidu 2015, Ashraf and Galor 2003); and Fenske and Kala provide, in Volume I, a synopsis of 'Environmental Economic History'. Some studies analyse the long-lasting effects of colonial investments in roads and railroads (Jedwab, Kerby, and Moradi 2016) and ports (Jia 2014), or the effect of Christian missions on education, health, and beliefs (Cage and Rueda 2016, Valencia 2016) whereas others explore the legacies of relatively recent historical events, examining the impact of the Holocaust (Acemoglu *et al*. 2014), communism (Alesina and Fuchs-Schundlen 2007), and Nazi occupation (Fontana *et al*. 2016) not only on economic development, but also on inequality, beliefs and political participation. Some works analyse the long-lasting effect of specific migration movements – for example Moser *et al*. (2014) examine the impact of Jewish émigré scientists leaving Nazi Germany on US innovation, while Grosjean and Khattar (2015) and Grosjean and Brooks (2016) study the impact of convict transportation from England to Australia, during the 18th and 19th century, on contemporary culture.

While there have been many influential contributions, there are many open issues. As the literature has tackled important and highly controversial subjects, there is naturally a debate and therefore more research is needed to develop a clearer view of these topics. For example, while there is not much ambiguity that the type of colonisation, or the identity of the colonial power, was consequential for contemporary development, there is still debate on the exact mechanisms at work. This is a hard task, as such large-scale episodes affect not only the economy, but also beliefs and norms, institutions, and the distribution of economic, and political power. Another open issue regards the potential

interactions of historical events with critical junctures in the process of development; for example, the negative consequences of forced labour systems in Latin America and Africa may be large and long-lasting, since they prevented industrialisation at a time of massive technological innovation. In line with this, Pascali (2017) finds that the trade and growth benefits of the introduction of the steam engine, during the first era of globalisation, were especially large in countries with strong executive constraints and checks-and-balances. Likewise, the high levels of civicness in Medieval Italian city-states, which correlate strongly with beliefs and development (Guiso *et al.* 2016), may have been especially important during the Enlightenment and the subsequent Commercial and Industrial Revolution.

While the papers summarised in this eBook series all reveal considerable persistence, they do not imply that development is entirely determinist; leadership and policies promoting investment and human capital accumulation or policies and technologies enabling trade integration do matter[4]. So, while on the surface, there may seem to be a tension between studies uncovering the shadow of history and the ability of policy to affect development (Banerjee and Duflo 2014), the works below can be viewed as showing that important policy decisions occurring in 'critical' times do have long-lasting effects (that subsequent policy-makers find hard to reverse). For example, as the chapter of La Porta, Lopez-de-Silanes, Shleifer and Vishny puts it, while laws often change, the associated legal environment and culture is much harder to modify, since they depend on judges and lawyers' training, legal tradition, precedent, and social norms. The works summarised in this eBook series, as well as other important studies in the same genre, carry an obvious, yet often neglected, lesson. The success of any policy implemented crucially depends on the underlying institutional and cultural heritage of a given society, therefore it is vital for policymakers, development actors and investors to understand the historical context, so as to model incentives and design effective interventions.

Despite the wide-ranging topics that contributions to this eBook series cover, there are many, often not fully-appreciated, similarities across them.

4 See for example Jones and Olken's (2005, 2010) innovative studies on the role of leadership on growth.

First, an element that quickly stands out across all chapters is their inter-disciplinary approach.[5] Many entries, for example, carefully investigate the economic and cultural consequences of historical events and test influential conjectures put forward by political scientists and sociologists. For example, Nunn (2008) quantifies the legacy of Africa's slave trades, testing long-established theories in political science. Going over the papers, summarised in the chapters of this eBook series, the reader learns a lot, not only about the economics, but also about the context, the protagonists, and the key issues at stake. This inter-disciplinary approach has been a major step forward and must be continued (Lamoreaux 2015). Related to this, most of the recent contributions come from scholars who cannot be identified as 'economic historians', since their contributions span several fields (e.g., Daron Acemoglu, Andrei Shleifer, Luigi Zingales, Guido Tabellini, Ross Levine, and Oded Galor, to name but a few).

Second, most papers use (typically, self-collected) high-quality historical data that are combined with contemporary proxies of economic, institutional, and financial development. Some of the data collection and compilation efforts are remarkable, as economists have cleaned and digitised hard-to-access historical archives: for example, Nunn (2008) has digitised records on the hundreds of shipments of slaves out of Africa; building on earlier work of Philip Curtin, Acemoglu *et al*. (2001) compiled data reflecting settler mortality rates during the colonial time, using newspaper articles from the 19th century; Voth and Voitalander (2012) digitised data on Jewish pogroms in German lands during the Black Death; Cage and Rueda (2016) and Valencia (2016) geo-located the Catholic and Protestant missions in Africa and Latin America; and Acemoglu *et al.* (2014) constructed a dataset tracing all paramount chiefs installed by the British during their indirect rule of Sierra Leone. Using a plethora of original sources and meticulous efforts, Easterly and Levine (2016) have unearthed data on the share of Europeans, during the colonial times, for more than 100 contemporary countries, in order to assess their initial presence and long-lasting effects. And many papers are based on digitised historical and anthropological maps, portraying, for example, the spatial distribution of African ethnicities at the time of colonisation (Nunn 2008, Nunn and Wantchekon

5 This is an important step forward, because, as Mancur Olson famously argued it is hard conducting interdisciplinary research without losing discipline.

2011, Michalopoulos and Papaioannou 2016), or of Native American tribes (Dippel 2013). Many use data from anthropologists (e.g., George Peter Murdock's mapping of ethnicities and codification of key economic, cultural, and institutional traits), as well as geo-referenced high-resolution data on geography (e.g., soil quality, terrain ruggedness, suitability of land for particular crops, among others). Some works employ data produced by population geneticists and evolutionary biologists (Spolaore and Wacziarg 2014 and Ashraf and Galor 2016). In addition, some of the papers summarised in this eBook series have compiled novel data for the most recent period. La Porta *et al*. (1997, 1998) have gone over the corporate and bankruptcy laws of many countries to construct quantitative measures capturing the strength of minority shareholders' and creditors' rights. Going over the historical record regarding the independence period for each African country, Wantchekon and Ponce (2016) have classified independence movements into rural and urban based.

Third, the works in this eBook series share an important feature: they are ambitious. Employing state-of-the-art econometric techniques and intuitive theoretical constructs, they aim to understand the consequences of events, such as the role of colonial strategies in Brazil (Naritomi *et al*. 2012), the impact of the Holocaust (Acemoglu *et al.* 2011), the artificial drawing of those colonial borders in Africa that survived independence (Michalopoulos and Papaioannou 2016), the role of Jewish immigrant scientists in US innovation (Moser *et al*. 2014), the role of the steam ship in advancing commerce and institutions (Pascali 2017), the long-lasting effect of communism on attitudes and values (Alesina and Fuchs-Schundlen 2007), or the contemporary legacies of city-states during Medieval times (Guiso *et al*. 2016). For each of these topics there are thousands of pages of excellent work in the areas of history, political science and sociology, along with a plethora of qualitative studies. To this corpus of excellence, economists bring along formal theorising and sound econometric tools, complementing and building upon the existing research. Naturally, ambition is at the same time a strength and a shortcoming. This is because, almost by default, it is impossible to perfectly explain and trace the legacy of history. Yet economists have been open to critique and in many instances they have gone back to the original archival data, re-examined and re-codified the entries, and improved upon the findings of these influential works. Clearly, the massive amount of work in history and political science, that rightly studies detailed aspects of these events, should and will not be 'replaced' by some simplified

economic model that (by necessity) abstracts from many relevant aspects to focus on some key channels; and the vast body of historical evidence should not be swept under the carpet because of some interesting econometric technique. But economics does offer a fresh new angle. Continuing and strengthening the ongoing cross-pollination between economists and scholars in other disciplines can only prove beneficial to the cause; that of understanding whether, how and why history matters in terms of shaping the observed variation in outcomes today across regions.

Fourth, as the revival of the 'new economic history' coincided with the 'credibility revolution in empirical economics' (Angrist and Pischke 2010), many of the papers rely on modern state-of-the art econometric methods, such as difference-in-difference estimation, 'matching' methods, regression discontinuity, instrumental variables, and 'natural experiments'. These methods – while not perfect – attempt to account for unobserved or hard-to-measure confounding factors, or to exploit some form of 'quasi-random' variation in the historical record. For example, in her study on the impact of British direct rule of Indian states (as compared to indirect rule via local kings), Iyer (2010) exploits experimental variation stemming from the lapse rule, applied by the British between 1848-1856; under this system the British would take under direct rule only those Indian states where the dying native ruler did not have an heir. To identify the impact of colonisation, Feyrer and Sacerdote (2009) focus on small islands and use variation in wind patterns to obtain quasi-random variation on the timing and duration of European contact. History is full of idiosyncratic events, accidents and mistakes that economists (and more recently political scientists) exploit to credibly identify relationships. For example, scholars assess the effects of (unexpected) environmental shocks, as Hornbeck and Naidu (2014) examine the impact of the Great Mississippi Flood of 1927 on black out-migration and subsequent agricultural development in the US South. Likewise, Fenske and Kala (2015) link enslavement raids in Africa to temperature shocks.[6] Even though historical variation entails often random elements, history is shaped by people, leaders, technology, and the environment; so the impact of historical events cannot be evaluated via formal experimental tools (such as lab

6 There is a related large literature on environmental shocks and civil conflict (see Burke, Hsiang, and Miguel 2015, for a review).

experiments or randomised-control trials), which are quite useful for the evaluation of various narrow policy interventions. Yet this does not invalidate their strength; quite the contrary. The studies reviewed in this eBook series exploit some unique aspect of the historical landscape or try to account as carefully as possible for confounding factors to examine the legacy of events that affect people's views, beliefs, country institutions, and the economy.

A fifth shared principle of these works is the conscious effort of the authors to make their findings accessible not only to specialists but also to the general public. The papers are widely accessible and fun-to-read (even when you disagree). Some authors, most notably Acemoglu and Robinson (2012) and Mokyr (2016) have written important books for the general public that build on this recent research agenda. And almost all authors have written non-technical summaries and Op-Eds. We hope that this eBook series will contribute to that ongoing effort.

Below we illustrate broadly the patterns of persistence over long periods of time. We then briefly go over the original works summarised in the 33 chapters of the three volumes of this eBook series.

2 Long-Term Persistence

2.1 The Evidence

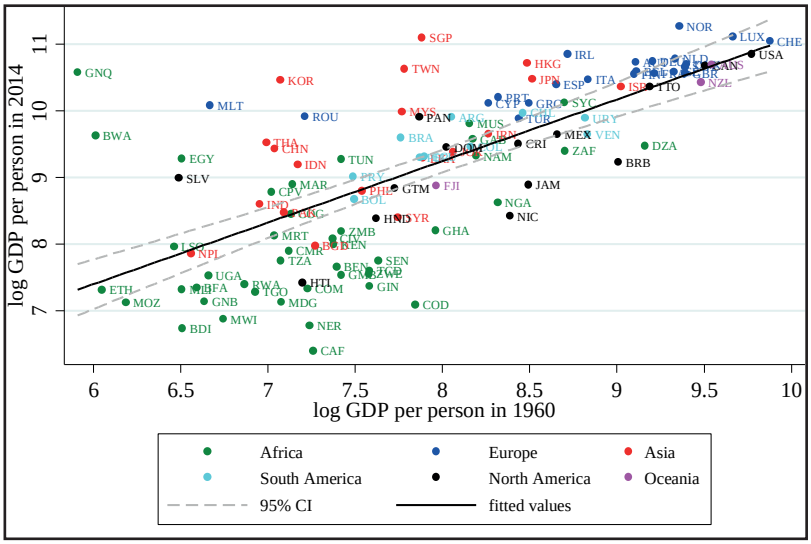
Economic development appears quite persistent.[7] Figure 1a provides a visualisation of the correlation of the logarithm of GDP per capita in 2014 and the respective statistic in 1960. The regression yields a close-to-unity elasticity (0.925), implying that countries that were 10% percent richer than other nations in the 1960s are (on average), today, 9.25% more developed. And one can explain half of the variation in contemporary performance with that of 1960 – the first year of (relatively) high-quality data from

7 Clearly there is noise in the GDP numbers, especially when one goes back to the pre-1960 period. If measurement error takes the classical form (i.e., is unrelated to country's output), then the correlations will be attenuated, indicating lower (than the true) persistence.

the Penn World Table (the elasticity and in-sample fit are similar if one uses Angus Maddison's data). Clearly during the past 6 decades, there have been success stories of rapid structural transformation and industrialisation, most notably in East Asian (Japan, South Korea, Taiwan, and Singapore) and Southern Europe. There are also episodes of decline, such as those of Haiti, Venezuela, and of many African countries. Yet, as Figure 1a reveals, such episodes are the exception rather than the rule; output per capita is quite persistent. And, if anything, persistence is stronger, if one examines output in levels rather than in per capita terms.

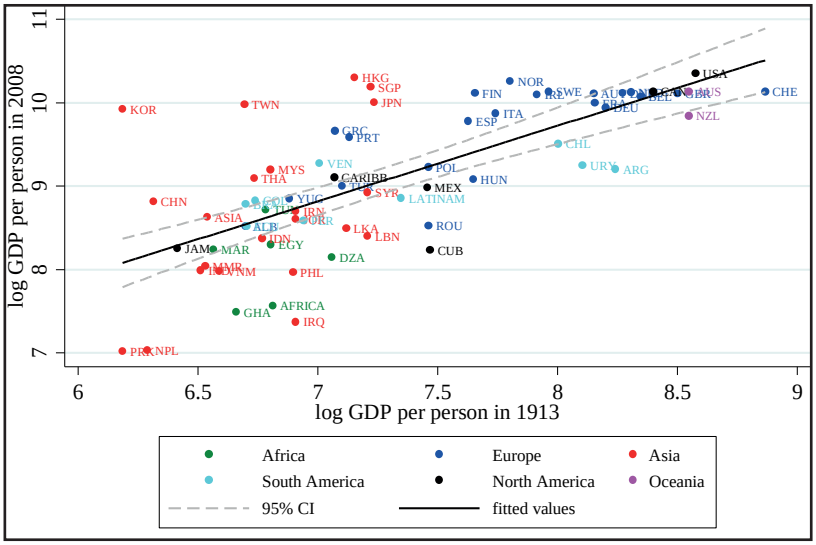
Even if one examines the link between current GDP per capita (p.c.) and pre-WWI output p.c., the correlation remains quite high. Using data from Angus Maddison, Figure 1b illustrates the correlation of log GDP p.c. in 2008 and in 1913; the elasticity is 0.90 and the in-sample fit is considerable, with an R-squared of around 0.50. While there are some evident success cases (the East Asian countries) and some failure cases (Africa, Nepal, North Korea, and Argentina), most countries are close to the regression line. And, as Figure 1c illustrates, the pattern is similar when we associate contemporary log GDP p.c. (in 2008) with GDP p.c. before the first wave of globalisation and during the Second Industrial Revolution (in 1870). The elasticity is almost 1 and log GDP in 1870 again explains half of the variability in contemporary GDP p.c. (R-squared continues to be around 0.50). The correlation falls only when we go back to the 1820s, when most countries were still in the pre-industrial phase and per capita income differences were negligible compared to today's large differences, even then the correlation exceeds 0.35

Figure 1a.



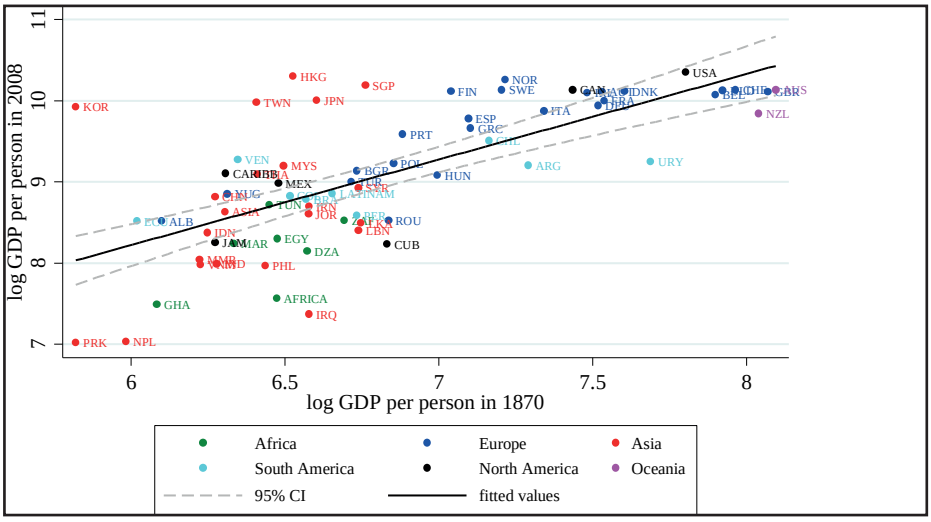
REGRESSION FIT: log(GDPcap2014) = 1.8537 + 0.9242*log(GDPcap1960) + e
R-squared = 0.50
Source: PWT

Figure 1b



REGRESSION FIT: log(GDPcap2008) = 2.4735 + 0.9063*log(GDPcap1913) + e
R-squared = 0.51
Source: Maddison

Figure 1c



REGRESSION FIT: log(GDPcap2008) = 1.8967 + 1.0542*log(GDPcap1870) + e
R-squared = 0.50
Source: Maddison

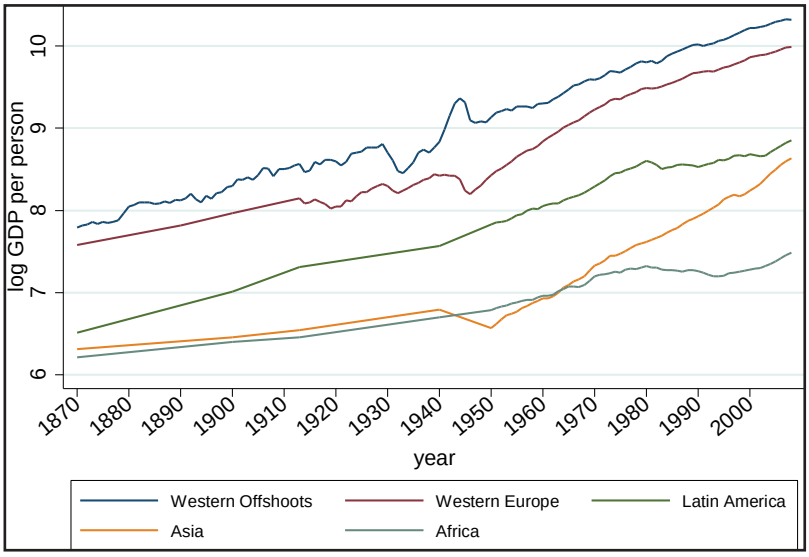
The patterns in Figures 1a-1c summarise (in a crude way) a large body of research revealing considerable persistence in income, output, and urbanisation, during at least the post-colonial period. There seems to be a 'structural break' only when one goes back to the Columbian exchange and the early stages of colonisation, a pattern that Acemoglu *et al*. (2002) have eloquently coined 'reversal of fortune'[8]. While obtaining reliable data on income and output for the pre-colonial times becomes tricky and there are natural questions on data quality, many works reveal persistence, even when one takes a very long-run perspective (Comin *et al*. 2010, and Ashraf and Galor 2013). Perhaps more importantly, there is persistence on income per capita and population density, even when one looks across regions within the same countries. For example, Maloney and Valencia (2015) report strong correlations between pre-colonial and contemporary population densities across regions in 18 countries in North, Central and Latin America (population density is the appropriate metric for development in Malthusian pre-Industrial societies). For 12 (7) countries the correlation exceeds 0.5 (0.75). Similarly, Broda and Weinstein (2002) report high correlations on population

8 Chanda, Cook, and Putterman (2014) show that when one conducts the analysis at the population (rather than the territorial) level, then persistence increases.

densities across Japanese regions over a four-century period. Maloney and Valencia (2015) also uncover strong positive correlations between contemporary regional (log) income and (log) pre-colonial population density. Likewise, Tabellini (2010) finds sizable persistence between contemporary regional income across eight European countries and historical proxies of development.

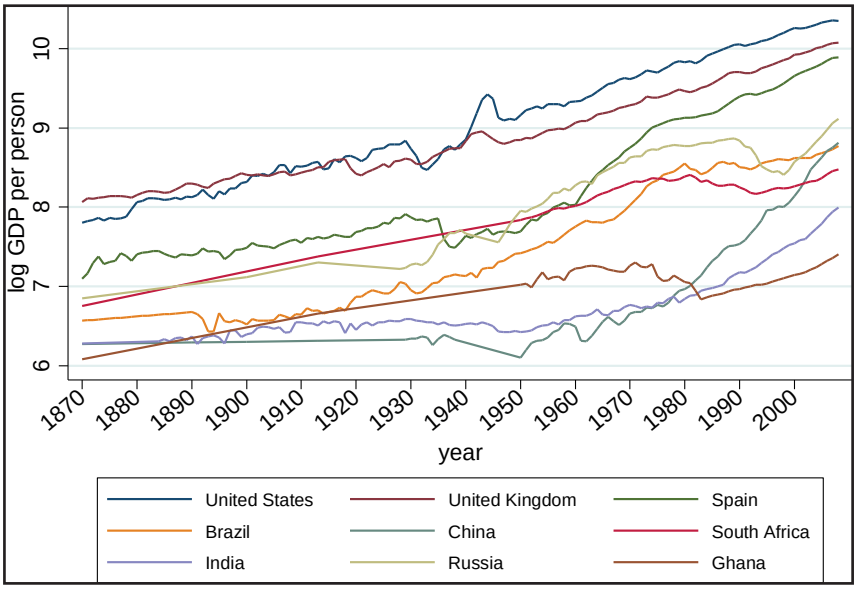
The evidence on persistence hints that there are deep-rooted, historical factors shaping development, at least partly. This finding is, at first-glance, puzzling, as there have been watershed events in the past couple of centuries, including colonisation, two world wars, numerous regional conflicts, revolutionary regime changes, the Industrial Revolution, the tremendous rise in globalisation. During the past two centuries the world population experienced an unprecedented increase in standards of living, as incomes rose, poverty fell (especially since the 1990s), fertility rates declined, and life expectancy and health improved. Yet the gains have been highly asymmetric, and, if one takes a medium to long-run perspective, there is evident divergence. This is revealed in Figures 2a-2b where, using the historical GDP series of Maddison, we plot output per capita since 1870 for continents and some countries.

Figure 2a



Source: Maddison

Figure 2b



Source: Maddison

Understanding persistence appears crucial, therefore, as a combined reading of Figures 1a-1c with Figures 2a-b suggests that countries/regions with a small-to-modest head start managed to gain the most, both from the technological innovations of the 19th and 20th centuries and from the global spur of commerce.

2.2. Explanations

The literature has bundled the potential explanations of persistence and divergence into four broad (and quite often interrelated) categories (see Acemoglu and Robinson 2012):

i. those related to historical institutions, such as colonial extractive rules, pre-colonial political legacies and enslavement;
ii. those stressing the role of cultural traits, related to religion, trust, family ties, beliefs and norms;
iii. those related to geography-ecology, such as the impact of floods, temperature shocks, terrain ruggedness and isolation, soil variability, etc.;
iv. others that emphasise historical accidents, such as the artificial drawing of colonial borders in Africa.

The chapters of this eBook series summarise works that explain contemporary economic development (as well as political development and attitudes) via different mechanisms, some geographic, some related to cultural traits, some stressing the legacies of institutional features, and some emphasising the role of accidental events. We view these contributions as complementary and, as many of the chapters will reveal, culture and institutions are interlinked and quite often share geographic origins (see Alesina and Giuliano 2016, Ashraf and Galor 2016).

Volume 1 of the eBook series starts with chapters reviewing works on the spatial distribution of economic activity across the globe and its main correlates. Next, it includes chapters summarising works which explore watershed events that have global repercussions. The chapters in Volume 2 summarise research on the deep origins of African development as well as works on the legacy of colonial practices in India, China, and Australia. Volume 3's chapters summarise studies on historical legacies in Latin and North America and then surveys works on the shadow of history in Europe.

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1 Introduction: A global view

Stelios Michalopoulos and Elias Papaioannou
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Broadly speaking, the chapters of Volume I discuss works with a global viewpoint. In Chapter 1, the editors (Stelios Michalopoulos and Elias Papaioannou) provide an overview of the chapters of this volume, that discuss works with a global viewpoint.

In Chapter 2, Vernon Henderson, Tim Squires, Adam Storeygard, and David Weil summarise their recent work on the role of geography, agglomeration, and history of the spatial distribution of development, as depicted by satellite images of light density at night. This chapter sets the stage for the eBook, as it quantifies the relative importance of these features of population density and development. The authors use a plethora of fine, georeferenced, data on geographic endowments (temperature, precipitation, elevation, land suitability for agriculture, length of growing period, prevalence of malaria, ruggedness), biome-vegetation zones, and access to water transport. Henderson *et al*. (2016) then perform a decomposition of global spatial development into geographic features, trade and agglomeration-related factors, and history (captured as a first-approximation by country fixed effects). Their analysis shows that geography is neither destiny (as Napoleon famously argued) nor bunk (as Henry Ford put it). Geography does matter, but it explains less than half of the variability in luminosity; history is important for explaining at least a third of the overall variability.

1 We would like to express our gratitude to all the authors who have graciously contributed to this e-book. A special thanks to Charles Wyplosz and Richard Baldwin for pushing us to undertake this project to collect non-technical summaries for some of the major contributions revealing the legacy of important historical events. Due to space and other constraints some important works are not covered by this e-book. We would like also to thank Sophie Roughton, Simran Bola, and Tessa Ogden from CEPR for helping us.

In Chapter 3, Quamrul Ashraf and Oded Galor summarise their (and others') work on how the Neolithic Revolution and the pre-historic movements of populations 'out of Africa' influences both pre-industrial and contemporary comparative development (Ashraf and Galor 2011, 2013). Their fascinating chapter connects insights from evolutionary biology, genetics, cultural anthropology, and political science with Unified Growth Theory. It also discusses the origins of genetic and cultural diversity and their consequences for long-run development.

In Chapter 4, Enrico Spolaore and Romain Wacziarg present empirical evidence showing that genetic distance and human relatedness have considerable statistical power in explaining both the diffusion of technology/development and the dissemination of democratic institutions (Spolaore and Wacziarg 2009, 2014). They also show how genetic and linguistic barriers explain the spread of the fertility transition across European regions during and after the Industrial Revolution. Their work highlights the challenges that societies and policymakers face; they have to overcome history-shaped barriers that slow down the spread of pro-growth technologies, institutions, and beliefs. The results, however, do not establish historical (or genetic/cultural) determinism; while the legacies are considerable, the empirical analysis shows that such barriers have diminished in the recent globalisation era, as people from different cultural, genetic, geographical, and institutional backgrounds mix, trade, marry, and befriend.

In Chapter 5, James Fenske and Namrata Kala provide an overview of 'Environmental Economic History'. In this chapter, which is complementary to our introduction, the authors summarise recent works that assess the impact of 'the interaction between human culture and the environment' with contemporary outcomes. In particular, the authors cover two strands of the literature. They go over empirical studies that aim to isolate the impact of particular geographic endowments on institutions, culture, and policies. In addition, they review studies assessing the long-term impact of environmental shocks on various development outcomes, such as the impact of droughts on historical conflict (Fenske and Kala 2015), the Great Mississippi Flood (Hornbeck and Naidu 2014), or the Dust Bowl (Hornbeck 2012).

In Chapter 6, Joel Mokyr summarises some of the key ideas of his latest work, which try to understand the forces behind the origins of modern growth and the Industrial Revolution. Drawing on his latest book (Mokyr 2016), he discusses the interactive role

played in Europe's history by political fragmentation and the emergence of knowledge-based science during the Enlightenment culture. This work stresses interactions that could explain the lasting impact of various historical features, in this case political fragmentation – which is linked to Europe's heterogeneous geography (Diamond 1997). Political competition appeared to become crucial when attitudes towards scientific knowledge changed somewhat and when new technology (the printing press) enabled its spread.

Chapters 7, 8, 9 and 10 discuss the impact of colonisation on former European colonies around the world (Volumes II and III include chapters summarising various aspects of colonisation on specific regions and countries).

In Chapter 7, Daron Acemoglu and James Robinson summarise their papers (some with Simon Johnson) on the role of colonial institutions in determining contemporary economic and political/institutional development (Acemoglu *et al.* 2001, 2002, 2005, and see Acemoglu and Robinson 2012, for a general-audience exposition). The authors' starting point is that colonial strategies were quite heterogeneous; on the one hand, in places where Europeans faced favourable living conditions and low opposition from local population and where population density was low, they migrated *en masse* and established colonies with inclusive pro-growth institutions. Examples include the United States, Canada, Australia, and New Zealand. On the other hand, in places with unfavourable ecological conditions (yellow fever, malaria) and effective opposition from the locals, Europeans set up small communities and applied extractive strategies aimed at minerals and agricultural goods. Africa stands out as the typical example. Latin America falls somewhere in the middle of the spectrum. Due to institutional persistence, colonial institutions endured after independence, contributing to a massive divergence in well-being.

In Chapter 8, Rafael La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny summarise their contributions on the long-lasting legacies of legal origins (e.g., La Porta *et al*. 1997, 1998). The authors have brought into economics and finance insights from legal theory, stressing the vast differences of the British common-law system with the French and German civil-law systems. La Porta *et al*. show how the different legal systems that Europeans established led to considerable heterogeneity on commercial and civil laws as well as the regulatory environment of product, labour, and

capital markets. In a series of papers (some co-authored with Simeon Djankov) they have constructed quantitative measures reflecting the quality of the legal system in protecting minority shareholders and creditors, and the efficiency of courts, red tape, and regulations; using the new data they have shown that common-law countries offer superior protection to investors, have more efficient and less formalistic courts, and regulate markets lightly. In contrast, countries that were French (and to a lesser extent German) colonies offer much weaker protection to shareholders and creditors, have slow courts with formalistic civil and administrative procedures, high levels of red tape, and tight regulations. La Porta *et al.* further argue that these important differences in corporate law and regulation have shaped financial patterns and depth (size of capital markets, stock market turnover, private credit), which in turn affects economic development (see Levine 2005).

In Chapter 9, Bill Easterly and Ross Levine summarise their recent work on the impact of colonisation in a large sample of 129 countries. Their analysis proceeds in two steps. First, the authors go over their newly constructed dataset of European presence at the time of colonisation. In many colonies (such as Togo, Kenya, Cambodia, Iraq, and Pakistan), the share of Europeans was minimal, consisting of less than 1% of the population, while in other colonies (Argentina, Australia, Costa Rica, Canada, and the United States), the share of Europeans, even at the very early stage exceeded 10%. In support of the Acemoglu *et al*. (2002) argument, they find that Europeans did not settle in large numbers in areas with dense indigenous populations. Second, they show that the share of Europeans correlates significantly with contemporary development. Importantly, they uncover that the percentage of Europeans in the population during colonisation is a more important correlate of output per capita than the share of the Europeans today, illustrating that the colonial experience was influential (see also Hall and Jones 1999).

In Chapter 10, Jim Feyrer and Bruce Sacerdote summarise their work. Colonial powers' decisions to establish colonies and protectorates was at least partly driven by local health conditions; opposition from indigenous population; and, perhaps, other region-specific factors that may, in turn, affect contemporary development directly, or via other-than-colonisation means. Feyrer and Sacerdote (2009) try to push on causation, a daunting task. They examine the impact of colonial tenure on contemporary development, focusing on small islands in the Pacific, Atlantic, and Indian Oceans and applying an ingenious identification approach. To isolate the one-way effect of colonisation and account for

other relevant factors, they exploit exogenous variation on oceanic winds and currents; sailing ships had very limited ability to sail against oceanic winds and thus followed currents that facilitated maritime travel. The authors then apply an econometric approach that relates modern income to the component of colonial tenure explained by islands' effective accessibility by sailing ships. Their two-stage analysis shows that longer colonial rule has a statistically strong and quantitatively non-negligible positive effect on contemporary GDP per capita. Thus, while this study focuses on small islands, crucially it advances the key issue of causation, by providing fresh evidence on a causal link between the length of colonisation and contemporary development.

In Chapter 11, Luigi Pascali discusses his recent work, examining the impact of the steam ship on the surge of shipping commerce during the first era of globalisation (1870-1913). Understanding growth during this period of industrialisation is key, as global GDP more than tripled during this half-century; and the increase in income was highly asymmetric. Pascali's (2017) insight is that the introduction of the steam ship differentially affected trade across the world. For some regions the effect was large, since unfavourable winds and currents were impeding trade, while for other regions the benefit was smaller because of winds already favourable to sail. His empirical analysis yields four interesting results. First, he documents a swift adoption of the new technology. Second, he estimates large shipping costs trade elasticities, suggesting that the introduction of the steam ship was a major driver of globalisation and of the spur in trade. Third, he shows a small overall effect of steam-ship-induced trade on average incomes across the world, that is, however, quite heterogeneous. Fourth, Pascali presents evidence that the spur of trade, fostered by the introduction of the steam ship, had large positive effects on development in countries with good institutions. In contrast, trade's impact on development in autocratic countries with low levels of executive constraints was negative. This result is quite important, as it emphasises the interactive effects of historical events; countries with more 'inclusive' institutions managed to benefit from a new revolutionary technology (steam ship) in a period of massive economic transformation (the Second Industrial Revolution in an era of rapid globalisation) sowing the seeds for the ensuing dramatic divergence.

2 On the spatial distribution of development. The roles of nature and history

Vernon Henderson, Tim Squires, Adam Storeygard, and David Weil
London School of Economics and Political Science; Amazon.com; Tufts University; Brown University

Why do people, in the world as a whole or within a given country, live where they do? Why are some places so densely populated and some so empty? In daily life, we take this variation in density as a matter of course, but in many ways it can be quite puzzling.

Economists point to three factors to explain how population is distributed. The first is that there are differences in geographical characteristics, often referred to as 'first nature', that make some places better disposed for habitation or producing output than others. This explains why mountainous regions, deserts, tundra and so on tend to have low population density, and why much of the world's population is situated in places where it is relatively easy to produce food.

The second factor is agglomeration. Because of economies of scale and gains from trade, we humans often find it efficient to gather in small areas. Of course, many industries, most notably food production, don't benefit from such concentration, and are instead spread out in accordance with the availability of first nature resources. Further, there are limits to the benefits of agglomeration: because of congestion and transport costs, the urban population is spread among many cities, which are, in turn, spatially dispersed.

The final factor affecting the distribution of population is history. Cities, once established, have a very strong tendency to stay put. This persistence results from many factors, often collectively described as 'second nature' (Cronon 1992). Among these factors are long-lived capital, political power, and the fact that once agglomeration has started in a particular place, it will be a natural focus for future equilibria. As discussed by Bleakley and Lin (2012) and Michaels and Rauch (forthcoming), this persistence can be important, even when the reasons that a city has been established in a particular place are no longer important.

The complete story of how nature, agglomeration, and history have interacted to give the world the distribution of population that we see today is far too complex to be captured in a single study. In 'The Global Spatial Distribution of Economic Activity: Nature, History, and the Role of Trade ' (Henderson *et al*. 2017), our goals are less ambitious. We ask how economic and technological development have changed the ways in which first-nature characteristics impact population distribution. While these characteristics themselves haven't changed too much over history (so far), the way in which they affect settlement has. Simple examples of such changes are the impacts of air conditioning, irrigation, and the discovery of new uses for particular mineral resources. We focus on the two natural characteristics where we think that changes associated with economic and technological change have been most important. These are, first, the suitability of a region for growing food, and second, the suitability of a region for engaging in national and international trade. Over the last several centuries, the importance of fertile land as a determinant of population density has declined, both because agricultural productivity has increased – so that a smaller fraction of the labour force works on farms – and because transport costs have fallen – so that people don't need to live near where their food is produced. Lower transport costs, along with increased opportunities for gains from trade, have similarly raised the value of locations (such as those on coasts, navigable rivers, or natural harbours) that are accessible to trade, either within or between countries.

Our goal is to show how these changes are reflected in the distribution of population today. In pursuing this goal, the effect of persistence, as described above, turns out to be very important. We are interested in how technology in historical times affected agglomeration at those times, but the data on population density that we use (described below)

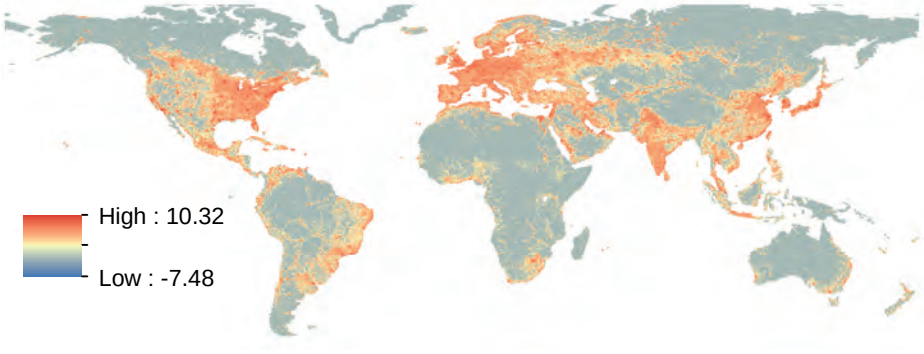
is only available for the world today. However, if we know when (in a rough sense) agglomeration began in a country, then we can use the similarity of today's distribution to the historical distribution to learn about how the technology available at that time affected agglomeration.

First-nature data and the distribution of population today

Before looking at the role of history, we start by simply examining the explanatory power of first-nature characteristics for population distribution in the world today, which is arguably an interesting issue in its own right.

Our starting point, in measuring the dispersion of population, is lights observed at night by weather satellites. Specifically, we use the 2010 Global Radiance Calibrated Nighttime Lights dataset (Ziskin *et al*. 2010). In previous work (Henderson *et al.* 2012), we showed that change over time in night-lights data is a useful proxy for the growth of GDP in countries with poor national income accounts data. The lights data are distributed as a grid of pixels of dimension 0.5 arc-minute resolution (1/120 of a degree of longitude/latitude). We aggregate into a grid of 1/4-degree squares, with each square covering approximately 770 square kilometres at the equator. At this resolution our sample is roughly 240,000 grid squares (excluding squares made up solely of water). Figure 1 shows this grid cell data for the world as a whole.

Figure 1. Demeaned lights



The first-nature variables we use in predicting lights come in three groups. The first, labelled 'agriculture', are factors that seem clearly related to producing food. These comprise six continuous variables (temperature, precipitation, length of growing period, land suitability for agriculture, elevation, and latitude) as well as a set of 14 indicators for biomes (mutually exclusive regions, encoding the dominant natural vegetation expected in an area, based on research by biologists.) The second group of variables, labelled 'trade', focus on access to water transport. These are dummy variables for whether the centre of a grid cell is within 25 kilometres of a coast, navigable river, major lake, or natural harbour, as well as a continuous measure of distance to the coast. Finally, we define a 'base' group of two variables – ruggedness and malaria ecology – which seemed to us to be roughly equally relevant for agriculture and trade.

Figure 2a. Demeaned predicted lights without fixed effects

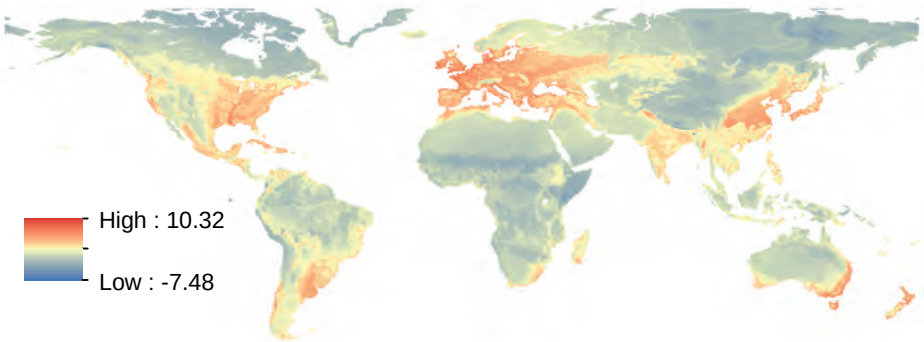
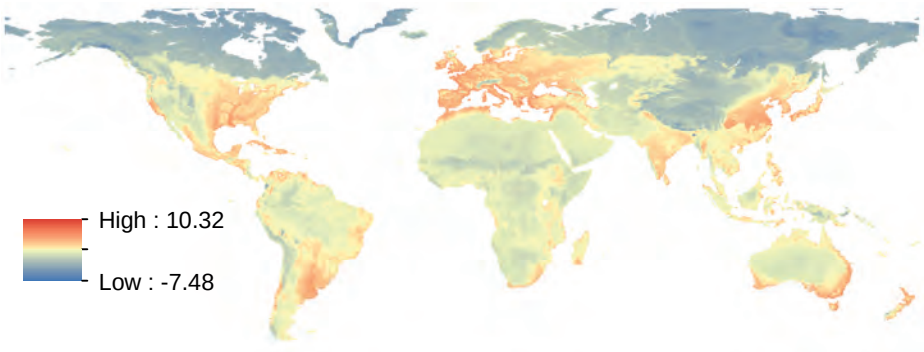


Figure 2a shows the fitted values from regressing lights in a grid square on our three sets of first-nature variables. Together, these variables explain 47% of the variation in lights and, looking at the figure, there is clearly a strong resemblance between the fitted values and the world as we know it. However, there are two potential problems associated with jumping from this result to the conclusion that nature really does explain such a large fraction of variability in population density. The first is that variation in visible light is not solely determined by population density. The other big determinant is income per capita. It is for this reason that, in Figure 1, Japan is so much brighter than Bangladesh, even though the latter is more densely populated. The second problem is that a statistical correlation between geographical characteristics and

either income or population density might not indicate a true effect of geography, but rather be proxying for the effect of something correlated with geography. For example, if European colonisers implanted good institutions in places where the climate was amenable to their settlement, and bad institutions in places where it was not (the story of Acemoglu *et al*. 2001), then a European-type climate will predict higher income, even though it may not directly affect income at all.

Figure 2b. Demeaned predicted lights with fixed effects



Both of these problems are addressed by looking at variation in lights and natural characteristics within countries. Formally, this amounts to including country-fixed effects in our analysis, which is done in all the work reported below. Figure 2b is an example of this: we estimate the effect of first-nature characteristics, using only within-country variation in lights, and then form fitted values for the world as a whole, omitting the estimated country fixed effects. As the figure shows, knowing only how geography affects population within countries, one would still do a pretty good job of predicting the variation in population density the world over. The agriculture and trade variables account for slightly more than one-third of within-country variation.

The changing importance of first-nature characteristics

We now turn to the question of how the importance of natural characteristics, as a determinant of the distribution of population, has changed over time. As mentioned above, a key to our approach is comparing countries where agglomeration took place early,

thus reflecting the weights put on natural characteristics further back in time, with those that agglomerated later. Unfortunately, we don't have a good, consistent measure of exactly when agglomeration took place, so instead we use data from 1950, on both urbanisation as well as two proxies: education and GDP per capita. Our assumption is that countries with higher values of these measures, as of that point in time, also started their urbanisation process earlier. We use several statistical approaches to parse the data. One is to estimate coefficients on our 'agriculture' and 'trade' variables separately for early and late agglomerators, while simultaneously letting the data determine where the cutoff is between these two groups of countries (essentially, looping through all possible division points to find the one that gives the best fit). Applying this method, using urbanisation in 1950, for example, we find that the cutoff between early and late agglomerators is an urbanisation rate of 36.2%, which puts 70 out of 189 countries (57.2% of our grid squares) in the 'early' category. Table 1 then shows the R-squareds from running regressions of visible lights on either the set of base variables (including country fixed effects), the base plus agriculture variables, or the base plus trade variables. The improvement in fit that comes from adding agricultural variables is much larger in the early than in the late agglomerating countries; correspondingly, the improvement in fit that comes from adding trade variables is much larger in the late agglomerating countries than in the early agglomerators. We find a similar pattern when we use education or GDP per capita in 1950 to split the data, and we find it also when we look solely within the New World or the Old World. We also find similar results when we look at other specifications, for example linearly interacting urbanisation or its proxies with agriculture and trade variables.

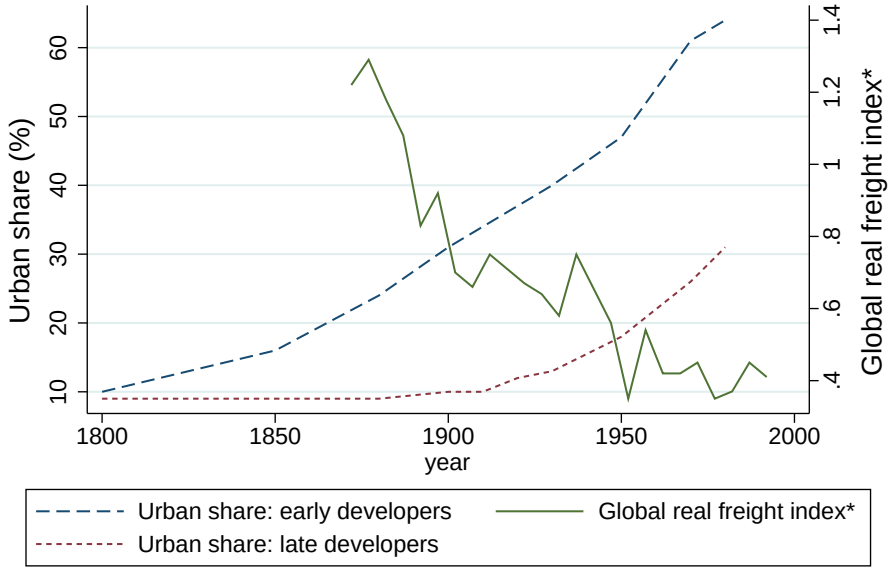
Table 1. R-squareds

RHS variables	Early Agglomerators	Late Agglomerators
Base	0.350	0.359
Agriculture + Base	0.613	0.508
Trade + Base	0.385	0.447

These results tell what, at first, seems to be a puzzling story: late agglomerators are generally poorer countries, and on average are more dependent on agriculture than early agglomerators. Yet it is in the latter group of countries that agricultural variables do a better job of predicting the location of population and economic activity. Our explanation

of this apparent puzzle looks to the timing of when agricultural productivity rose and similarly when trade costs fell. In countries where agglomeration got going early, the rise in agricultural productivity preceded the decline in transport costs. That is, people began moving from farms to cities at a time when it was still relatively expensive to move food from place to place. As a result, cities were located close to areas conducive to food production. By contrast, in late agglomerators, the rise in agricultural productivity that allowed urbanisation came later, relative to declining transport costs, and so the latter was relatively more influential as a determinant of location. Figure 3 shows some of the data that supports this story: it plots the urban share of the population in groups of early and late agglomerators, as well as a global index of transport costs. The figure makes clear that transport costs were far lower when late agglomerators reached any particular level of urbanisation than when the same level was reached by early agglomerators.

Figure 3.



*excludes periods including world war years

Sources: Bairoch (1988); Mohammed and Williamson (2004)

An interesting implication of this analysis is that countries that are only urbanising now have population distributions that are more appropriate to modern technology than do those that urbanised earlier. For example, even though, in Europe, coastal areas already have particularly high population densities, our estimates imply that, had Europe developed later, coastal density would be even greater. Similarly, had Africa developed earlier, interior areas such as the Ethiopian highlands and the Congo basin would have higher relative population densities than those actually observed today.

Another set of implications, drawn from the story in our paper, involves spatial inequality within countries. We expect that early agglomerators, with their activity focused around agriculturally suitable land, and a distribution of population inherited from a period when transport costs were high, should have a higher degree of spatial equality in lights overall than late agglomerators, with their heightened coastal focus and low transport costs. To assess this prediction, we calculate a spatial Gini coefficient for light across grid cells for each country. Table 2 shows the results from regressing the lights Gini on urbanisation in 1950. The coefficient is negative, as predicted. Further, controlling for the Gini of lights predicted using our geographic variables, as well as measures of country size and population (and thus population density), does not affect the result.

Table 2. Gini Coefficient of Lights

Urbanisation in 1950	-0.00400 (0.00067)	-0.00425 (0.00063)	-0.00285 (0.00049)
Gini Coefficient of Predicted Lights		0.382 (0.073)	0.0933 (0.0658)
ln(land area)			0.0864 (0.0074)
ln(population in 2010)			-0.0500 (0.0081)
Constant	0.851 (0.026)	0.702 (0.037)	0.212 (0.063)
Observations	131	131	131
R-squared	0.167	0.277	0.597

Conclusion

The saying that "geography is destiny" is often attributed to Napoleon. Meanwhile, the American industrialist Henry Ford really did say that "history is bunk." In our research, we have shown that, when it comes to thinking about how population is distributed within countries, there is reason to doubt both of these statements. Geography clearly matters quite a bit, when it comes to where people live. But the aspects of geography that matter change over time. Further, there is enormous persistence in location, so that the ways in which geography mattered in the past – that is, history – are still reflected in the spatial distribution of population today.

To many readers, sitting in cities founded hundreds of years ago, sipping coffee grown thousands of kilometres away, none of this will come as a great surprise. However, understanding the dynamic interplay of geography, technology, economic growth, and history – a project in which our paper is only a small step – is of great import in thinking about many issues facing the world today. Not only are the impacts of different geographic characteristics continuing to change with economic and technological development, but, in decades to come, geographic characteristics themselves will be changing at an ever increasing rate. At the same time, in much of the developing world, urbanisation is taking place at a rapid pace. The locational decisions made today will have impacts for centuries to come.

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3 Deep roots of comparative development

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Introduction

The transition from an epoch of stagnation to an era of sustained economic growth has marked one of the most extraordinary transformations in human history. While living standards in the world economy stagnated during the millennia preceding the Industrial Revolution, income per capita has undergone a remarkable twelve-fold increase over the past two centuries, altering the distribution of education, health, and wealth across the globe.

The unprecedented rise in the standard of living, however, has not been universally shared among individuals and societies. In particular, variation in the timing of the take-off from stagnation to growth has led to a vast divergence in income per capita. Inequality across societies, which had been modest until the 19th century, has since widened considerably, with the ratio of income per capita between the richest and the poorest regions of the world being magnified from a moderate 3:1 ratio in 1820 to a staggering 15:1 ratio by 2010.

Unified Growth Theory

The differential timing of the take-off from Malthusian stagnation to sustained economic growth and the corresponding divergence in income per capita across the globe have been the focus of intensive research during the past two decades. The inconsistency of the predominant theories of economic growth with some of the most

fundamental characteristics of the growth process, as well as their limited ability to shed light on the origins of the vast global disparity in contemporary living standards, have spurred the development of a unified theory of economic growth that captures the growth process in its entirety. The advancement of Unified Growth Theory has been fuelled by the conviction that the understanding of the global variation in economic development would be fragile and incomplete unless the prevailing theory of economic growth reflects the principal driving forces behind the entire process of development, capturing the central role that historical factors have played in bringing about the current worldwide disparities in living standards.

Unified Growth Theory provides a fundamental framework for analysing the evolution of individuals, societies, and economies over the *entire* course of human history (Galor and Weil 2000, Galor and Moav 2002, Galor 2005, Galor and Mountford 2008, Galor 2011).[1] The theory unveils the principal economic forces that have generated the remarkable transition from stagnation to growth and underlines their significance for understanding the contemporary growth process of both developed and less-developed economies. Moreover, it sheds light on the roles played by historical and prehistorical factors in the divergence of income per capita across regions of the world over the course of the past two centuries. The theory captures, in a *single* analytical framework, the main characteristics of the process of development: (i) the epoch of Malthusian stagnation that characterised most of human history; (ii) the escape from the Malthusian trap and the associated spike in the growth rates of income per capita and population; (iii) the emergence of human capital formation in the process of development; (iv) the trigger for the onset of the demographic transition; (v) the emergence of the contemporary era of sustained economic growth; and (vi) the divergence in income per capita across countries.

Unified Growth Theory suggests that the transition from stagnation to growth has been an inevitable by-product of the process of development. It argues that the inherent Malthusian interaction between the rate of technological progress, on the one hand, and the size and composition of the population, on the other, accelerated

1 See also Hansen and Prescott (2002) and Lagerlöf (2006).

the pace of technological progress and, ultimately, raised the importance of education in coping with a rapidly changing technological environment. The associated rise in the demand for education, in turn, brought about significant reductions in fertility rates. It enabled economies to divert a larger share of the fruits of factor accumulation and technological progress to the enhancement of human capital formation and income per capita, paving the way for the emergence of sustained economic growth. Furthermore, heterogeneity in country-specific geographical, institutional, and human characteristics that have affected the intensity of the pivotal interaction between the rate of technological progress, on the one hand, and the size and composition of the population, on the other, has generated variation in the timing of the transition from stagnation to growth and, thus, contributed to the contemporary gap in income per capita across countries (Galor 2010).

The biogeographical origins of comparative development

Theories of comparative development highlight a variety of proximate and ultimate determinants of the vast inequities in living standards across the globe. The relative importance of geographical, cultural, and institutional factors; human capital formation; ethnic, linguistic, and religious fractionalisation; colonialism; legal origins; and globalisation has been at the centre of a debate regarding the origins of the differential timing of transitions from stagnation to growth and the remarkable transformation of the world income distribution in the last two centuries (e.g., Gallup *et al*. 1999 Acemoglu *et al*. 2001, 2005, Alesina *et al*. 2003, Glaeser *et al*. 2004, La Porta *et al*. 2008, Ashraf and Galor 2013a, Michalopoulos and Papaioannou 2014). Although both theoretical and empirical research have typically focused on the effects of such factors in giving rise to and sustaining the divergence in income per capita since the early modern era, attention has recently been drawn towards deeply rooted factors that have been argued to affect the path of comparative economic development over the entire arc of human history. Specifically, this line of research suggests that factors determined tens of thousands of years ago have had a significant effect on the course of economic development from the dawn of mankind to the contemporary era.

These explorations of the long shadow of (pre)history have centred around three fundamental lines of inquiry – namely, (i) the interaction between human evolution

and the process of economic development; (ii) the impact of the differential timing of the Neolithic Revolution on comparative development across societies; and (iii) the influence of heterogeneity in the genetic composition of populations on their comparative economic performance – emphasising the roles played by the Neolithic Revolution and the prehistoric exodus of anatomically modern humans from Africa, in generating variation in the composition of human traits across populations around the globe.[2]

Human evolution

The impact of the economic environment on the evolution of human traits and the contribution of this evolutionary process to long-run economic development have been the subject of an intensive research programme over the past two decades. The central hypothesis in this research avenue, originating with Galor and Moav (2002), suggests that, in the era following the Neolithic Revolution, Malthusian pressures not only acted as a key determinant of the size of a population but conceivably shaped, via the forces of natural selection, its composition as well. Lineages of individuals whose traits were complementary to the economic environment may have generated higher levels of income and, thus, a larger number of surviving offspring. Consequently, the gradual increase over time in the representation of these traits in the population may have contributed to the process of development, the pace of the transition from stagnation to growth, and comparative economic development across societies.

In line with the evidence regarding human evolutionary adaptations since the onset of the Neolithic Revolution, this research additionally suggests that, due to the egalitarian nature of hunter-gatherer societies, the forces of evolutionary selection within a society were largely muted prior to the adoption of farming and the emergence of the nuclear family. The transition to sedentary agriculture and the emergence of property rights, however, may have subsequently reinforced the association between parental income and reproductive success and, thus, amplified the pace of these evolutionary processes (Galor and Moav 2002).

2 The following discussion of the literature on human evolution, genetic diversity, and economic development is borrowed from Ashraf and Galor (forthcoming).

Subjecting hypothetical evolutionary processes to the scrutiny of evolutionary growth models, this body of research has identified several traits that may have been subjected to positive selection during the Malthusian epoch, due to their conduciveness to human capital formation and economic development. In particular, these studies have highlighted the selection of innate preferences for the quality rather than quantity of offspring (Galor and Moav 2002), resistance to infectious diseases (Galor and Moav 2007), human body size (Lagerlöf 2007), predisposition towards entrepreneurial spirit (Galor and Michalopoulos 2012), lactase persistence (Cook 2014), conspicuous consumption (Collins *et al*. 2015), and time preference (Galor and Özak 2016).[3]

Specifically, Galor and Moav (2002) have advanced the hypothesis that, during the Malthusian epoch, natural selection may have brought about a gradual increase in the prevalence of traits associated with predispositions towards the quality rather than quantity of offspring. The positive influence of this evolutionary process on investment in human capital may have stimulated technological progress and contributed to the reinforcing interaction between human capital investments and technological progress, which ultimately triggered the demographic transition and brought about a state of sustained economic growth. The quantitative analysis of Collins *et al*. (2014) corroborates this hypothesis.

An empirical test of the hypothesis advanced by Galor and Moav (2002) has recently been conducted by Galor and Klemp (2014). Using an extensive data set of genealogical records for nearly half-a-million individuals in Quebec between the 16th and 18th centuries, their study suggests that moderate fecundity, and thus predisposition towards investment in child quality, was conducive to long-run reproductive success, reflecting the negative influence of higher fecundity on the survivability, marital age, and education of each offspring. The finding lends credence to the hypothesis that, during the Malthusian epoch, natural selection favoured individuals with lower fecundity and greater predispositions towards child quality, thus contributing to human capital formation, the demographic transition, and the transition from stagnation to growth.

3 It may be noted that the interaction between human evolution and the process of development, as emphasised by this literature, is applicable to either cultural or genetic propagation mechanisms for the intergenerational transmission of individual traits (Bisin and Verdier 2011, Bowles and Gintis 2011, Robson and Samuelson, 2011, Doepke and Zilibotti 2014).

The evolutionary origins of worldwide variations in the resistance to infectious diseases, as well as their implications for comparative development, have been examined by Galor and Moav (2007). This research hypothesises and provides empirical evidence that the socioeconomic transformations associated with the Neolithic Revolution triggered an evolutionary process, which, in turn, applied positive selective pressures on the resistance to infectious diseases. Consequently, heterogeneity across societies in their length of exposure to this evolutionary process, as captured by the differential timing of their transition to sedentary agriculture, may have significantly shaped the contemporary global distribution of human longevity. In a related paper, Cook (2015) further links this evolutionary process to the degree of intrapopulation genetic diversity in the human leukocyte antigen (HLA) system.

Galor and Michalopoulos (2012) have explored the coevolution of entrepreneurial spirit and the process of long-run economic development. Their analysis suggests that Darwinian selection of entrepreneurial traits may have played a significant role in the process of economic development, influencing the dynamics of inequality both within and across societies. Specifically, they argue that entrepreneurial spirit evolved non-monotonically over the course of human history. In early stages of development, risk-tolerant growth-promoting traits may have possessed an evolutionary advantage, and their increased representation in the population over time accelerated the pace of technological progress and, thereby, the process of economic development. In mature stages of development, however, risk-averse traits may have gained an evolutionary advantage, diminishing the growth potential of advanced economies and contributing to convergence in economic growth across countries.

The coevolution of subsistence consumption, the ability to engage in efficient and diversified food procurement strategies, and the process of development has also been examined by this line of research. Specifically, Lagerlöf (2007) has argued that resource depletion, associated with technological progress and rising population density during the Malthusian epoch, may have triggered a shift in reproductive advantage from large to small body sizes, thereby generating an endogenous reversal of the long-run time trend in human body mass. In addition, Cook (2014) has provided empirical evidence, documenting that heterogeneity across regions in the contemporary prevalence of the lactase persistence trait is positively associated with differences in the level of precolonial

economic development – a pattern that presumably reflects the reproductive success and the productivity-enhancing benefits associated with this post-Neolithic adaptation that extends the ability to digest milk into adulthood.[4] Furthermore, Collins *et al*. (2015) have argued that female mating preferences may have increased the reproductive success of males predisposed to engage in conspicuous consumption in order to credibly signal their quality. However, because conspicuous consumption is funded through increased participation in the labour force, the increase over time in the prevalence of signalling males in the population may have given rise to an increase in economic activity, which then contributed to long-run economic growth.

Finally, Galor and Özak (2016) have explored the evolutionary origins of the contemporary distribution of time preference across regions. They advance the hypothesis and provide empirical evidence that geographical variation in the natural return to agricultural investment may have had a persistent effect on the distribution of time preference across societies. In particular, exploiting a natural experiment associated with the expansion of suitable crops for cultivation in the course of the Columbian Exchange, these authors find that preindustrial agro-climatic characteristics, conducive to higher returns from agricultural investment, may have triggered selection and learning processes that have had a persistent positive effect on the prevalence of long-term orientation.

In contrast to the literature on the interaction between human evolution and the process of development, which emphasises the 'direct effects' of the composition of human traits in society on economic outcomes, a complementary line of research, originating with Spolaore and Wacziarg (2009), has exploited human evolutionary data in order to empirically examine the 'barrier effects' of the extent of cultural and biological divergence between societies on their ability to adopt technological and institutional innovations from the global frontier and, thus, on the diffusion of economic development. Notably, in these contributions (e.g., Spolaore and Wacziarg 2009, 2016), the extent of divergence between societies is proxied by their pairwise genetic distance in selectively neutral genetic markers – a measure that captures the time elapsed since the two societies diverged from a common ancestral population and, therefore, the time

4 The long-run codetermination of human physiology and economic development is explored further by Dalgaard and Strulik (2015, forthcoming).

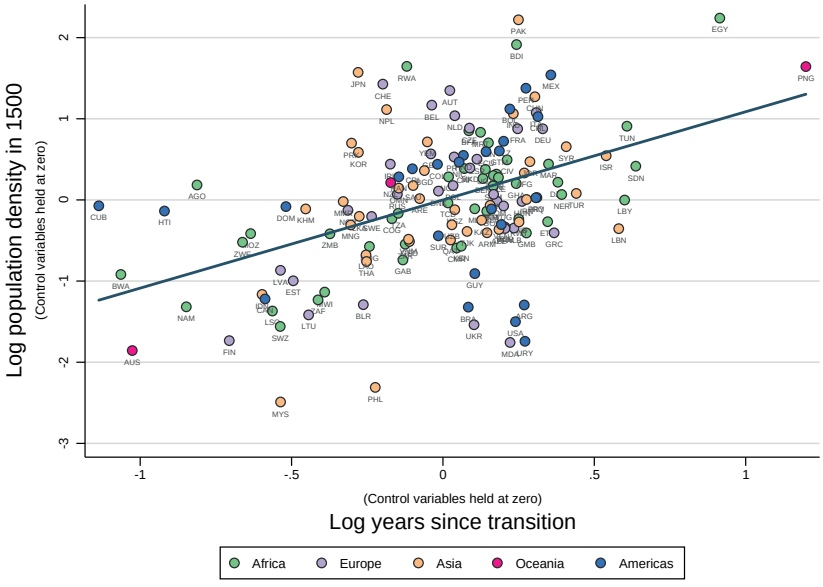
over which intersocietal cultural and biological differences could have accumulated, due to the forces of cultural and genetic drift, differential selection, and divergent gene-culture coevolution. In line with the 'barrier effects' arising from cultural and biological divergence, this area of inquiry has documented the reduced-form contribution of genetic distance between societies to differences in income per capita, technology adoption, and institutional quality, amongst other outcomes.

The neolithic revolution

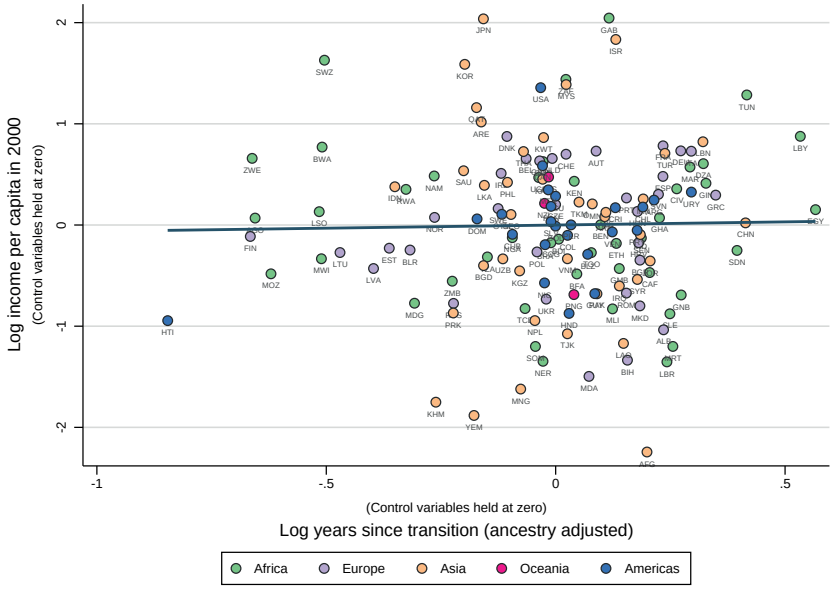
The influence of biogeographical endowments in giving rise to variation in the timing of the Neolithic Revolution across regions has been at the centre of an influential hypothesis of comparative economic development (Diamond 1997, 2002). Accordingly, the emergence and subsequent diffusion of sedentary agricultural practices were primarily driven by geographical conditions such as climate, continental size and orientation, as well as the availability of wild plant and animal species amenable to domestication. In particular, favourable biogeographical endowments, associated with a larger variety of domesticable species of plants and animals and with factors facilitating the spatial diffusion of agricultural practices across similar climatological environments, contributed to the emergence of agriculture during the Neolithic Revolution, giving some societies the early advantage of operating a superior production technology and generating resource surpluses. They permitted the establishment of a non-food-producing class, whose members were crucial for the development of written language and science and for the formation of cities, technology-based military powers, and nation states. The early dominance of these societies thereafter persisted throughout history, being further sustained by geopolitical and historical processes such as colonisation and globalisation.

Figure 1. The Neolithic Revolution and historical versus contemporary comparative development

Panel a



Panel b



Sources: Ashraf and Galor (2011, 2013a)

As illustrated in panel (a) of Figure 1, heterogeneity across societies in the timing of the transition to sedentary agriculture is indeed instrumental for the understanding of their *precolonial* comparative development, as captured by population density in the year 1500 (Ashraf and Galor 2011; Spolaore and Wacziarg 2013). Nevertheless, evidence suggests that the initial dominance of some societies, due to their earlier transition to agriculture, has dissipated over the past five hundred years, and, as depicted in panel (b) of the figure, the timing of the Neolithic Revolution has no significant association with *contemporary* income per capita (Ashraf and Galor, 2013a).[5]

In particular, the finding of a persistent impact of the (ancestry adjusted or unadjusted) timing of the Neolithic Revolution on contemporary cross-country comparative development (e.g., Olsson and Hibbs 2005, Putterman 2008, Putterman and Weil 2010) does not appear to hold *within* continents – i.e., when one accounts for unobserved time-invariant continent fixed effects. Thus, while the differential timing of the transition to agriculture could still potentially explain some of the *cross-continental* differences in contemporary living standards, through long-run persistence, this explanatory power cannot be separately identified from the confounding influences of correlated but unobserved differences across continents in time-invariant geographical, cultural, and institutional factors. In contrast, the explanatory power of the timing of the Neolithic Revolution for precolonial comparative development holds not only across continents but within continents as well.

Genetic diversity

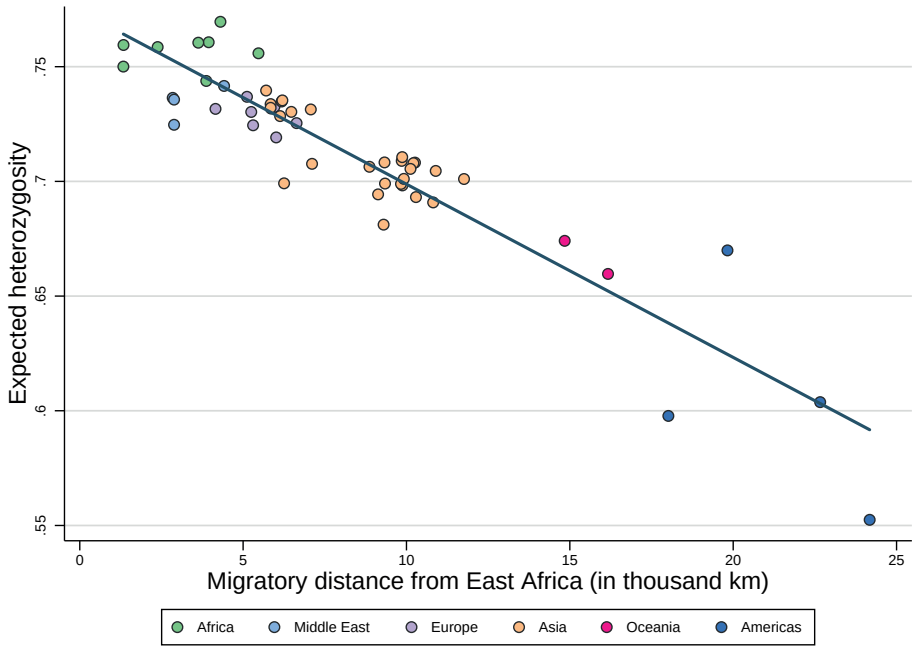
The importance of interpersonal genetic diversity *within* populations has been the focus of a recent but vibrant research programme in the academic literature concerning the deep roots of comparative development, which originates with Ashraf and Galor (2013a). This research has advanced and empirically substantiated the hypothesis that levels of genetic diversity in indigenous settlements across the globe were adversely affected by their migratory distances from the cradle of mankind in East Africa and,

5 The depicted relationship between ancestry-adjusted years since the transition to agriculture and income per capita in 2000 corresponds to the regression presented in column 2 of Table 6 from Ashraf and Galor (2013a).

thereby, generated a persistent hump-shaped influence on development outcomes, reflecting the trade-off between the beneficial and detrimental effects of diversity on productivity at the societal level.

Diversity can positively influence economic development by widening a society's spectrum of individual skills, abilities, and cognitive approaches, which, in turn, fosters innovative activity, stimulates specialisation, and allows societies to adapt more rapidly to changing technological environments. Conversely, by also widening a society's spectrum of individual values, beliefs, preferences, and predispositions in social interactions, diversity can reduce the extent of social cohesion, generate inefficiencies in the provision of public goods, and hamper economic coordination, thus conferring a negative influence on economic performance. Importantly, if the social benefits and costs of diversity are diminishing at the margin, diversity is expected to impart a hump-shaped influence on aggregate productivity. Thus, the economic performance of societies characterised by intermediate levels of diversity is expected to be higher than that associated with excessively homogenous or heterogeneous societies.

Figure 2. Migratory distance from East Africa and genetic diversity



Source: Ashraf and Galor (2013a)

The extent of ethnic fractionalisation within national populations has been recognised as an important adverse correlate of development (Easterly and Levine 1997, Alesina *et al*. 2003, Alesina and La Ferrara 2005). This body of research has shown that, across countries, fractionalisation tends to be negatively correlated with income per capita, economic growth, institutional quality, efficiency in provision of public goods, and the extent of social cohesion. The standard measure of ethnic diversity at the national level – namely, the index of ethnic fractionalisation – reflects the probability that two randomly selected individuals from the population will belong to different ethnic groups. This and other similar measures of ethnic diversity, however, predominantly capture only one dimension of diversity in a society – the proportional representation of the different ethnic groups. Importantly, unlike genetic diversity at the national level, these measures do not incorporate the extent of interpersonal diversity *within* each ethnic group in the population, and, with some exceptions, they also generally ignore the degree of differentiation (or the 'distance') between constituent groups.

The hump-shaped influence of diversity on development

Exploiting data on genetic diversity (expected heterozygosity) from the Human Genome Diversity Project (HGDP), Ashraf and Galor (2013a) empirically examine their prediction regarding the trade-off between the beneficial and detrimental effects of the degree of interpersonal diversity on productivity at the societal level. Consistent with their hypothesis, they find that genetic diversity, as determined predominantly by a serial founder effect associated with the prehistoric 'out of Africa' migration process, does indeed confer a significant hump-shaped influence on income per capita, explaining 16% of the worldwide cross-country variation in the standard of living in the year 2000.

Although Ashraf and Galor's main focus is on contemporary comparative development, they confirm the hump-shaped influence of diversity on economic development in both historical and contemporary time periods, showing that diversity within societies has shaped their comparative development since well before the advent of the Industrial Revolution. Demonstrating that the hump-shaped relationship between diversity and development can be observed in historical periods is important for two reasons. First, since the mechanisms through which diversity can affect productivity at the societal level

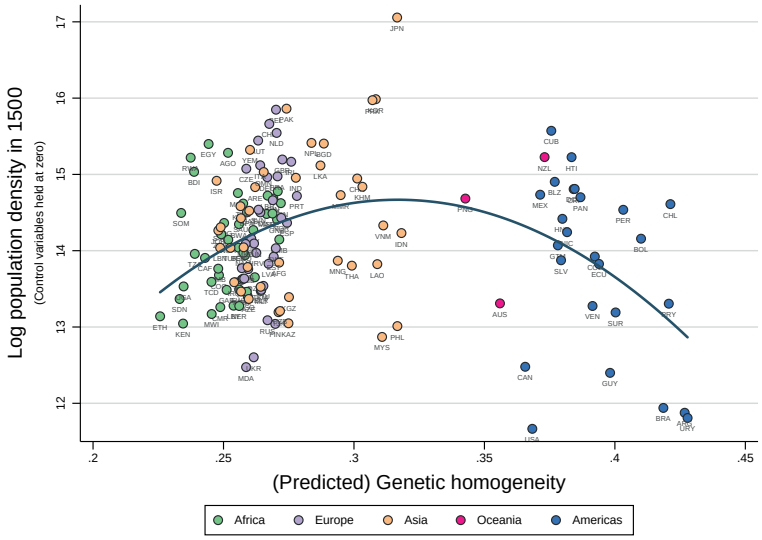
are conceptually independent of the stage of economic development (i.e., agricultural versus industrial), the hump-shaped influence of diversity is expected to hold, not only across modern economies, but across preindustrial societies as well. Second, prior to the discovery of the New World and the great intercontinental migrations of the colonial era, the geographical locations of historical societies largely reflected the locations to which their ancestral populations had arrived at the end of their prehistoric, 'out of Africa', migration from the cradle of mankind, and as such, the diversity of a precolonial society was overwhelmingly determined by an ancient serial founder effect originating in East Africa, as depicted in Figure 2.[6] The great intercontinental migrations associated with the Columbian Exchange, however, drastically altered the ethnic composition of many regional populations, particularly in the New World, thereby introducing additional complexities to the measurement of diversity for contemporary national populations, as elaborated further below.

In the preindustrial era, comparative development was characterised by Malthusian forces – namely, gains in productivity at the societal level were channelled primarily towards population growth rather than growth in income per capita. During this era, more developed societies were, therefore, characterised by higher population density, rather than a higher standard of living (Ashraf and Galor 2011). Thus, Ashraf and Galor's historical analysis of the influence of genetic diversity on comparative development focuses on explaining the variation across preindustrial societies in population density in the year 1500.

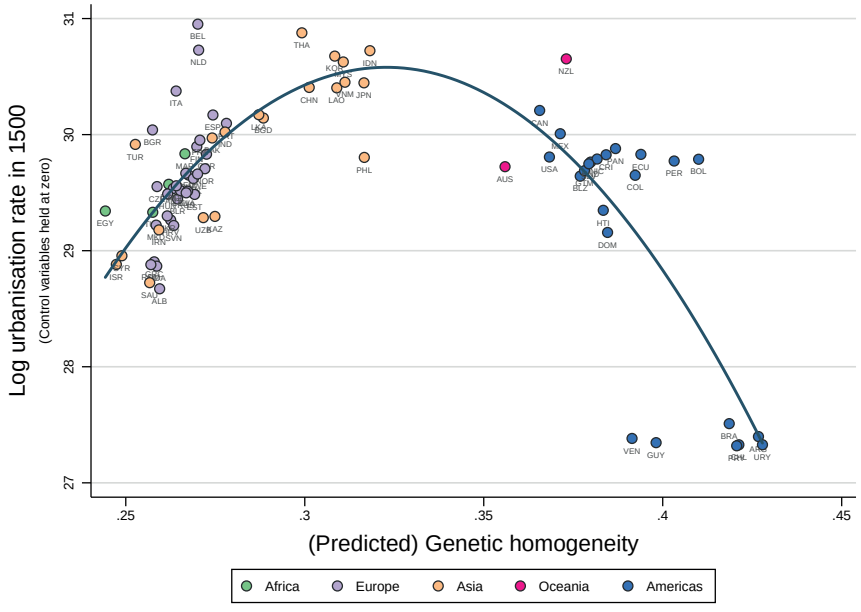
6 This relationship reflects the fact that the prehistoric demic expansion of humans from the cradle of mankind to the rest of the globe was characterised bong series of discrete steps, where, in each iteration, a subpopulation left its parental colony to establish a new colony farther away, carrying with them only a subset of the genetic diversity of their parental population.

Figure 3. Genetic diversity and historical comparative development

Panel a



Panel b



Source: Ashraf and Galor (2013a)

To overcome sample limitations and potential concerns about reverse causality associated with the use of observed genetic diversity, the authors exploit the strong explanatory power of migratory distance from East Africa for the worldwide variation in observed genetic diversity across ethnic groups in the HGDP sample, in order to generate a measure of predicted genetic diversity for all societies around the world, based on their respective geographical locations in the year 1500. As illustrated in panel (a) of Figure 3, employing the measure of predicted genetic diversity, the authors document a hump-shaped influence of diversity on population density in the year 1500, in a sample of observations spanning the entire globe. Notably, the depicted relationship accounts for potentially confounding effects due to heterogeneity across societies in the timing of the Neolithic Revolution and in various geographical factors relevant for their historical development, as well as confounding effects arising from unobserved cross-continental differences. This finding is robust to a large number of sensitivity checks, including 'placebo tests', which show that a similar hump-shaped pattern does not exist when employing either aerial distance from East Africa or migratory distances from other geographical locations as the explanatory variable of interest. In addition, as depicted in panel (b) of Figure 3, the finding continues to hold when the rate of urbanisation in the year 1500 is employed as an alternative measure of comparative development across preindustrial societies.

Ashraf and Galor's analysis of contemporary comparative development exploits data on the ethnic compositions of modern national populations, which reflect the great intercontinental and interregional migrations over the past half-millennium. Specifically, it incorporates this information to construct a country-level measure of contemporary genetic diversity that takes into account not only the genetic diversity of each ethnic group in a national population but also the pairwise genetic distances amongst these constituent ethnic groups[7]. Applying their measure of contemporary genetic diversity, the authors find a significant hump-shaped influence of diversity on income per capita in the year 2000. This relationship, depicted in panel (a) of Figure 4, accounts for potentially confounding effects arising from cross-country heterogeneity in the

7 Additional details regarding the construction of this measure of contemporary genetic diversity are provided in the online appendix of Ashraf and Galor (2013a)

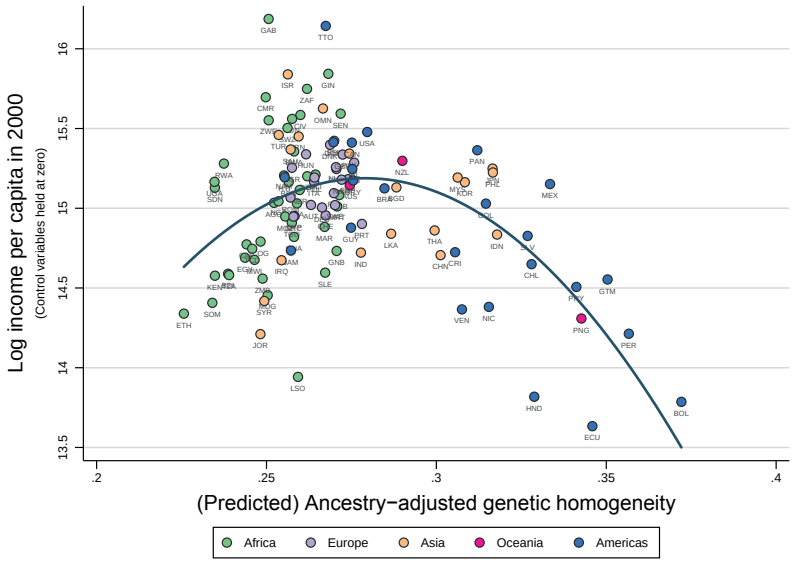
timing of the Neolithic Revolution, various geographical, cultural, and institutional correlates of contemporary economic development, and unobserved continent-specific characteristics. The relationship is additionally robust to controlling for population density in the year 1500, indicating that the hump-shaped influence of diversity does not merely reflect long-run persistence in economic development. Moreover, it continues to hold when limiting the sample to countries in which the overwhelming majority of the population has remained geographically native since the precolonial era, thus alleviating concerns regarding the endogeneity of international population flows over the past five hundred years.

The main finding from Ashraf and Galor's analysis of contemporary comparative development suggests that (i) increasing the diversity of the most homogenous country in their sample (Bolivia) by one percentage point would raise its income per capita in the year 2000 by 41%; (ii) decreasing the diversity of the most diverse country in their sample (Ethiopia) by one percentage point would raise its income per capita by 21%; (iii) a one percentage point change in genetic diversity (in either direction), at the 'optimum' level of 0.721 (that most closely resembles the diversity level of the United States), would lower income per capita by 1.9%; (iv) increasing the diversity of Bolivia to the level prevalent in the United States would increase Bolivia's per-capita income by a factor of 5.4, closing the income gap between the two countries from a ratio of 12:1 to 2.2:1; and (v) decreasing the diversity of Ethiopia to the level prevalent in the United States would increase Ethiopia's per-capita income by a factor of 1.7 and, thus, close the income gap between the two countries from a ratio of 47:1 to 27:1. Further, the level of diversity most conducive to economic development is found to be higher in the contemporary period, relative to the preindustrial era, consistent with the underlying premise that the beneficial effects of diversity on productivity are expected to be more pronounced in an increasingly demanding technological environment.[8]

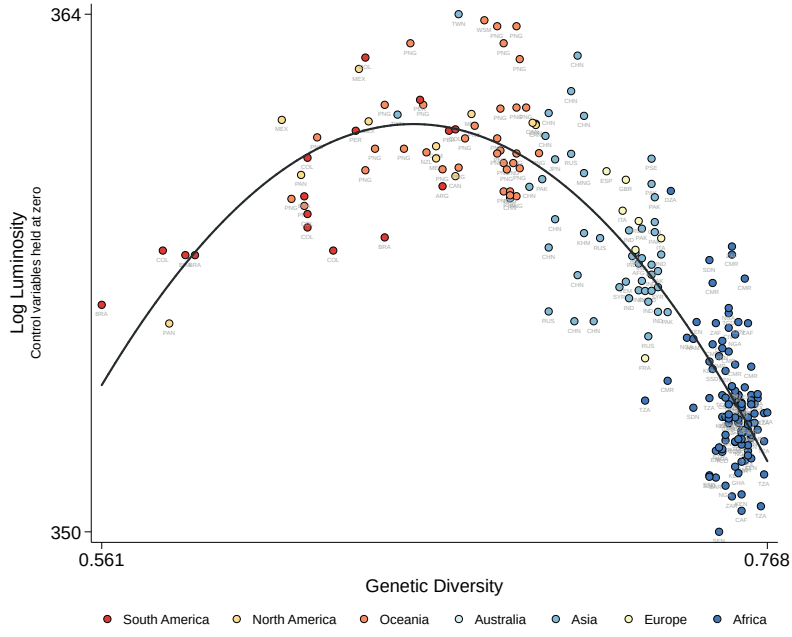
8 Confronting the possibility that income per capita in the modern world could be noisily measured, especially for less-developed economies, Ashraf *et al.* (2014) document the hump-shaped influence of diversity on contemporary comparative development as captured by the cross-country variation in per-capita adjusted nighttime luminosity, measured by satellites from outer space. This lends further credence to the hypothesis that diversity may account for a significant portion of the worldwide variation in contemporary living standards.

Figure 4. Genetic diversity and contemporary comparative development

Panel a



Panel b



Sources: Ashraf and Galor (2013a), Ashraf *et al*. (2015)

More recently, Ashraf *et al*. (2015) have empirically examined the influence of diversity on productivity at the ethnic group level, while accounting for potentially confounding effects, arising from observed heterogeneity in various ethnicity-specific geographical, cultural, and institutional factors, as well as unobserved heterogeneity in country-specific characteristics. This research finds that observed genetic diversity in a worldwide sample of 230 ethnic groups, as well as predicted genetic diversity (based on migratory distance from East Africa) in a global sample of 1,331 ethnic groups, confers a significant hump-shaped influence on economic prosperity, suggesting that the variation in genetic diversity across ethnic homelands has contributed to variations in economic development across ethnic groups and regions at the *subnational* level. The significant hump-shaped influence of observed genetic diversity on group-level productivity, as reflected by the per-capita adjusted nighttime luminosity of an ethnic homeland, is illustrated for the sample of 230 ethnic groups in Panel (b) of Figure 4.

Finally, it has also been shown that migratory distance from the cradle of mankind may have imparted a reduced-form hump-shaped influence on comparative economic development (Ashraf and Galor 2013a). Although the reduced-form influence of migratory distance from East Africa appears to operate primarily through its impact on genetic diversity, as observed in the HGDP sample, it is plausible that migratory distance *per se* has had direct effects on economic development, independent of its influence through genetic diversity, potentially reflecting the self-selection of individuals into migration and differential evolutionary processes that may have taken place in the course of the prehistoric demic expansion of anatomically modern humans from Africa.

Mechanisms

The reduced-form hump-shaped influence of diversity on productivity suggests several potential mechanisms through which diversity can influence economic performance, reflecting various elements of the trade-off between the social costs and benefits of diversity. Ashraf and Galor (2013a) furnish cross-country empirical evidence for two such mechanisms. Specifically, they show that contemporary genetic diversity imparts (i) a positive influence on innovative activity (as reflected by the average annual number of scientific articles per capita in the 1981–2000 time-horizon); and (ii) a negative influence on the degree of social cohesion (as reflected by the prevalence of

interpersonal trust in survey data on individual values, collected over the 1981–2008 time period). These relationships between diversity, on the one hand, and either innovative activity or the prevalence of trust, on the other, are depicted in panels (a) and (b) of Figure 5.

Further evidence on some of the mechanisms through which diversity can affect economic prosperity is provided by several other papers in this research programme. Bearing in mind that ethnic diversity has been shown to be associated with various dimensions of economic underperformance at the national level (as discussed earlier), the evidence uncovered by Ashraf and Galor (2013b) suggests that prehistorically determined genetic diversity could be an underlying cause of different manifestations of the ethnolinguistic fragmentation of national populations. Specifically, their hypothesis suggests that following the 'out of Africa' migration, the initial endowment of genetic diversity in a given location may have catalysed the formation of distinct groups at that location, through a process of endogenous group selection, reflecting the trade-off associated with the scale and internal cohesion of each group. Although a larger group can benefit from economies of scale, it is more likely to be less cohesive due to costly coordination. Thus, in light of the added contribution of genetic diversity to the lack of cohesiveness of a group, a larger initial endowment of genetic diversity in a given location may have given rise to a larger number of groups. Over time, due to the forces of 'cultural drift' and 'biased transmission' of cultural markers, which serve to distinguish 'insiders' from 'outsiders' of a group (e.g., language dialects, customs and traditions, norms of social conduct), intergroup divergence in such markers became more pronounced, leading to the formation of distinct collective identities along ethnic lines.

In line with this hypothesis, genetic diversity at the national level is found to impart a strong positive influence on various alternative measures of ethnolinguistic diversity, while accounting for the potentially confounding influences of the timing of the Neolithic Revolution, the time elapsed since initial human settlement, colonial history, the geographical determinants of ethnic diversity, and unobserved continent-specific factors. Further, to address the issue of causality, the findings are shown to hold in a sample restricted to only countries from the Old World, which were largely immune from the potentially endogenous intercontinental migrations of the colonial era.

In the same vein, the findings are also shown to be robust to employing prehistoric migratory distance from East Africa as a plausibly exogenous source of variation in contemporary genetic diversity in a global sample of countries. The positive influence of genetic diversity on the number of ethnic groups at the national level, as uncovered by Ashraf and Galor (2013b), is illustrated in panel (c) of Figure 5.

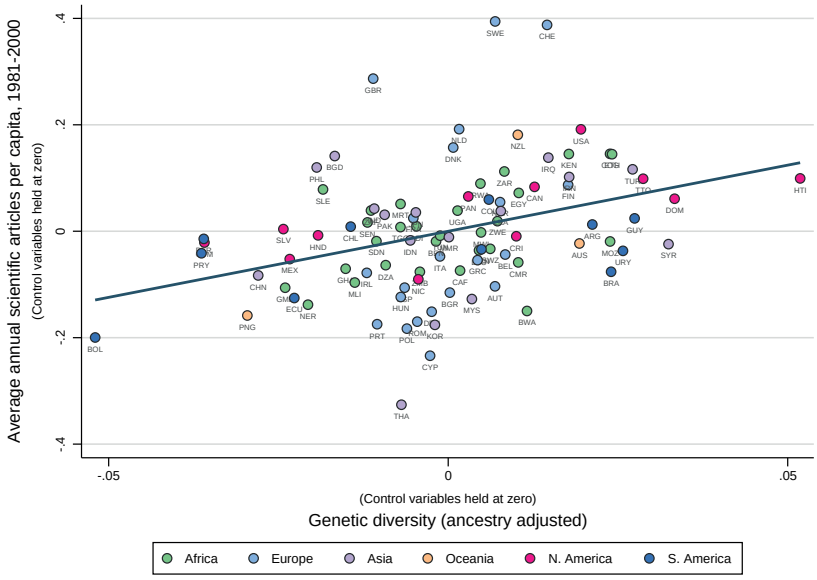
Civil and other forms of intrastate conflicts are another mechanism though which the genetic diversity of a national population can lead to its economic underperformance. Exploiting cross-country variations, Arbath *et al.* (2015) find that genetic diversity in the contemporary era has been a significant contributor to the emergence, prevalence, recurrence, and severity of civil conflicts over the last half-century, conditional on the geographical and institutional correlates of conflict, outcomes of economic development, and unobserved continental characteristics. Importantly, because genetic diversity captures both intergroup and *intragroup* differences in interpersonal traits, it possesses explanatory power for not only interethnic conflicts but *intraethnic* factional conflicts as well, unlike standard measures of ethnic diversity. This research additionally demonstrates that genetic diversity can potentially contribute to intergroup conflicts in society through the channels of greater ethnic fragmentation, reduced interpersonal trust, and sharper divergence in preferences for public goods and redistributive policies.[9] Panels (d) and (e) of Figure 5 respectively depict the positive influence of genetic diversity on the frequency of civil conflicts and on heterogeneity in political preferences at the national level.

The emergence and persistence of autocratic forms of societal governance is yet another mechanism through which genetic diversity can give rise to contemporary economic underperformance. Specifically, Galor and Klemp (2015) advance the hypothesis that, although prehistorically determined genetic diversity triggered the formation, in early human societies, of institutions for mitigating the adverse influence of diversity on social cohesion, the contribution of diversity to economic inequality and class stratification within societies may have ultimately reshaped early institutional development towards more extractive and autocratic forms of governance.

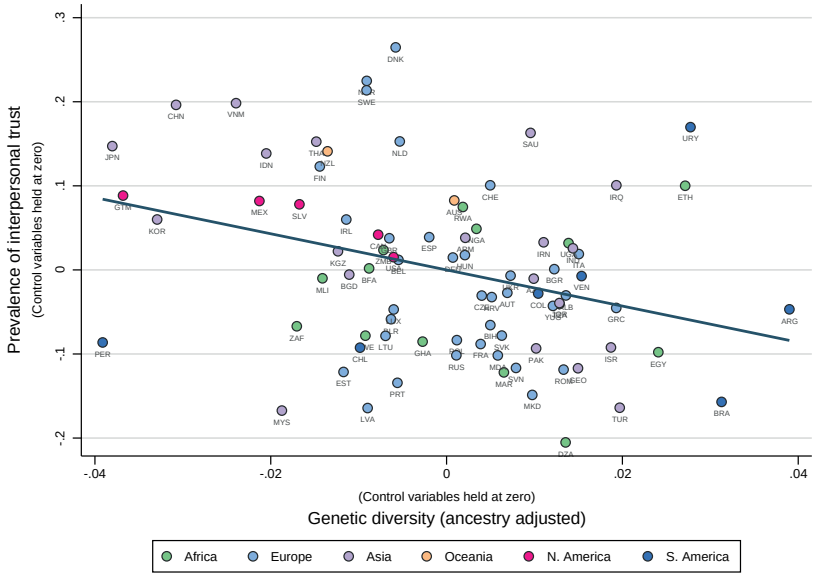
9 Relatedly, Becker *et al.* (2015) provide evidence that links the ancient serial founder effect of the 'out of Africa' migration with contemporary heterogeneity in risk-taking individual preferences at the national level.

Figure 5. Mechanisms of the impact of genetic diversity on productivity

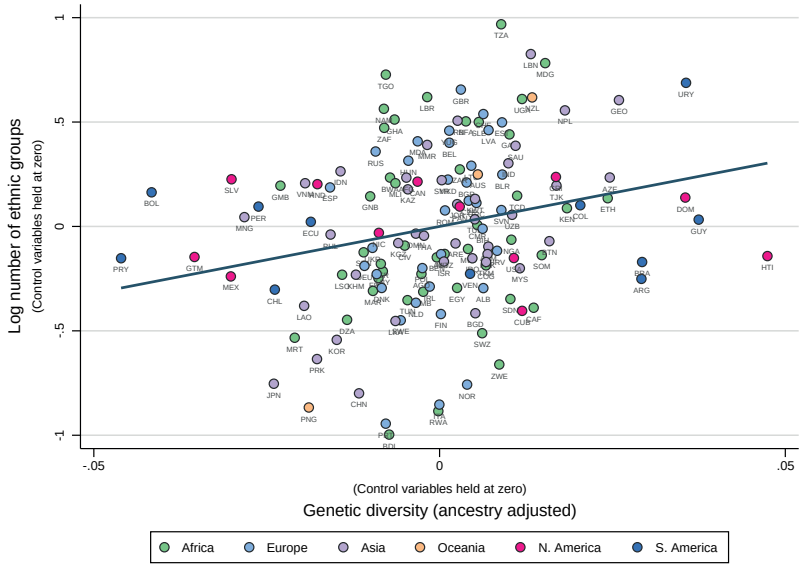
Panel a



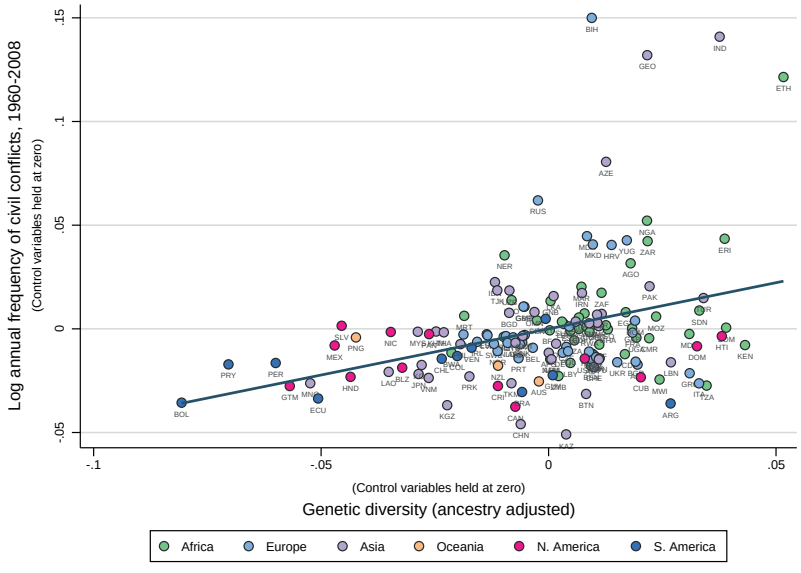
Panel b



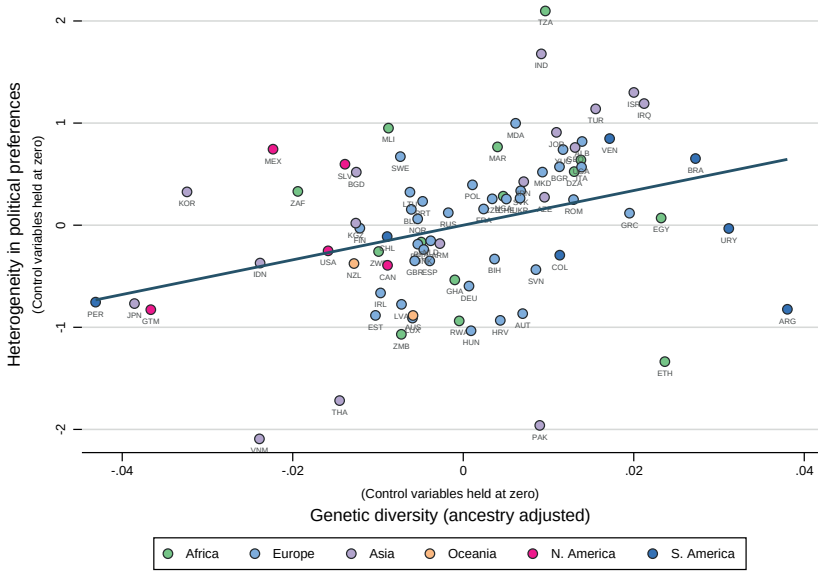
Panel c



Panel d



Panel e



Sources: Ashraf and Galor (2013a, 2013b) Arbath *et al*. (2015)

Exploiting variations across precolonial ethnic homelands, the authors demonstrate that, conditional on potentially confounding effects due to various geographical factors and unobserved continental characteristics, genetic diversity imparts a positive influence on the prevalence of precolonial autocratic institutions and that this relationship plausibly reflects the dual impact of diversity on the formation of institutions and the emergence of social stratification. Furthermore, the authors document that the spatial variation in genetic diversity across the globe may have contributed to the cross-country variation in contemporary degrees of autocracy, partly reflecting the persistence of institutional, cultural, and compositional characteristics of populations over time.

Beyond the aforementioned studies, which highlight some of the mechanisms associated with the social costs of genetic diversity, Depetris-Chauvin and Özak (2015) present

evidence in support of its social benefits.[10] Motivated by the initial hypothesis that genetic diversity can foster the division of labour in society, by widening the spectrum of individual skills, abilities, and cognitive approaches, this research exploits variations across precolonial ethnic homelands to empirically document that, conditional on a wide range of geographical characteristics, prehistorically determined genetic diversity may have conferred a positive influence on the degree of economic specialisation in different production activities in a society, thereby fostering its proclivity to engage in and reap the economic benefits of trade. The authors additionally show that present-day populations residing in regions that were characterised by a higher degree of precolonial economic specialisation tend to exhibit significantly greater occupational heterogeneity, as well as a higher level of economic development.

Interestingly, the beneficial impact of genetic diversity on productivity has also been documented at a much lower level of aggregation than countries or ethnic groups. Specifically, exploiting variations across high schools in the state of Wisconsin, Cook and Fletcher (2016) find that the heterozygosity of the student body of a high school in 1957 may have conferred a significant positive influence on the economic performance of the school's graduates later in life, as captured by individual net worth in 1992 and 2004, and by family income in 1974 and 1992. Importantly, because these findings are established by exploiting variations within a single state, they are unaffected by cross-country (and even within-country cross-state) confounders. In addition, because the high-school student bodies in the authors' data set were entirely comprised of individuals of European ancestry, the results are unlikely to be afflicted by issues of population stratification that could otherwise conflate the influence of heterozygosity with those of ethnicity or ancestral origins on economic outcomes.

10 The beneficial effects of genetic diversity on economic development are also documented empirically by Ager and Brückner (2016). Exploiting variations across counties in the United States in the late nineteenth-century, these authors find that county-level populations that experienced a larger initial increase in their genetic diversity, due to the arrival of European immigrants, subsequently also experienced higher rates of growth in both income and scientific patents per capita during the 1870–1920 time-horizon. In another interesting study by Delis *et al*. (forthcoming), the authors exploit panel variations across firms listed on the stock markets of North America and the United Kingdom to demonstrate that adding members to a firm's board of directors from countries of origin with differing levels of genetic diversity increases its corporate performance. The authors hypothesise that their finding reflects the productivity-enhancing benefits of interpersonal differences in cultural, psychological, physiological, and other traits that cannot be captured by alternative measured indices of diversity.

Policy implications

Ashraf and Galor's analysis establishes a fundamental trade-off, associated with the influence of genetic diversity on economic performance: diversity can stimulate specialisation and innovative activity, but it can also diminish social cohesion. The fact that genetic diversity has been a deep *determinant* of economic development, however, does not imply that the genetic composition of a population governs its economic *destiny*. The influence of diversity on productivity reflects both genetic and cultural components, implying that a society can shape the context in which the *existing* diversity of its population influences socioeconomic outcomes, by enacting policies to harness the beneficial effects of the existing level of diversity and mitigate its potentially detrimental consequences.

The controversy over the implications of Ashraf and Galor's findings has focused on the assertion that intermediate levels of genetic diversity tend to be most conducive to economic development, thereby leading uninformed critics to suggest that this work could be used to justify the forcible movement or 'engineering' of populations. This viewpoint, however, disregards the key argument that the influence of diversity on development operates through various proximate mechanisms. Instead, the implications for policymaking from Ashraf and Galor's analysis are that policies should be aimed at conditioning these intervening channels. Specifically, overly diverse societies could focus on fostering interpersonal trust and mediating the potential for social conflict, by encouraging civic participation, improving the quality of political institutions, and mitigating inefficiencies and distortions in the provision of public goods. Overly homogenous societies, on the other hand, could aim to increase diversity in skills, occupations, and training programmes, in order to foster specialisation and innovative activity. In both cases, the orientation of the educational system appears to be the most promising avenue – education can help to instil the cultural values of tolerance needed in overly diverse societies, and it can also promote cultural receptiveness to different types of productivity-enhancing knowledge that may be lacking in overly homogenous societies.

Concluding remarks

The rapidly expanding literature on the deep roots of comparative development has vastly improved our understanding of the interaction of human evolution and the process of long-run economic development, as well as the roles played by various prehistoric biogeographical forces, in shaping contemporary global inequality. Examinations of the coevolution of previously unexplored genetic and cultural traits along with the process of long-run development, as well as deeper investigations of the somatic, behavioural, cultural, and institutional mechanisms through which prehistoric biogeographical forces have shaped contemporary comparative development, represent exciting avenues for future research.

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Quamrul H. Ashraf is an Associate Professor in the Department of Economics at Williams College. His scholarly interests lie in the areas of economic growth and development, economic demography, and macroeconomics. Ashraf's main research program has been focused on exploring the deep, historically rooted cultural, institutional, and geographical determinants of economic growth and the global dynamics of comparative development across societies in the very long run, including the influence of prehistorically determined intra-population diversity and of the biogeographic determinants of the transition to sedentary agriculture during the Neolithic Revolution. His other work has focused on using simulation-based models of economic growth to quantitatively assess the aggregate implications of economy-wide policy interventions to improve public health or reduce population growth; and applying the methodology of agent-based computational economics to investigate various macroeconomic phenomena, including the real costs of inflation and the role of the banking system in macroeconomic crises. Ashraf holds BA degrees in Economics and Computer Science from Trinity College (Connecticut, U.S.A.) and MA and PhD degrees in Economics from Brown University.

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He is the founder of Unified Growth Theory. He has contributed to the understanding of process of development over the entire course of human history and the role of deep-rooted factors in the transition from stagnation to growth and in the emergence of the vast inequality across the globe. Moreover, he has pioneered the exploration of the impact of human evolution, human genetic diversity, and inequality on the process of

development over most of human existence. His interdisciplinary research has redirected research in the field of economic growth to the exploration of the long shadow of history and to the role of biogeographical forces in comparative economic development. It has spawned the influential literatures studying the impact of inequality on the process of development, the interaction between human evolution and economic development, the transition from stagnation to growth, and the impact of human diversity on comparative economic development.

4 Barriers to the spread of prosperity

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Tufts University; UCLA Anderson School of Management

Introduction

The diffusion of wealth is arguably the most consequential development for human welfare in recent history. Since the Industrial Revolution, modern prosperity has spread from its European birthplace to many corners of the world.[1] Yet the technologies, institutions and behaviours associated with this process of economic modernisation have diffused unequally over space and time. Why?

A recent literature has documented the important role played by deeply-rooted factors as predictors of the current world distribution of income and other economic outcomes. These factors include geographic conditions and historical events that sent different societies on different economic trajectories — the effects of bio-geographic endowments (Olsson and Hibbs 2005, Ashraf and Galor 2011), the legacy of colonialism (Acemoglu *et al*. 2001), the persistent effect of pre-colonial traits and institutions (Michalopoulos and Papaioannou 2013), the durable cultural impact of traditional agricultural practices (Alesina *et al.* 2013), and the effects of long-term history and movements of populations across the globe (Spolaore and Wacziarg 2009, Putterman and Weil 2010, Ashraf and Galor 2013), to name but a few. Many of these historical determinants are summarised in

1 For example, see Mokyr (2005) for an insightful historical discussion and Galor (2011) for a unified account of the growth take-off.

this e-book. However, the mechanisms by which deeply-rooted factors influence current prosperity remain elusive. Moreover, studies that emphasise the persistence of historical legacies and long-term determinants raise questions about the scope for change. As pointed out, for instance, in an excellent discussion by Banerjee and Duflo (2014), there is an inherent tension between historical determinism and the ability of policy to affect outcomes. If the past casts such a long shadow, can contemporary societies escape from factors and constraints that may have historically limited their economic development?

In this chapter, we argue that the divergent historical paths followed by distinct populations led to barriers between them. The more divergent the historical paths of different populations, the greater the barriers. And the greater the barriers, the more difficult it was for innovations, institutions and behaviours to spread from society to society. Hence, on average, countries that are richer today are those more closely related to the frontier society where modern technologies, institutions and behaviours first arose. In order to prosper, more distantly related societies need to overcome the barriers that separate them from societies that are closer to the frontier. However, while such barriers are deeply-rooted, their effect is not permanent and immutable. Historical factors do not constitute permanent limits to the growth potential of those with disadvantageous historical legacies. Instead, barriers resulting from distinct historical trajectories can be gradually overcome, suggesting a substantial role for action and positive change.

Measuring human barriers

In principle, barriers to the transmission of prosperity can arise from numerous sources. Geographic barriers are likely to be important for several outcomes, and they are perhaps easiest to measure and control for in empirical work on the diffusion of development. Measuring human barriers – those that prevent, at a given geographic distance, the spread of innovations, institutions and behaviours – is much more challenging. In our past work, beginning with Spolaore and Wacziarg (2009), we employed a variety of measures of historical separation among populations to capture human barriers. Chief among them was FST genetic distance, a measure that captures separation times between populations: when humans migrated out of Africa, groups splintered as they moved across continents, and the groups that separated earlier had more time to drift apart genetically than groups that separated more recently. Hence, genetic distance is correlated with how long populations

have had a common history. Pairs of societies with smaller genetic distance are expected to have lower human barriers to the spread of development.[2]

The idea behind the use of genetic distance as a general proxy for human barriers is that human traits – not only biological but also cultural – are mostly transmitted, with variation, from generation to generation (i.e. vertically). Thus, the longer two societies have drifted apart, the greater the differences in traits between them, and the greater the barriers that separate them. Of course, genetic distance is by no means the only measure of intergenerational separation times. Linguistic distance is a closely related class of measures, again based on a trait that is mostly transmitted vertically (language). Another possibility is to look directly at differences in culture, as revealed by surveys: values, norms, and attitudes (including but not limited to religion). Cultural values can be transmitted in a number of ways – vertically, from generation to generation; obliquely, across biologically unrelated members of the same society; or horizontally, i.e. across societies (Richerson and Boyd 2005). The vertical dimension of transmission is a common feature of genetic traits and language, as well as of norms and values. Thus, metrics of distance between societies that are based on these three classes of measures, while distinct from each other, should be positively correlated. This is indeed what we find in Spolaore and Wacziarg (2016a), where we further discuss and document empirically the complex links between various measures of human relatedness. In a nutshell, the vertical transmission of genes, language and culture accounts for the positive correlations between human distance metrics based on each of these traits. Yet these measures are not perfectly correlated because: i) there are differential rates of drift in genes, language and values, ii) some of these traits are transmitted horizontally, and iii) different methodologies are used to compute distances across the three classes. In our ongoing research on the diffusion of development, we use all three classes of measures.

2 Of course, since geographic and genetic distances are correlated - because groups splintered gradually as they moved farther and farther away from East Africa, while conquering other territories - it is imperative to control for geographic distance in any work that uses genetic distance as a measure of human barriers.

Three examples

What is the evidence that these measures of human relatedness matter when predicting differences in prosperity? In recent work we have found such evidence in a variety of contexts. Here we will discuss three: technology, institutional quality, and fertility behaviour.

The diffusion of development .

In Spolaore and Wacziarg (2009 2014a) we documented a strong correlation between genetic distance between countries relative to the technological frontier and their differences in levels of development: two societies are predicted to have similar levels of development if they happen to be at relatively similar distances from the global technological frontier (in our applications, either the United States or Northwestern Europe). We interpreted this correlation as indicative of barriers to the spread of the Industrial Revolution. We showed in particular that the effect of barriers was largest just after the Industrial Revolution, when some but not all countries had transitioned to economic modernity. The effect declined as more and more societies, at successively greater genetic distances from the innovation frontier, became rich. In the age of globalisation, when barriers became easier to overcome, the effect fell further (Figure 1).

Further, in Spolaore and Wacziarg (2012, 2014a) we found that this pattern held true not just for the overall level of prosperity, measured by per capita income, but also for specific technologies (cell phones, computers, etc.). In sum, societies that are historically distant from the technological frontier have a harder time adopting better technologies, and consequently take longer to become prosperous.

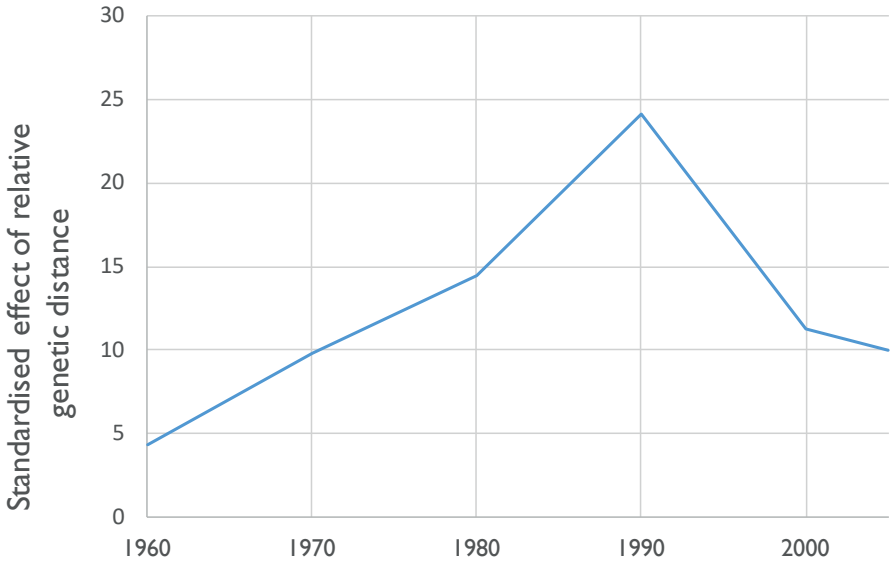
Figure 1. Standardised effect of genetic distance relative to the UK on bilateral differences in per capita income over time, 1820–2005

source: Spolaore and Wacziarg (2014a)

The diffusion of institutions.

In Spolaore and Wacziarg (2016b) we conducted a similar exercise to understand the worldwide diffusion of democracy during the Third Wave of Democratisation that took off in the 1970s. The manner of this diffusion process was similar to the spread of the Industrial Revolution: genetic distance relative to the institutional frontier (the United States) matters increasingly after the onset of the third wave, and declines gradually as more countries, at greater distances from the institutional frontier, become democratic (Figure 2). What deserves further research is the precise mechanism whereby institutional change spreads from one country to the next.

Figure 2. Standardised effect of genetic distance relative to the USA on bilateral differences in Polity 2 Democracy scores, 1960–2005



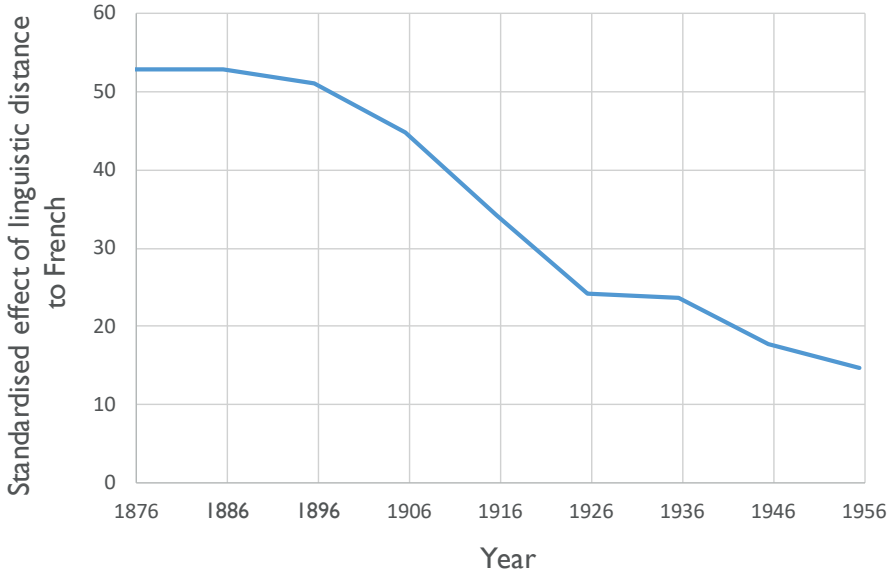
source: Spolaore and Wacziarg (2016b)

The diffusion of the fertility transition in Europe .

In the two examples above, the effect of distance from the frontier fades away after some time, but does not disappear entirely. Yet a prediction of our diffusion model is that the effect of ancestral distance should disappear after the most distant societies have finally overcome the barriers and adopted modern technologies, institutions and behaviours. The case of the European fertility transition, starting in the early 19th century in France, affords an example where the entire diffusion process can be observed within our sample. In Spolaore and Wacziarg (2014b), we analysed this process in a panel of European regions from 1831 to 1970. We measured ancestral distance using linguistic distance, since this was more readily available for the regions of Europe than genetic distance. Initially, only regions that spoke a language close to French adopted the fertility behaviour first observed in France in the late 18th-early 19th century. Later, regions at

successively greater distances from France adopted the new behaviour. By the end of our sample period, virtually every region in Europe had adopted modern behaviours regarding fertility (i.e. 2-3 children per household). The interpretation of this particular diffusion process is different than for our other examples for two reasons. First, the frontier society in this case was not England, but France. This fact highlights how different innovations may start at different frontiers – implying different barriers to their diffusion. Second, fertility behaviours likely diffused as the result of a process of social influence regarding appropriate norms of fertility, rather than the diffusion of specific technologies (although the diffusion of birth control methods – broadly defined – may have played a complementary role). Whatever the precise mechanism, the lesson is clear: ancestral barriers, measured by relative linguistic distance from French, predicted the diffusion of modern fertility behaviours across Europe.

Figure 3. Standardised effect of linguistic distance to French on marital fertility through time, in overlapping samples of 30 years centred on the date displayed in the x-axis. The sample is a balanced sample of 519 European regions



source: Spolaore and Wacziarg (2014b)

Conclusion: Barriers and the scope for policy

As we have argued in this chapter, populations that are historically and culturally more distant face higher barriers to adopting each other's technologies, institutions, and behavioural innovations. Such barriers – measured by genetic, linguistic and cultural distance – stem from long-term historical divergence, and thus capture the effect of deeply-rooted historical factors that sent different populations on different historical trajectories. However, we have also seen that the effect of barriers is not permanent and immutable, but changes over time, as societies that are farther from the frontier also learn and adopt novel technologies and innovations.

Moreover, the frontier itself is not immutable, but changes over time, and may differ depending on the specific innovation – for example, the frontier was originally England for the Industrial Revolution, but France for the societal changes in norms and behaviour associated with Europe's demographic transition.

If such historical barriers can be overcome – and they have indeed been overcome by many societies over time – there is room for optimism regarding the scope for change and progress, even when dealing with persistent historical factors.[3] While distances themselves may be deeply-rooted in history, their impact on contemporary outcomes can, in principle, be affected by current actions and policies. For instance, policy can reduce obstacles to interactions and communication between people from different cultural and linguistic backgrounds. Our research suggests that the effect of barriers to the spread of prosperity has diminished in the age of globalisation. The ease with which ideas, people, goods and capital can flow across societal borders helps to reduce the ancestral barriers that kept populations from learning from each other. Facilitating these flows, therefore, offers the promise of lower barriers to the spread of prosperity.

3 That said, we should add that inter-population barriers do not always play a negative role in human history. They may also prevent the spread of deleterious innovations, such as hateful ideologies or disruptive behaviors, and may reduce international conflict over territories and resources (see Spolaore and Wacziarg 2016c).

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5 Environmental economic history

James Fenske and Namrata Kala
University of Warwick and CEPR; Harvard University

Nash (1972) is generally credited with coining the term 'environmental history' to refer to the then-emerging field, integrating ecology and geography into the understanding of history. Examining 'the interaction between human cultures and the environment in the past' (Worster, 1988), many early environmental historians followed the path set by pioneering works such as Turner (1921) and Webb (1931), and wrote on the experiences of Western countries. Nash (1967) studied American perceptions of wilderness, while Hays (1959) focused on the conservation movement in the United States. As the field developed, a global literature also developed that illuminated the reciprocal and dynamic relationship between humans and their environment in other regions of the world, for example in Africa (Beinart 1984, Fairhead and Leach 1996, Harms 1999), in Asia (Elvin 2008, Gadgil and Guha 1993), and in global perspective (Crosby 1972).

For over a decade, economists have been contributing to this literature, usually using different techniques than those used by environmental historians, and emphasising the different contributions made by their work. A key contribution of this literature has been a focus on isolating specific causal relationships, within a broader and more complex environment that includes knowledge, capital and institutions (Hornbeck 2012a), usually involving the generation and assembly of new Geographic Information Systems (GIS) databases. The list of environmental factors considered in this literature is broad, including, but certainly not limited to, pollution, wind patterns, natural disasters, soil quality, topography and the disease environment. This brief overview of environmental economic history will focus on the effects of the environment on human outcomes, both concurrent and in the long-run, rather than on human transformations of the environment, though the latter is an important part of this literature (e.g. Hansen and Libecap 2004, Hornbeck and Keskin 2014, Taylor 2011). As we discuss in the following paragraphs, the environmental factors have far-reaching implications for development, beyond

direct environmental impacts – for instance, agricultural endowments or changes can be mechanisms for the evolution of institutions, norms, and societal development. Other environmental factors, such as the disease burden, have similar implications. We focus on two topics in the literature in particular – the impact of geographic endowments and the impact of environmental shocks on historical and long-run development. This aspect of environmental economic history is thus closely related to the broader economic history literature concerning the impact of historical events on long-term development (see Nunn, 2014, for a comprehensive treatment).

Impacts of geographic endowments

One major strand of this literature has examined direct economic impacts of those characteristics of the environment that are either time-invariant or very slow to change. This overlaps with studies of the role of geography in economic growth over the very long run (e.g. Andersen *et al*. 2016 on ultraviolet radiation, and Galor and Özak 2016 on potential crop yields). For instance, economists have written on the effects of the disease environment on development in the past and on how the environment has shaped historical institutions. Bleakley (2007) draws causal inference on the impacts of hookworm disease on education by measuring the convergence of previously high-infection areas with previously low-infection areas of the United States in the aftermath of a rapid eradication campaign in the early twentieth century. His empirical approach has also been used to evaluate the importance of other diseases in other contexts (e.g. Lucas 2010, Cutler *et al.* 2010).

In estimating the impact of geographic endowments on institutions, Fenske (2014) and Depetris-Chauvin (2015) have both linked state centralisation in pre-colonial Africa to the gains from trade stemming from ecological diversity. Fenske (2013), similarly, documents the geographical forcing variables that predict land rights, slavery and population density in a cross section of global societies. These studies have merged GIS maps of the African environment with other spatial data on the continent's institutional history, and based causal inference on evidence from instrumental variables and narrow within-country comparisons of observations. Bubb (2013), on a microeconomic level, has found exogenous suitability for tree-crop cultivation to be a much stronger predictor

of property-rights institutions governing land in the Ivory Coast and Ghana than the colonial institutions of either country. Similar GIS databases on soil characteristics and their variations have been used to examine the historical origins of cultural patterns such as female labour force participation (Alesina *et al.* 2013), ethnic diversity (Michalopoulos 2012) and the spread of Islam (Michalopoulos *et al.* 2016).

Other work on the impact of geographic endowments has instead focused on the indirect legacies of geographic endowments that affect the present, because of how they have shaped history. Alsan (2014), in a prominent example, argues that the TseTse fly reduces African prosperity in the present, principally because it inhibited pre-colonial political centralisation. To do this, Alsan constructed a novel GIS TseTse suitability index and merged it with existing spatial data on African ethnic groups' locations, precolonial institutions, and modern luminosity. Her causal claims were supported by adjustment for a wide set of covariates, narrow within-country comparisons, and a placebo exercise showing no similar effects of TseTse suitability in parts of the world where the fly itself was absent. Fiszbein (2016) uses exogenous variation in climatic conditions that affect the returns to agricultural diversity to study the impact of agricultural diversity on long-term industrial development in the US.

Nunn (2014), similarly, has highlighted the role of the environment in shaping particular historical events and processes, which themselves have long-term impacts. Africa's slave trades are an example: recent work has shown that terrain ruggedness (Nunn and Puga 2012) and geographic isolation from sources of slave supply (Nunn 2008) have influenced the dynamics of the slave trade and, through these factors, African development. These studies have employed GIS resources on the continent's geography and historic climate and added geocodes to existing databases of the slave trade; they draw causal inference from the results of instrumental variables and placebo analyses. Studies of the long-run impacts of Africa's slave trades have turned to these same geographic conditions in isolating plausibly exogenous variation in slave exports (e.g. Nunn and Wantchekon 2011, Dalton and Leung 2014).

Impacts of environmental shocks

Given the importance of time-varying environmental events, such as weather fluctuations and natural disasters, and due to the possibilities for convincing causal inference, stemming from exogenous change, several studies have evaluated the importance of environmental shocks in economic history. Several papers have examined immediate economic effects of events such as droughts, floods, and the spread of new diseases. Much of this literature has focused on the United States. Davis *et al.* (2009), for example, use the weather-driven variations in nineteenth century cotton crops to infer a causal effect on non-agricultural business cycles; greater cotton exports increased the supply of high-powered money in the economy. Fishback *et al.* (2011), similarly, have investigated whether climate or weather affected mortality rates during the Great Depression. Other papers have examined the effects of similar shocks in other parts of the world: Fenske and Kala (2015) and Rönnbäck (2014), for example, have both examined the role of temperature fluctuations in the transatlantic slave trade and found that these affected the extent of participation in the slave trade and prices in African markets.

The relative ease with which events such as conflict and political transitions in the historical context can be recorded, and their importance in impacting the course of history, have made these the focus of a considerable volume of work. Hsiang et al. (2013) provide an extensive bibliography that includes several historical examples. Christian and Fenske (2015) and Papaioannou and de Haas (2015) have linked episodes of adverse weather to unrest and crime, respectively, during the colonial period in Africa. For China, both Jia (2014) and Bai and Kung (2011) have similarly used fluctuations in weather to explain historical episodes of violence. Chaney (2013) has found that years of deviant Nile floods reduced the chances that the highest-ranking religious authority in Muslim Egypt was replaced. These studies have taken data on historic weather from archival sources or historic reconstructions and merged these with both primary and secondary sources that document conflict and political transitions, in order to produce historic datasets covering environmental economic history.

Other work has traced out the longer-run effects of environmental catastrophes by contrasting the later trajectories of places or individuals affected by these events with

reasonable comparison groups who were not similarly treated. By geocoding soil erosion maps, writers such as Cutler *et al.* (2007) and Arthi (2014) have examined the long run health impacts of America's dust bowl era on individuals, while Hornbeck (2012b) has traced its implications for land values, population, and agricultural development. The long-run consequences of droughts on the eve of the Mexican revolution (Dell 2012), the spread of the boll weevil (Lange *et al.* 2009) and the Great Mississippi Flood (Hornbeck and Naidu 2014) have received similar treatment. By demonstrating that these effects often persist up to the present, these works have shown the relevance of environmental history for understanding modern development.

Conclusion

Environmental history is now a mature field, and the environmental sub-field of economic history is well-developed, but the integration of these literatures is, as yet, less than ideal. It is our hope that findings, data sources and methods from the environmental economic history literature will further enrich the writing of environmental history. Furthermore, several important themes in the environmental history literature have received limited attention from economists, such as the dynamic relationship between successive Chinese states and their environment (Elvin 2008), the welfare implications of colonial forest reservation (Gadgil and Guha 1993), and the political economy of colonial land conservation (Mackenzie 1998). The natural environment has played an important part in the development of societies, often mediated by its impact on their institutions, and we look forward to seeing the integration of new methods and questions in service of this important topic.

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6 The persistence of technological creativity and the Great Enrichment: Reflections on the "Rise of Europe."

Joel Mokyr

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How and why did the modern world and its unprecedented prosperity begin? Many bookshelves are filled with learned tomes by historians, economists, political scientists, and other erudite scholars, providing endless explanations as to why the process of modern economic growth or 'the Great Enrichment' started in western Europe in the 18th century. One of the oldest and most persuasive of these is the political fragmentation of Europe throughout most of its history. No ruler was ever able to unite Europe in the way the Mongols and the Mings united China. As a result, European rulers found themselves competing for the best and most productive intellectuals and artisans. Scholars have debated the merits and mechanisms of what Eric L. Jones called 'the states system' and the consensus seems to be that, while the costs were substantial in terms of warfare, protectionism, and coordination failures, in the very long run the benefits turned out to be larger.

In 1789, in the closing chapter of his Rise and Fall, Edward Gibbon wrote that

'Europe is now divided into twelve powerful, though unequal, kingdoms, three respectable commonwealths, and a variety of smaller, though independent, states ... The abuses of tyranny are restrained by the mutual influence of fear and shame; republics

1 The following is based on sections from my forthcoming A Culture of Growth: Origins of the Modern Economy (Princeton: Princeton University Press, 2016)

have acquired order and stability; monarchies have imbibed the principles of freedom, or, at least, of moderation; and some sense of honour and justice is introduced into the most defective constitutions by the general manners of the times. In peace, the progress of knowledge and industry is accelerated by the emulation of so many active rivals...'

Other Enlightenment writers, such as David Hume and Immanuel Kant, saw it the same way. Interstate rivalry did many things, and not all of them good for economic growth. But they stimulated policies that encouraged innovation and the adoption of modern technology, from the reforms of Peter the Great to the Sputnik panic in the United States in 1957. More important, perhaps, is that the 'states system' constrained the ability of political and religious authorities to control intellectual innovation. If they clamped down on heretical and subversive (that is, original and creative) thought, their smartest citizens would just go elsewhere (as many of them, indeed, did).

The objection to this view is that fragmentation is not a sufficient condition. The Indian subcontinent and the Middle East were fragmented for much of their history, and Africa even more so, yet they did not experience a Great Enrichment. Clearly, more was needed. One element of scientific and technological development, that has perhaps not received as much attention as it should, is the size of the 'market' that intellectual and technological innovators faced. In 1769, Matthew Boulton wrote to his partner James Watt, 'It is not worth my while to manufacture [your engine] for three counties only; but I find it very well worth my while to make it for all the world.' What was true for steam engines was true for books and essays on astronomy, medicine, and mathematics. Writing such a book involved fixed costs, and so the size of the market mattered. If fragmentation meant that the constituency of each innovator was small, it would have dampened the incentives.

This difficulty was resolved in late medieval and early modern Europe. What emerged and turned out to be of great importance, is that political fragmentation was coupled with an intellectual and cultural unity, a more or less integrated market for ideas, that allowed Europe to benefit from the increasing return associated with intellectual activity. This unity was rooted in Europe's classical heritage (with the widespread use of Latin as the *lingua franca* of intellectuals), and the structure of the Christian Church. While, for much of the Middle Ages, the intensity of intellectual activity

(in terms of both the number of participants and the intensity of the debates) was light compared to what it was to become after 1500, it was transnational. By 1500 or so, national boundaries mattered little in the thin but lively community of intellectuals in Europe. Many of its leaders moved back and forth within Europe, despite the slow and uncomfortable nature of travel. Two of the most prominent leaders of 16th century humanism, the Valencia-born Juan Luis Vives and Desiderius Erasmus embodied this footlooseness: Vives studied in Paris, lived most of his life in Flanders, but was also a member of Corpus Christi College in Oxford and served for a while as tutor to Henry VIII's daughter Mary; Erasmus moved back and forth between Leuven, England, and Basel but also spent time in Turin and Venice. In the 17th century such mobility among intellectuals became even more pronounced.

Moreover, through the printing press and the much improved postal system, written knowledge spread faster than ever. Attempts by conservatives to suppress new ideas foundered in a pluralistic environment. The reputations of intellectual superstars like Galileo and Spinoza were such that, if local authorities tried to prohibit the publication of their works, they would easily find publishers abroad. Galileo's 'banned' books were smuggled out of Italy and published in Protestant cities, as in the case of the *Discorsi,* published in Leiden in 1638 and the *Dialogo,* re-published in Strasbourg in 1635. Spinoza's publisher, Jan Riewertz, placed 'Hamburg' on the title page of the *Tractatus* to mislead censors, even though the book was published in Amsterdam. In this way intellectuals could manipulate a set of divided and uncoordinated polities for the sake of intellectual freedom.

This unique combination of political fragmentation, along with the pan-European institution of the Republic of Letters, holds the key to the dramatic intellectual changes after 1500. Books written in one part of Europe found their way to other areas, and were soon read, quoted, plagiarised, discussed, and commented upon everywhere. When a new discovery was made anywhere in Europe, it was debated and tested throughout the continent. Fifty years after the publication of William Harvey's *De Motu Cordis*, the English doctor and intellectual Thomas Browne reflected on Harvey's discovery that 'at the first trump of the circulation all the schools of Europe murmured ... and condemned it by a general vote ... but at length [it was] accepted and confirmed by illustrious physicians.'

The superstars of European learning catered to a European, not a local, audience and enjoyed continent-wide reputations. They saw themselves as citizens of a 'Republic of Letters' and regarded this entity, in the words of Pierre Bayle (one of the central figures in it), as a free commonwealth, an empire of truth. The political metaphor was mostly wishful thinking, but it reflected the features of the community as an institution that set rules of conduct for the market for ideas – above all the central belief in contestability and the willingness to slaughter sacred cows, and a commitment to open science. To return to Gibbon: he observed that the philosopher, unlike the patriot, was permitted to consider Europe as a single 'great republic' in which the balance of power may continue to fluctuate and the prosperity of some nations 'may be alternately exalted or depressed', but which guaranteed a 'general state of happiness, system of arts and laws and manners' which 'advantageously distinguished' Europe from other civilisations.

What this meant was that, in this regard, Europe's intellectual community had the best of both worlds, with the advantages of an integrated transnational academic community superimposed on a competitive states system. This system produced many of the cultural ingredients that paved the way for the Great Enrichment: a belief in social and economic progress, a growing regard for scientific and intellectual innovation, and the commitment to a Baconian programme of knowledge in the service of economic growth. Its scientists adopted the idea of experimental science as a prime tool, and accepted the use of increasingly more sophisticated mathematics as a method of understanding and codifying nature. It also produced the European Enlightenment, in which the belief in progress was translated into a coherent political programme, a programme that, despite its many flaws and misfires, still dominates European polities and economies.

It should be emphasised that Europe's success was not the result of any inherent superiority of European (much less Christian) culture. It was a classical emergent property, a complex and unintended outcome of simpler interactions on the collective entity. It was the result of contingent institutional outcomes, and was neither designed nor planned. Once in place, however, it created self-reinforcing and autocatalytic dynamics that made knowledge-driven economic growth not just possible but sustainable. As long as we regard the Republic of Letters as an 'institution' in the Northian sense, we can see the Industrial Revolution as the outcome of institutional changes — but institutions

at the level of the continent, not only the institutions of the modern nation state as most scholars still seem to believe.

The idea of knowledge-driven economic growth as the *primum movens* of the Industrial Revolution is still controversial, and rightly so. Examples of purely science-driven inventions in the eighteenth century are few, though after 1815 their number rises rapidly. Yet, dismissing the scientific revolution as irrelevant to modern economic growth misses the point that, without an ever-growing understanding of nature, the artisan-driven advances of the 18th century (especially in the textile industry) would ineluctably have ground to a halt. Moreover, some inventions still needed inputs from learned people, even if they cannot be said to be purely science-driven. For instance, the marine chronometer – one of the most important inventions of the era of the Industrial Revolution (though rarely mentioned as a part of it) – was made possible through the work of earlier mathematical astronomers. The first of these was the sixteenth-century Dutch (more accurately Frisian) astronomer and mathematician Jemme Reinerszoon, known as Gemma Frisius, who suggested the possibility of what John Harrison (the ingenious watchmaker who cracked this thorny problem) actually did.

It is interesting to note that the advances in science were driven not only by the emergence of open science and the growing sophistication of the transnational market for ideas, but also by the appearance of better tools and instruments, which in turn facilitated research in natural philosophy. The most famous ones were the microscope, telescope, barometer, and modern thermometer, all developed in the first half of the 17th century. Improved physics, mathematics, and biology refuted many misconceptions, inherited from classical antiquity, and made contestability increasingly irresistible as a principle of investigation. The newly discovered notions of a vacuum and an atmosphere stimulated the emergence of atmospheric engines. In turn, steam engines inspired scientists to investigate the physics of the conversion of heat into motion, and, more than a century after Newcomen's first pump, thermodynamics was developed.

Taken together, these examples indicate that the interaction of propositional knowledge (knowledge of 'what') and prescriptive knowledge (knowledge of 'how') constituted a positive feedback or autocatalytic model that may not converge to any kind of basin of attraction. In other words, once the process gets going, it becomes self-propelled. In that sense, knowledge-based growth is one of the most persistent of all historical

phenomena – though the conditions of its persistence are complex and require above all a competitive and open market for ideas. This has two important corollaries. First, we must recognise that things could have turned out differently than they did, with fairly minor changes in initial conditions or accidents along the way. Had political and military developments taken different turns in Europe, conservative forces might have prevailed and taken a more hostile attitude toward the new and progressive interpretation of the world. There was nothing predetermined or inexorable in the ultimate triumph of scientific progress and sustained economic growth, any more than, say, the eventual evolution of Homo sapiens (or any other specific species) on the planet. Second, once in motion, the force of technological and scientific progress may be irresistible, notwithstanding the backlash it has encountered in recent years. The world still consists of competing entities, and seems not much closer to unification than it was in 1600. The costs of fragmentation in terms of lost gains from trade and coordination are high, but there may also be unintended benefits to the 'new nationalism'.

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7 The economic impact of colonialism

Daron Acemoglu and James A. Robinson
MIT and CEPR; University of Chicago and CEPR

The immense economic inequality we observe in the world today didn't happen overnight, or even in the past century. It is the path dependent outcome of a multitude of historical processes, one of the most important of which has been European colonialism. Retracing our steps 500 years, or back to the verge of this colonial project, we see little inequality and small differences between poor and rich countries (perhaps a factor of four). Now the differences are a factor of more than 40, if we compare the richest to the poorest countries in the world. What role did colonialism play in this?

In our research with Simon Johnson we have shown that colonialism has shaped modern inequality in several fundamental, but heterogeneous, ways. In Europe the discovery of the Americas and the emergence of a mass colonial project, first in the Americas, and then, subsequently, in Asia and Africa, potentially helped to spur institutional and economic development, thus setting in motion some of the prerequisites for what was to become the industrial revolution (Acemoglu et al. 2005). But the way this worked was conditional on institutional differences within Europe. In places like Britain, where an early struggle against the monarchy had given parliament and society the upper hand, the discovery of the Americas led to the further empowerment of mercantile and industrial groups, who were able to benefit from the new economic opportunities that the Americas, and soon Asia, presented and to push for improved political and economic institutions. The consequence was economic growth. In other places, such as Spain, where the initial political institutions and balance of power were different, the outcome was different. The monarchy dominated society, trade and economic opportunities, and,

in consequence, political institutions became weaker and the economy declined. As Marx and Engels put it in the Communist Manifesto,

> *"The discovery of America, the rounding of the Cape, opened up fresh ground for the rising bourgeoisie."*

It did, but only in some circumstances. In others it led to a retardation of the bourgeoisie. In consequence colonialism drove economic development in some parts of Europe and retarded it in others.

Colonialism did not, however, merely impact the development of those societies that did the colonising. Most obviously, it also affected the societies that were colonised. In our research (Acemoglu *et al*. 2001, 2002) we showed that this, again, had heterogeneous effects. This is because colonialism ended up creating very distinct sorts of societies in different places. In particular, colonialism left very different institutional legacies in different parts of the world, with profoundly divergent consequences for economic development. The reason for this is not that the various European powers transplanted different sorts of institutions – so that North America succeeded due to an inheritance of British institutions, while Latin America failed because of its Spanish institutions. In fact, the evidence suggests that the intentions and strategies of distinct colonial powers were very similar (Acemoglu and Robinson 2012). The outcomes were very different because of variation in initial conditions in the colonies. For example, in Latin America, where there were dense populations of indigenous people, a colonial society could be created based on the exploitation of these people. In North America where no such populations existed, such a society was infeasible, even though the first British settlers tried to set it up. In response, early North American society went in a completely different direction: early colonising ventures, such as the Virginia Company, needed to attract Europeans and stop them running off into the open frontier and they needed to incentivise them to work and invest. The institutions that did this, such as political rights and access to land, were radically different even from the institutions in the colonising country. When British colonisers found Latin-American-like circumstances, for example in South Africa, Kenya or Zimbabwe, they were perfectly capable of and interested in setting up what we have called 'extractive institutions', based on the control of and the extraction of rents from indigenous peoples. Acemoglu and Robinson (2012) argue

that extractive institutions, which strip the vast mass of the population of incentives or opportunities, are associated with poverty. It is also not a coincidence that such African societies are today as unequal as Latin American countries.

It wasn't just the density of indigenous peoples that mattered for the type of society that formed. As we showed in Acemoglu *et al.* (2001) the disease environment facing potential European settlers was also important. Something that encouraged the colonisation of North America was the relatively benign disease environment that facilitated the strategy of creating institutions to guarantee European migration. Something that encouraged the creation of extractive institutions in West Africa was the fact that it was the 'white man's graveyard', discouraging the creation of the type of 'inclusive economic institutions' which encouraged the settlement and development of North America. These inclusive institutions, in contrast to extractive institutions, did create incentives and opportunities for the vast mass of people.

Our focus on the disease environment as a source of variation in colonial societies was not because we considered this to be the only or even the main source of variation in the nature of such societies. It was for a particular scientific reason: we argued that the historical factors that influenced the disease environment for Europeans and therefore their propensity to migrate to a particular colony are not themselves a significant source of variation in economic development today. More technically, this meant that historical measures of European settler mortality could be used as an instrumental variable to estimate the causal effect of economic institutions on economic development (as measured by income per-capita). The main challenge to this approach is that factors which influenced European mortality historically may be persistent and can influence income today, perhaps via effects on health or contemporary life expectancy. There are several reasons why this is not likely to be true however. First, our measures of European mortality in the colonies are from 200 or so years ago, before the founding of modern medicine or the understanding of tropical diseases. Second, they are measures of mortality faced by Europeans with no immunity to tropical diseases, which is something very different from the mortality faced by indigenous people today, which is presumably what is relevant for current economic development in these countries. Just to check, we also showed that our results are robust to the controlling econometrically of various modern measures of health, such as malaria risk and life expectancy.

Thus, just as colonialism had heterogeneous effects on development within Europe, promoting it in places like Britain, but retarding it in Spain, so it also had very heterogeneous effects in the colonies. In some places, like North America, it created societies with far more inclusive institutions than in the colonising country itself and planted the seeds for the immense current prosperity of the region. In others, such as Latin America, Africa or South Asia, it created extractive institutions that led to very poor long-run development outcomes.

The fact that colonialism had positive effects on development in some contexts does not mean that it did not have devastating negative effects on indigenous populations and society. It did.

That colonialism in the early modern and modern periods had heterogeneous effects is made plausible by many other pieces of evidence. For example, Putnam (1994) proposed that it was the Norman conquest of the South of Italy that created the lack of 'social capital' in the region, the dearth of associational life that led to a society that lacked trust or the ability to cooperate. Yet the Normans also colonised England and that led to a society which gave birth to the industrial revolution. Thus Norman colonisation had heterogeneous effects too.

Colonialism mattered for development because it shaped the institutions of different societies. But many other things influenced these too, and, at least in the early modern and modern period, there were quite a few places that managed to avoid colonialism. These include China, Iran, Japan, Nepal and Thailand amongst others, and there is a great deal of variation in development outcomes within these countries, not to mention the great variation within Europe itself. This raises the question of how important, quantitatively, European colonialism was, compared to other factors. Acemoglu, Johnson and Robinson (2001) calculate that, according to their estimates, differences in economic institutions account for about two-thirds of the differences in income per-capita in the world. At the same time Acemoglu, *et al.* (2002) show that, on their own, historical settler mortality and indigenous population density in 1500 explain around 30% of the variation in economic institutions in the world today. If historical urbanisation in 1500, which can also explain variation in the nature of colonial societies, is added, this increases to over 50% of the variation. If this is right, then a third of income inequality in the world today can be explained by the varying impact of European colonialism on different societies. A big deal.

That colonialism shaped the historical institutions of colonies might be obviously plausible. For example, we know that, in Perú of the 1570s, the Spanish Viceroy Francisco de Toledo set up a huge system of forced labour to mine the silver of Potosí. But this system, the Potosí mita, was abolished in the 1820s, when Perú and Bolivia became independent. To claim that such an institution, or, more broadly, the institutions created by colonial powers all over the world, influence development today, is to make a claim about how colonialism influenced the political economy of these societies in a way which led these institutions to either directly persist, or to leave a path dependent legacy. The coerced labour of indigenous peoples lasted directly up until at least the 1952 Bolivian Revolution, when the system known as pongueaje was abolished. More generally, Acemoglu and Robinson (2012, Chapters 11 and 12) and Dell (2010) discuss many mechanisms via which this could have taken place.

Finally, it is worth observing that our empirical findings have important implications for alterative theories of comparative development. Some argue that geographical differences are dominant in explaining long-run patterns of development. In contradistinction, we showed that once the role of institutions is accounted for, geographical factors are not correlated with development outcomes. The fact that, for instance, there is a correlation between latitude and geography, is not indicative of a causal relationship. It is simply driven by the fact that European colonialism created a pattern of institutions that is correlated with latitude. Once this is controlled for, geographical variables play no causal role. Others argue that cultural differences are paramount in driving development. We found no role at all for cultural differences measured in several ways. First, the religious composition of different populations. Second, as we have emphasised, the identity of the colonial power. Third, the fraction of the population of a country of European descent. It is true, of course, that the United States and Canada filled up with Europeans, but in our argument this was an outcome of the fact that they had good institutions. It is not the numerical dominance of people of European descent today that drives development.

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8 Legal origins

Rafael La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer,and Robert Vishny
Dartmouth College, Tuck School of Business; EDHEC Business School; Harvard University, Department of Economics; Booth School of Business, University of Chicago

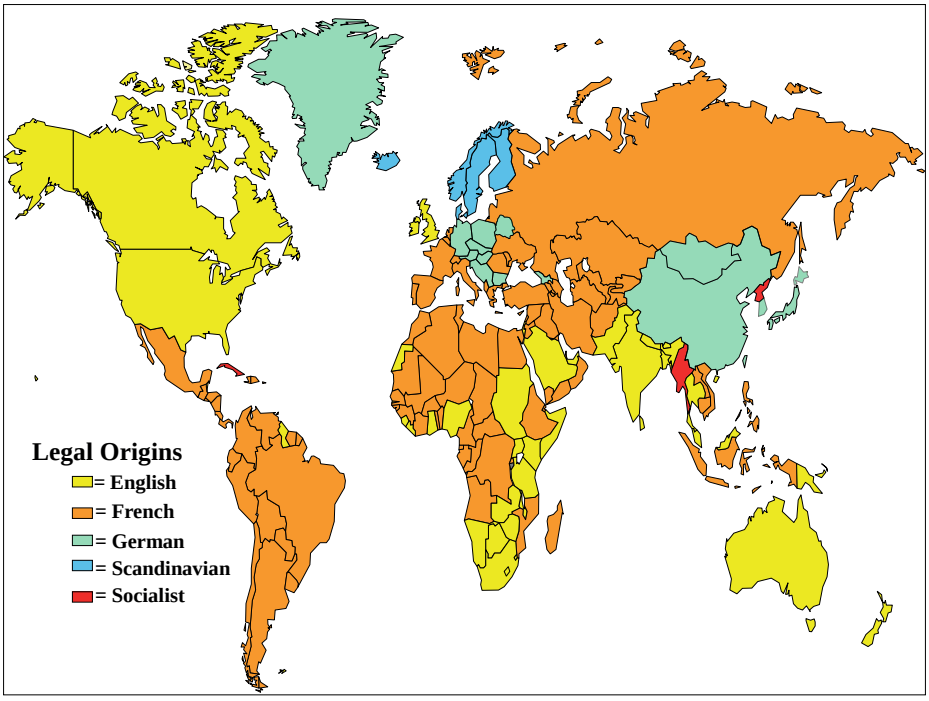
The history of conquest and colonisation has left a profound impact on the culture and institutions of affected countries. Perhaps the most obvious example of this is language. People in the United States speak the language of their coloniser, Britain; people in South American speak Spanish, with the exception of the Brazilians, who speak the language of their coloniser, Portugal. Another obvious example is religion: South Americans are Catholic, thanks to many forced conversions; North Africans are Moslem, for the same reason. A less obvious example is sport: people play soccer in French Africa and South America, as they do in France and Spain; but they play rugby in South Africa, Australia, and New Zealand, as they do in the UK. The Cubans, long under profound American political and economic influence, still play baseball, despite over half-a-century of anti-American rule.

Perhaps the more economically relevant example of such transplantation is provided by a country's laws, particularly its commercial laws. Countries colonised by the UK typically have laws significantly influenced by those of England; countries colonised by France, Spain, and Portugal have laws influenced by their respective colonisers. Spain and Portugal themselves have laws heavily influenced by those of France, which they inherited from the Napoleonic conquest. Sometimes such legal transplantation takes the simple form of the copying of laws; other times the influence is less direct, driven by commonality of language and the training of lawyers and politicians, which often took place in the colonising country or at universities it established in its colonies.

These patterns of conquest and colonisation created so-called legal families of laws substantially influenced by the origin countries. England and its colonies, including the

US, are part of the common-law family; France, Spain, Portugal and their colonies are part of the French civil-law tradition. There are also less widely spread but distinctive Scandinavian, German, and – fortunately disappearing – socialist legal traditions. None of these legal traditions determine the laws of countries that belong to them completely, and there is clear evidence of legal change, evolution, and reform, but legal origins nonetheless exert a substantial influence for centuries. Figure 1 illustrates the spread of legal traditions around the world.

Figure 1. The distribution of legal origin



What is perhaps most interesting for an economist is that legal traditions exhibit distinctive formal features as well as substantive approaches to how the law regulates economic life. At the formal level, the common law is formed by appellate judges, who establish precedents by solving specific legal disputes. Dispute resolution tends to be adversarial rather than inquisitorial. Judicial independence from both the executive and the legislature is central. The civil law tradition dates back in its formal features to Roman law, and spread through Continental Europe after Roman law was rediscovered

during the Middle Ages in Italy. It uses statutes and comprehensive codes as primary means of ordering legal material, and relies heavily on legal scholars to ascertain and formulate rules. Dispute resolution tends to be inquisitorial rather than adversarial. Judicial independence is not as big an issue.

As legal scholars have long recognised, the differences in legal traditions are not merely formal. The common-law tradition tends to be less interventionist and more supportive of private economic arrangements. The civil-law tradition tends to be more dirigiste, and more focused on the state constraining such arrangements. In the words of one legal scholar, civil law is 'policy implementing' while common law is 'dispute resolving' (Damaška 1986). In the words of another, French civil law embraces 'socially-conditioned private contracting', in contrast to common law's support for 'unconditioned private contracting' (Pistor 2006). These are profound historically-shaped features of the stance of the law, which, through transplantation, have continued to run in legal families.

A critical feature of legal transplantation that makes it helpful for investigating the effects of laws on economic outcomes is that, like conquest and colonisation themselves, it is largely involuntary. Although, in a few cases, such as Russia in the 19th century or Japan after the Meiji restoration, a country borrows commercial laws purely voluntarily, in most cases, such as those described above, the transplantation is either forced or is a by-product of a forced political change. As a consequence, one can think of it as largely exogenous, and examine its economic and social consequences.

In light of this history, it is perhaps not surprising that legal families often exhibit substantively different legal rules and approaches, which then have a significant influence on economic outcomes. In a pair of papers that we wrote 20 years ago (La Porta *et al*. 1997, 1998), we applied this approach to corporate law. We found, consistent with the broad view of the stance of the law, that common-law countries are more protective of outside investors, including both creditors and shareholders, than civil-law countries, while the latter tend to be more protective of insiders and to give outside investors fewer rights. These differences are manifested in the many specific legal rules which we summarised by creating indices of shareholder and creditor protection. Most importantly, we showed that these quantitative measures of investor protection are associated with indicators of financial development. Corporate ownership is more

dispersed, both debt and equity markets are larger, and dividend payouts and corporate valuations are higher in common- than in civil-law countries (La Porta *et al.* 1997, 1998, 1999, 2000, 2002). Legal origins affect legal rules, legal rules affect investor protection, and investor protection affects financial structure.

Since these papers were written, a significant literature has revisited these findings. Some of our measures of investor protection were correctly criticised, and we revised and extended them (e.g., La Porta *et al*. 2006, Djankov *et al*. 2008). There was a question over whether the patterns of financial development we have identified have also existed historically, and the best available evidence indicates that they have (Hildebrand 2016). Some scholars argued that our legal origins are merely proxies for politics, with civil law standing in for social democracy. In the data, the patterns we described hold for dictatorships as well as democracies, rejecting this political interpretation (La Porta *et al.* 2008).

We have also investigated whether the procedural and organisational differences between the legal systems stressed by legal scholars can be quantified. We have found that, indeed, courts in common-law countries tend to be more independent from the executive branch than courts in civil-law countries, with longer judicial tenure and greater limits on firing judges (La Porta *et al.* 2004). Common-law legal procedure is also less formalised, with fewer written or formal steps necessary to move disputes forward, fewer filings, and more limited possibilities of appeal. Moreover, these procedural differences translate into substantive outcomes: other things being equal, it generally takes longer and costs more to evict a non-paying tenant, or to collect a bounced cheque, in a civil- than a common-law country (Djankov *et al.* 2003). The quantitative evidence is broadly consistent with the broad perspective of comparative law.

A further question one can ask is whether differences in legal origins also show up not just in legal rules, but also in patterns of government regulation. We investigated this question together with Simeon Djankov of the World Bank, who went on to create the extremely influential World Bank *Doing Business Report*, based on our findings. Thanks to the cooperation with the World Bank, we were able to assemble large data sets on government regulations affecting business activity in many countries. We began by examining the regulation of entry of new firms, by calculating the number of formal

steps, and the minimum time and cost it would take to open a business legally (Djankov *et al*. 2002). We also looked at government regulations of labour markets (Botero *et al*. 2004). Here as well, consistent with the comparative law approach, we found evidence of much heavier regulation in civil- than in common-law countries. The evidence on regulations confirmed the fundamental differences in how legal systems approach social control of economic life.

We also found that these regulatory differences correlate with economic outcomes. For example, countries with fewer entry regulations tend to have less corruption, which is typically a by-product of a heavy regulatory stance. They also, not surprisingly, have more official employment, all else being equal. Countries with heavier labour regulations, not surprisingly, exhibit higher unemployment rates – especially among the young — and lower rates of labour force participating. Here as well, the broad stance of the law appears to influence important economic outcomes.

Given this evidence, one might ask whether legal origin is destiny, and whether legal rules and regulations are permanently fixed given a country's tradition. The answer to that is a most decisive 'no'. It is certainly the case that in some core areas of law, such as legal procedure, we have found very slow change and a huge amount of persistence (Balas *et al.* 2010). In other areas, however, there has been a lot of change. The extraordinary popularity of the World Bank *Doing Business Report* around the world has prompted many countries to revise some of their most burdensome regulations, particularly in the field of regulation of entry. In fact, some countries, such as Georgia, sought to attract foreign investors based on their high '*Doing Business*' scores and massive regulatory reforms, while others, such as New Zealand, ran political campaigns based on their outstanding scores.

In sum, there is little doubt at this point that legal traditions are associated with distinctive formal and substantive approaches to solving legal problems, and that these approaches are associated with some distinctive economic outcomes. How large the substantive consequences are remains an open question. In our work, we have strenuously stayed away from claiming that legal traditions and legal rules influence economic growth. This observation is part of a more general proposition that the only consistent determinant of long-run growth is human capital and even major institutional differences, such as dictatorship versus democracy, are not evidently correlated with

growth. But if one is interested in outcomes that are a bit less aggregate – including financial development, the role of the formal sector, or unemployment – then the significance of legal traditions in shaping these outcomes is much clearer in the data

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9 The European origins of economic development

William Easterly and Ross Levine
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Countries have followed divergent paths of economic development since European colonisation. Some former colonies, such as the Congo, Guinea-Bissau, Malawi, and Tanzania, have experienced little economic development over the last few centuries, with current per capita Gross Domestic Product (GDP) levels of about $2 per day. Others, including Australia, Canada, and the United States, are among the richest countries in the world today, with per capita GDP levels of about $140 per day. Others fall along the spectrum between these extremes.

To explain these divergent paths, many researchers emphasise that the European share of the population during colonisation shaped national rates of economic growth through several mechanisms. For example, Engerman and Sokoloff (1997) (ES) and Acemoglu *et al.* (2001, 2002) (AJR) stress that European colonisation had enduring effects on political institutions. They argue that, when Europeans encountered natural resources with lucrative international markets and did not find the land, climate, and disease environment suitable for large-scale settlement, only a few Europeans settled and created authoritarian political institutions to extract those resources. The institutions created by Europeans in these 'extractive colonies' impeded long-run development. But, when Europeans found land, climate, and disease environments that were suitable for smaller-scale agriculture, they settled, forming 'settler colonies' with political institutions that fostered development.

1 This discussion is based on William Easterly & Ross Levine, 2016, "The European origins of economic development", Journal of Economic Growth 21(3): 225-257.

Other researchers focus less on what Europeans found and more on what Europeans brought. ES and Glaeser *et al.* (2004) (GLLS) argue that Europeans brought human capital and human capital creating institutions that shape long-run economic growth. According to this human capital view, European settlers directly and immediately added human capital skills to the colonies and also had long-run effects on human capital accumulation. These long-run effects emerge because human capital disseminates throughout the population over generations and it takes time to create, expand, and improve schools. Furthermore, this human capital view suggests that having a larger share of Europeans during colonisation could facilitate human capital accumulation across the entire population, both because it would increase interactions among people of European and non-European descent and because it might accelerate expanded access to schools.

These views yield two testable implications: (1) the proportion of Europeans during colonisation will be positively related to the democratic political institutions and human capital development that yield higher levels of economic development today, and (2) the proportion of Europeans during colonisation will matter more for economic development than the proportion of the population of European descent today because of (a) the enduring effects of political institutions and (b) the slow dissemination of human capital and creation of well-functioning schools. Although the political institutions and human capital views emphasise different mechanisms, they provide closely aligned predictions about the impact of colonial European settlement on current economic development.

Other researchers, either explicitly or implicitly, highlight additional mechanisms through which European migration had positive or negative effects on development. North (1990) argues that the British brought comparatively strong political and legal institutions, which were more conducive to economic development than the institutions brought by other European nations. Spolaore and Wacziarg (2009) stress that the degree to which the genetic heritage of a colonial population was similar to that of the economies at the technological frontier positively affected the diffusion of technology and thus economic development. Putterman and Weil (2010) and Chanda *et al.* (2014) emphasise that the experiences with statehood and agriculture of the ancestors of people currently living within countries help to explain cross-country differences

in economic success. Comin *et al.* (2011) find that the ancient technologies of the ancestors of today's populations help predict current levels of per capita income. In all of these papers, the ancestral nature of a population – which was reshaped by European colonisation – helps account for cross-country differences in economic development today.

Although this considerable body of research emphasises the effect of European settlement during colonisation on subsequent rates of economic development, what has been missing in the empirical literature is the key intermediating variable: colonial European settlement. While researchers, including AJR, have examined the European share of the population in 1900, this is well after the colonial period in several countries, including virtually all of the Western Hemisphere. To the best of our knowledge, researchers have not directly measured colonial European settlement and examined its association with current economic development.

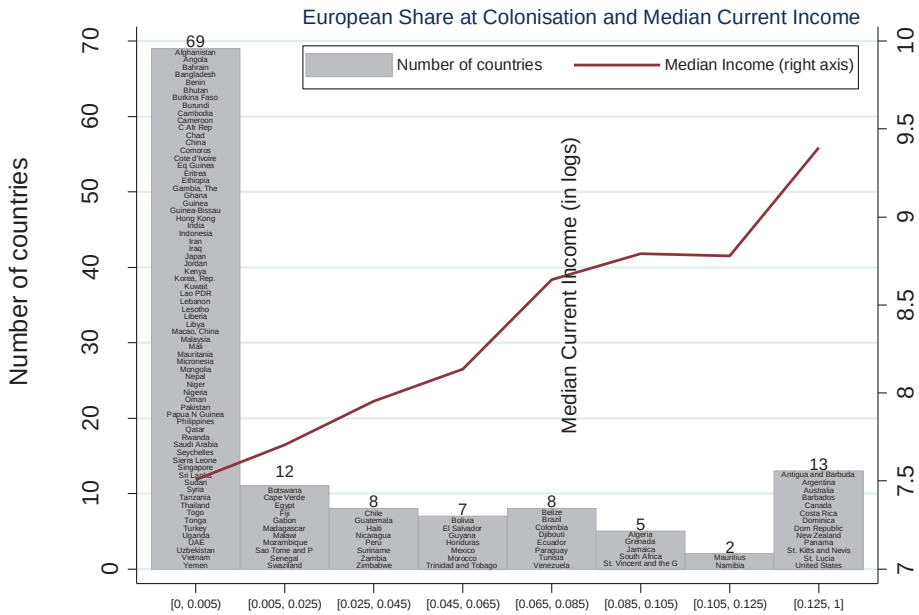
In this paper, we construct a new database on the European share of the population during colonisation and use it to examine the historical determinants of colonial European settlement and the relation between colonial European settlement and current economic development.[2] Although we do not isolate the specific mechanisms linking colonial European settlement with current levels of economic development, as emphasised in each of the individual theories discussed above, we do assess the core empirical predictions emerging from the literature on the relationship between European settlement and economic development: namely that (1) the proportion of Europeans during colonisation is positively related to economic development today and (2) the proportion of Europeans during colonisation is more important, in accounting for cross-country differences in current economic development, than the proportion of the population of European descent today.

We first discover that colonial European settlement is strongly, positively associated with economic development today. As illustrated in Figure 1, countries with a higher share of Europeans in the colonial population tend to have higher levels of Gross Domestic Product (GDP) per capita today. This relationship holds true, after controlling for many

2 The data and programs used to conduct these analyses are available at: http://link.springer.com/article/10.1007/s10887-016-9130-y.

features of the areas and peoples colonised by the Europeans, and for which European country colonised the area. Our results also paint a positive picture of the development impact of minority colonial European settlements, about which the previous literature was ambiguous. We also show that the relationship between economic development today and the proportion of Europeans during colonisation weakens markedly when controlling for either current educational attainment or government quality. This finding is consistent with the view that human capital and political institutions are intermediating mechanisms through which European settlement shaped current economic development.

Figure 1. Distribution of colonial European settlement and median current income



Note: This figure shows the number of countries classified in groups according to their European shares at colonisation (left axis). The median current income (in logs) for each group is also reported (right axis).

Second, we find that the European share of the population during colonisation is more strongly associated with economic development today than the percentage of the population today that is of European descent. This finding is consistent with the view that Europeans brought growth-promoting characteristics – such as institutions, human capital, technology, connections with international markets, and cultural norms – that had enduring effects on economic development. This result de-emphasises the

importance of Europeans, *per se*, and instead emphasises the impact of what Europeans brought to economies during the colonial period.

To clarify our contribution, it is crucial to emphasise what we do not do. We do not assess the welfare implications of European colonisation. Europeans often cruelly oppressed, enslaved, murdered, and even committed genocide against, indigenous populations, as well as enslaving captives brought from Africa (see Acemoglu and Robinson 2012, for compelling examples). Thus, GDP per capita today does not measure the welfare effects of European colonisation; it only provides a measure of economic activity today, within a particular geographical area. Although there is no question about European oppression and cruelty during colonisation, there are questions about the net effect of European colonisation on economic development today. We have confirmed the strong association between colonial European settlement and comparative economic development. Indeed, we calculate that 40% of all development that has happened outside Europe is associated with this colonial European settlement. Our findings are a suggestive confirmation of the deep historical roots of today's development outcomes, as well as the importance of the dissemination of institutions, human capital, and technology across borders.

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Ross Levine received his doctorate from UCLA and worked at the Board of Governors of the Federal Reserve System and the World Bank. He then taught at the University of Virginia, the University of Minnesota, and Brown University. His research focuses on the linkages between financial regulations, the operation of financial systems, and the functioning of the economy.

10 On the long-run effects of colonial legacies. Evidence from small islands

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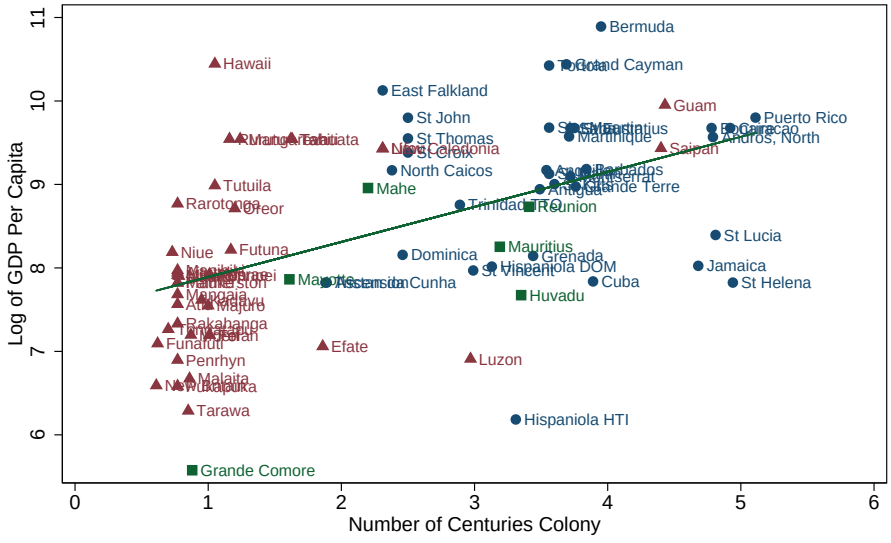
The legacy of colonial history is readily apparent in language, culture, and modern military and trade alliances. This has led many economists to look at the relationship between colonialism and modern institutions and economic outcomes. In other chapters of this volume, La Porta *et al.* look at the impact of colonial legal systems; Acemoglu and Robinson examine the impact of the form of colonisation (extractive versus heavy settlement by Europeans); Michalopoulos and Papaioannou examine the mixed legacy of colonial history and tribal affiliation; and Iyer examines the impact of variations in direct colonial rule in India.

As always in the cross-country growth literature, it is difficult to establish causality. Most colonisation was not a random event. Countries established colonies in order to take advantage of natural resources or because the land was favourable for agriculture. These advantages may play a direct role in modern outcomes. In Feyrer and Sacerdote (2009) we examine the role that colonial history plays in explaining income per capita differences between countries. We take a novel approach, by confining our analysis to a newly assembled data set on islands. Reading historical accounts from the Age of Discovery, it is apparent that there is a strong random component to the discovery and

colonisation of islands. Many islands in the pacific were unknown to Europeans until the late 1700s. It was not until the voyages of Cook (1768-1779) that a complete and accurate map of the world was available. Some colonies were founded almost entirely by chance – to take one example, the infamous case of the Mutiny on the Bounty led to the discovery and colonisation of Rarotonga, Kadavu, Pitcairn, and Norfolk islands.

Discoveries during the colonisation era were made by sailing ships, which had a limited ability to sail into the wind. This adds a distinctly non-random element to the process of discovery. Islands that were located in corridors with strong east-west prevailing winds were more likely to be found, revisited, and colonised, than islands that were harder to reach due to prevailing wind patterns. The majority of the east-to-west colonial-Spanish ship traffic in the Pacific followed very closely the route initiated by Magellan, because his voyage was largely dictated by the patterns of the trade winds. Islands along this route tended to be colonised earlier – since their wind patterns do not have a direct impact on income today, we can use this variation as an instrument to predict the intensity of colonial activity for an island.

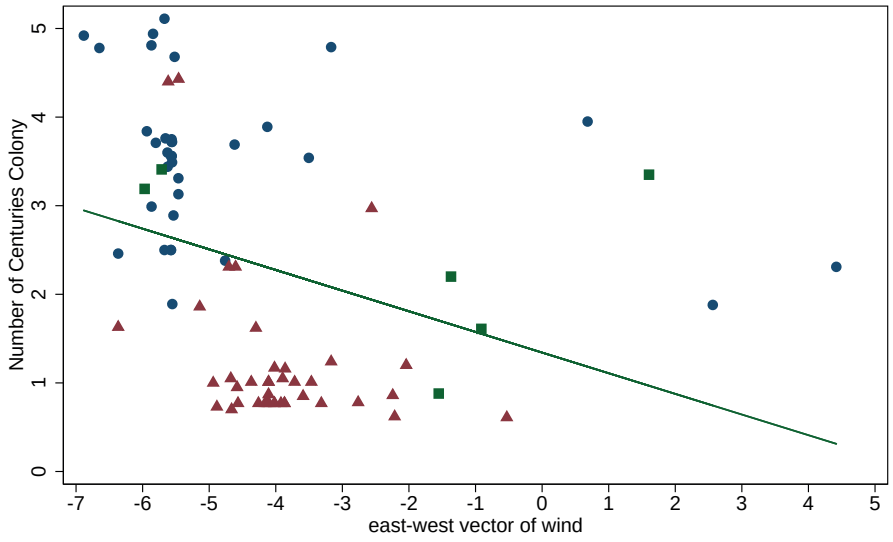
Figure1. GDP per capita versus years of colonialism



Blue Circles == Atlantic Ocean, Red triangles == Pacific Ocean, Green squares == Indian Ocean.

The use of islands also allows us to expand the sample that is traditionally used in studying colonial outcomes. There are many islands with varied histories and so we have more experiments with which to work. Using a variety of historical sources, we assembled a data set, detailing the years that each island was a colony and the identity of the coloniser. Our outcome measures are output per capita and infant mortality in 2000. Individual islands in a group are included if the islands have a distinct colonial history or distinct modern outcomes, compared to their island group. For example, Yap and Pohnpei, in the Federated States of Micronesia, have different colonial histories and different modern outcomes.

Figure 2. Years of colonialism versus easterly vector of wind



Blue Circles == Atlantic Ocean, Red triangles == Pacific Ocean, Green squares == Indian Ocean.

Figure 1 shows our basic result. Islands that were colonised for longer periods of time have higher GDP per capita. Figure 2 shows the relationship between wind speed (our instrument) and colonial tenure. The east-west vector of wind strongly predicts the length of colonial rule. Table 1 shows these results more formally and includes both OLS and IV results. In all regressions we control for latitude and island area. We also include dummies for whether the island is in the Pacific or the Atlantic (the Indian

Ocean is the excluded group). The latitude and area controls are significant in all our specifications but do not have any impact on the main variable of interest, which is the number of centuries as a colony. The ocean dummies are, at most, marginally significant.

We find that longer colonial rule is associated with higher GDP per capita.[1] Each additional century as a colony results in a per capita GDP increase of almost 50% (Column 1). The IV results suggest an even larger effect, with each 100 years resulting in a 70 percent increase in per capita GDP. We see similar results for infant mortality. While much of the identification is being driven by the Pacific Ocean, point estimates with an Atlantic sample are not significantly different than the full sample.

The number of years as a colony is a function of two dates. First, when did an island initially become a colony? And second, when did the island become independent? Our IV strategy will be capable of identifying random variation in the first date, but will not be informative about the second. In columns (3) and (4) we break our 'centuries a colony' variable into start and end dates. We also include a dummy variable for whether the island remained a colony in 2000, the year for which we measure GDP per capita. We find that the start date of colonial rule is driving much of our result. Earlier colonisation dates predict higher output. A later final year as a colony is also associated with higher income, though this is not statistically significant. Finally, islands that still had a colonial relationship in 2000 have significantly higher GDP per capita in 2000. This set of countries includes islands, such as Guam, Puerto Rico, and Bermuda, that have received significant transfers from their colonial rulers in the modern period.

The similarity of the OLS and IV results is consistent with our initial conjecture of the random nature of colonisation. If we can assume that island colonisation (in contrast to continental colonisation) was not significantly driven by island characteristics, we can explore several hypotheses in OLS, where we cannot pursue an IV strategy. For example, we are interested in whether the timing of colonisation matters.

1 As we emphasise in our original paper, we are only measuring impacts on GDP for current inhabitants and are in no way attempting to balance or justify these impacts against the devastation or extinction of the island's original inhabitants.

Table 1. Outcomes regressed on years of colonisation

	(1) Log GDP Capita OLS	(2) Log GDP Capita IV	(3) Log GDP Capita OLS	(4) Log GDP Capita IV
Number of Centuries a Colony	0.491	0.712		
	(0.110)**	(0.253)**		
First Year a Colony			-0.342	-0.626
			(0.108)**	(0.304)*
Final Year A Colony			0.409	0.527
			(0.755)	(0.874)
Remained A Colony in 2000			0.954	0.81
			(0.311)**	(0.373)*
Abs(Latitude)	0.053	0.054	0.038	0.046
	(0.012)**	(0.011)**	(0.012)**	(0.015)**
Area in millions of sq km	-20.374	-21.738	-15.071	-20.769
	(3.894)**	(3.970)**	(5.383)**	(7.148)**
Island is in Pacific	0.752	1.018	0.664	1.043
	(0.464)	(0.559)+	(0.491)	(0.641)
Island is in Atlantic	0.425	0.188	0.319	0.043
	(0.395)	(0.477)	(0.383)	(0.481)
Constant	6.033	5.484	4.879	7.406
	(0.552)**	(0.834)**	(15.218)	(17.308)
Observations	81	81	81	81
R-squared	0.527	0.498	0.655	0.616

For IV Columns we instrument for centuries of colonial rule or the first year as a colony using the 12 month average and standard deviation of the east-west wind speed for each island. Robust standard errors are in parentheses. Standard errors are clustered at the island group level.

* significant at 5%; ** significant at 1%

Table 2, column (1) shows the results where we separately include years as a colony before 1700, years between 1700 and 1900, and years after 1900. We don't have enough instruments to separately identify these different periods, so we will rely on OLS. We find that the years between 1700 and 1900 are doing most of the work in our main result. Once we control for the later years, being a colony before 1700 is no longer associated with higher GDP per capita. We suspect that this is due to the changing nature of colonialism and of European institutions, both before and after the Enlightenment.

Table 2. The effect of colonialism by colonising countries

	(1)	(2)
	Log GDP per Capita	Log GDP per Capita
Centuries a Colony before 1700	-0.097	
	(0.221)	
Centuries a Colony 1700-1900	0.875	
	(0.233)**	
Centuries a Colony after 1900	-0.354	
	(0.975)	
Remained a Colony in 2000	1.070	
	(0.346)**	
Centuries US		2.145
		(0.394)**
Centuries Dutch		0.660
		(0.117)**
Centuries British		0.512
		(0.155)**
Centuries French		0.586
		(0.144)**
Centuries Spanish		0.204
		(0.089)*
Centuries Portuguese		-0.813
		(0.169)**
Centuries German		1.332
		(1.199)
Centuries Japanese		-1.170
		(0.781)
Constant	6.218	5.849
	(0.759)**	(0.636)**
Observations	81	81
R-squared	0.693	0.645

Regressions include controls for absolute value of latitude, land area, and dummies for island being located in Pacific or Atlantic Ocean. Robust standard errors are in parentheses. Standard errors are clustered at the island group level.

* significant at 5%; ** significant at 1%

The very earliest colonies were motivated by commerce and religion. The 1494 Treaty of Tordesillas split the globe at 46° W longitude, into Spanish and Portuguese spheres. Portugal controlled to the east of this line (from Africa to Indonesia) and Spain controlled to the west (the New World and the Pacific). The main goal of Magellan's expedition was to find a Spanish route to the Spice Islands, sailing west from Europe. The secondary goal of the expedition was to convert the natives to Christianity. These early colonies had few qualms about enslaving the native peoples and forcibly converting them to Christianity.

Later voyages, like those headed by James Cook, were very much post-enlightenment affairs. Cook brought scientists and artists along to study and catalogue all that they found. In stark contrast to Magellan, Cook was concerned about the potential for harm to native peoples, as they came in contact with Europeans. Many later European colonies did not enslave the natives and in some cases representative local governments were established.

A second reason to suspect that post-enlightenment colonisation was different is that most of the institutions that we associate with successful modern economies simply did not exist during the earlier period. Democracy, the rule of law, protection of property rights and other features of modern economies advanced significantly between the Age of Magellan and the Age of Cook. Our results are consistent with the idea that being a European colony between 1700 and 1900 allowed for the transmission of those institutions that appear to be beneficial to modern incomes.

In addition to the timing of colonial rule we might also be interested in whether different colonisers had different impacts. Table 2, column (2) shows the results where we separate years as a colony by the identity of the coloniser. Putting the colonisers in rough order, the figure for years as a colony of the US or Germany has the largest positive effect, most likely because these countries were much later colonisers. The positive impact of being a US colony also reflects the relatively high income levels of the remaining colonies like Guam, American Samoa, and Puerto Rico. Years as a colony of the Dutch, the British and the French are similar to our main results. Years as a Spanish colony are still positive, but less so than our main results. Years as a Portuguese colony have a negative association with modern GDP per capita.

Finally, we can check if our results are suggestive about colonisation in general, by extending our results to a non-island sample. We start with the set of countries examined by Acemoglu *et al*. (discussed in another chapter in this volume) and repeat our island exercise. Regressing GDP per capita against centuries as a colony we find a significant and positive relationship with a magnitude of about half of our main results. The positive relationship is maintained even after controlling for the AJR settler mortality measure.

In summary, we argue that individual islands provide useful evidence on the causal effects of institutions on income. In particular, the history of islands suggests that there is a large random component in both the timing of colonisation and the identity of the coloniser. The most striking feature of our data set (and the one which we emphasise here) is that islands with a longer colonial history have a significantly higher modern-day income. The relationship between colonisation and income is driven mostly by post-enlightenment colonial activity in the 1700-1900 period. US, Dutch and British rule are more positively associated with income than Spanish or Portuguese rule. Not surprisingly, islands that are still held as colonial possessions or overseas territories (e.g. Bermuda and Puerto Rico) have a higher measured income than politically independent islands. Overall the islands data set provides a nice opportunity to examine the effects of political and social history and long standing institutions on current economic outcomes.

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11 Maritime technology, trade, and economic development. evidence from the first era of trade globalisation

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Question

The use of the term globalisation has become commonplace in recent years. However, this surge in interconnection that we observe in the world today is not a new phenomenon. Between 1820 and 1913, the world experienced an unprecedented increase in world trade, with a marked acceleration that began in 1870. Increased global GDP or population cannot simply explain this trade boom. In fact, between 1870 and 1913, the world export-to-GDP ratio increased from 5% to 9%, while per-capita volumes more than tripled.

What caused this first era of trade globalisation? How did this tremendous increase in trade affect economic development? Can the first era of trade globalisation explain the Great Divergence, the process by which the Western countries emerged from the 19th century as the most powerful and wealthy in the entire world?

Natural experiment

In a recent paper (Pascali, forthcoming), I use a natural experiment of history to answer these questions and exploit a quasi-random variation in trade costs during the second half of the 19th century, which was generated through the adoption of the steamship

by the international shipping industry. Before the steamship, sea routes were shaped by winds. Feyrer and Sacerdote (2009) show that wind speed and direction were important factors in the pattern of island colonisation in the Pacific and in the Atlantic Ocean. Trade routes also used to depend on wind patterns. As an example, consider Figure 1, which illustrates a series of journeys made by British sailing ships in the 19th century, between England, Cape of Good Hope and Java, and Figure 2, which depicts the prevailing sea-surface winds in the world. Winds tend to follow a clockwise pattern in the North Atlantic; consequently, sailing ships would sail westward from Western Europe, after traveling south to 30°N latitude and reaching the 'trade winds', thus arriving in the Caribbean, rather than traveling straight to North America. The result is that trade systems historically tended to follow a triangular pattern between Europe, Africa, the West Indies and the United States. Furthermore, because in the South Atlantic winds tend to blow counterclockwise, sailing ships would not sail directly southward to the Cape of Good Hope; rather, they would first sail southwest towards Brazil and then move east to the Cape of Good Hope at 30°S latitude.

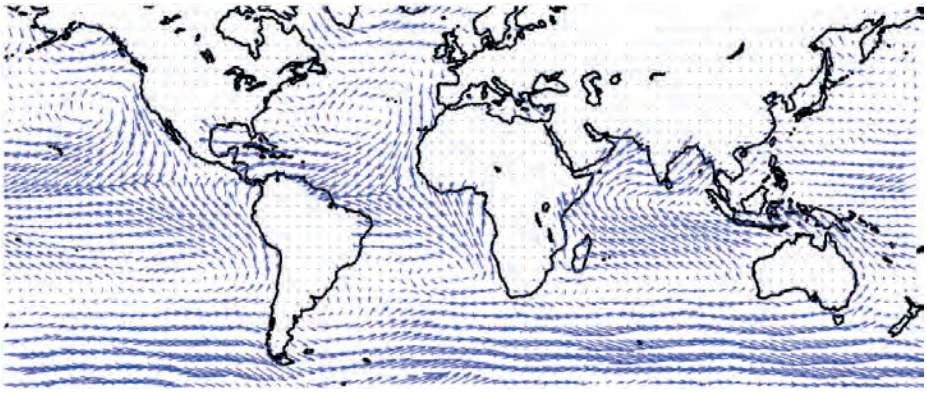
Figure 1. 15 journeys made by British ships between 1800 and 1860

Note: These journeys were randomly selected from the CLIWOC dataset among all voyages between England and Java comprised in the dataset.

The invention and subsequent development of the steamship represents a watershed event in maritime transport. For the first time, vessels were not at the mercy of the winds, and trade routes became independent of wind patterns. The steam engine greatly reduced shipping times, but did so in a disproportionate manner across countries and trade routes.

These asymmetric changes in shipping times (and related trade costs) across countries are used, as a natural experiment, to identify the effect of the adoption of the steamship on trade patterns and volumes and to explore the effect of international trade on economic development.

Figure 2. Prevailing winds in May (between 2000 and 2002)



Note: direction of wind defined by the direction of the arrow and speed by the length of the arrow.

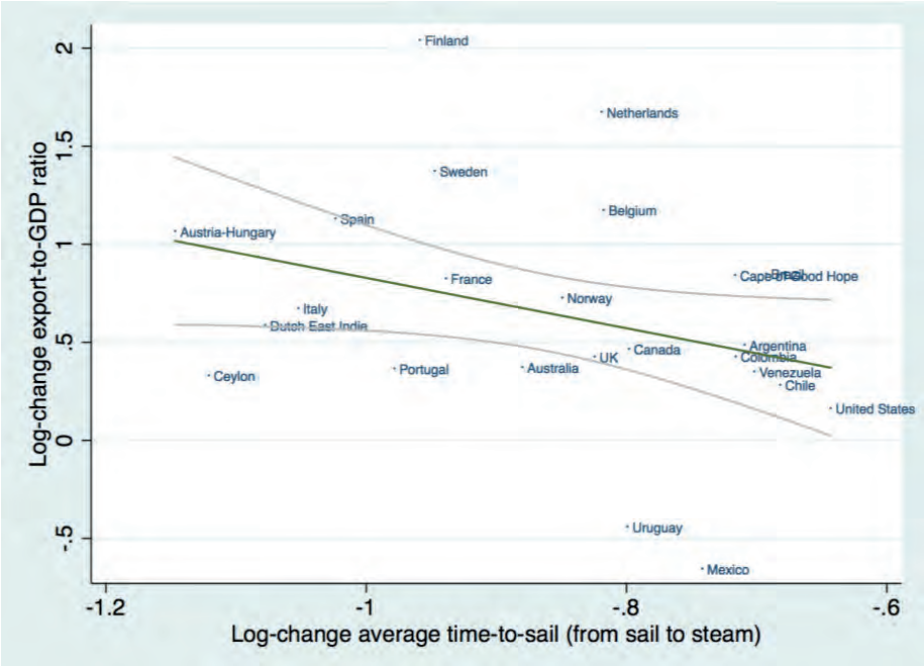
Findings

Four key findings emerge from the econometric analysis.

First, regressions of bilateral trade on shipping times by both sail and steam vessels, between 1850 and 1900, reveal that trade patterns were shaped by shipping times under sail until 1860, by a weighted average of shipping times under sail and steam between 1860 and 1875, and by shipping times under steam thereafter. This result points toward a very fast adoption and diffusion of the steam technology in the international shipping industry.

Second, I provide a rough estimate of the impact of the steamship on world trade volumes. Figure 3 depicts the negative relationship between the change in the isolation of the country (measured as the average shipping time from this country to the remainder of the world) induced by the steamship and the change in trade volumes between 1850 and 1905. The estimated elasticity is surprising large: it implies that the reduction in shipping times induced by the steam engine is likely to be the main determinant of the first wave of trade globalisation.

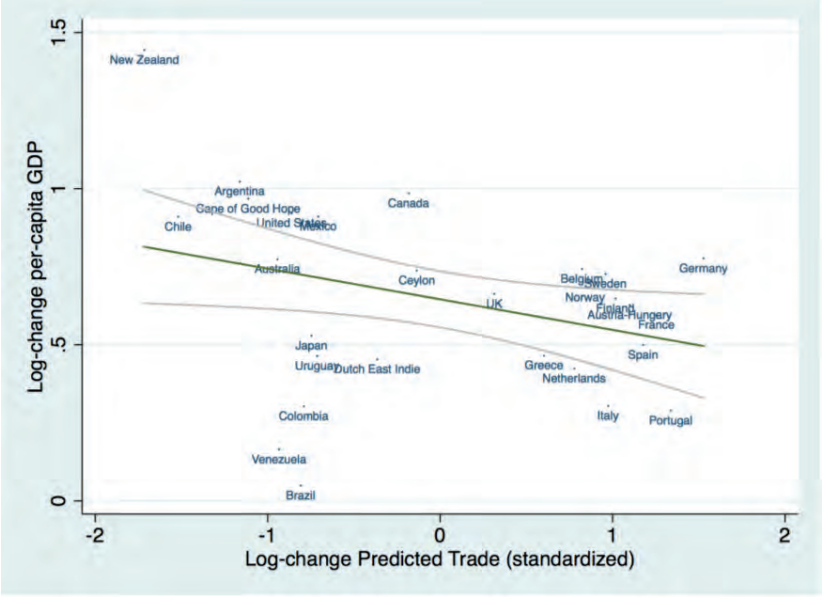
Figure 3. Relation between the log-change in average shipping time from a country to the remainder of the world (caused by the adoption of the steam engine) and the log-change in the export-to-GDP ratio between 1850 and 1905.



Third, exploiting quasi-random variation in trade costs, generated by the transition from sail to steam, I document that the consequences of this trade expansion on development were not necessarily positive. On a sample of 36 countries, the average impact, in the short run, of the first wave of trade globalisation was a reduction in per-capita GDP, population density and urbanisation rates. To illustrate this point, Figure 4 reports the negative relationship between the change in trade volumes, induced by adoption of the

steamship, and the change in per-capita GDP between 1850 and 1905. The finding that the effect of the first wave of globalisation could be negative on average is surprising. In a previous study, Williamson (2011) documents a negative correlation between growth in terms of trade (generated by increased trade) and per-capita GDP growth in a large set of developing countries between 1870 and 1939. However, to the best of my knowledge, the current study is the first to document a negative causal effect. Notice, however, that this average negative impact of trade on income masks large differences across groups of countries. In particular, an exogenous increase in international trade produced different effects, depending on the initial levels of economic development: it was detrimental in countries characterised by a per-capita GDP below the top 33rd percentile in 1860, while it did not impact the economic performance of the richest countries. These estimates and a simple back-of-the-envelope calculation imply that the greater part of the economic divergence observed between the richest countries and the rest of the world, in the second-half of the nineteenth century, can be attributed to the first wave of trade globalisation.

Figure 4. Relation between the log-change in trade, caused by the adoption of the steamship and the long change in per-capita GDP between 1850 and 1905.



Finally, I find that the effect of trade on economic development is beneficial for countries that are characterised by strong constraints on executive power, which is a distinct feature of the institutional environment that has been demonstrated to favour private investment (see Acemoglu *et al*. 2001, and Acemoglu and Johnson 2005). More specifically, I find that an exogenous doubling in the export-to-GDP ratio reduced per-capita GDP growth rates by more than one-third in countries characterised by an executive power with unlimited authority, while it increased per-capita GDP growth rates by almost one-fifth in countries where the executive power was obliged to respond to several accountability groups. Why should we expect institutions to be crucial to benefitting from trade? A common argument is that a country with 'good' institutions will suffer less from the hold-up under-investment problem in those industries that intensively rely on relationship-specific assets (for a complete review, see Nunn and Trefler 2014). In this sense, good institutions are a crucial source of comparative advantage in non-agricultural sectors, in which the hold-up problem is more binding. My results confirm this theoretical prediction: an exogenous increase in the exposure to international trade increased the share of exports in non-agricultural products, and the share of the population living in large cities, only in those countries characterised by stronger constraints on the executive power. This result is relevant to the large stream of literature that has argued that institutions are crucial to obtaining benefits from international trade. The closest article in this sense is Acemoglu *et al.* (2005), which shows that the rise of Atlantic trade between the 16th and 19th centuries only produced a large positive impact on per-capita GDP and urbanisation in those European countries characterised by political institutions that placed significant checks on monarchy.

Conclusions

What factors drove globalisation in the late 19th century? How did the rise in international trade affect economic development? Pascali (forthcoming) addressed these two questions using new data and a novel identification strategy. I found that 1) the adoption of the steamship had a major impact on patterns of international trade worldwide, 2) only a small number of countries, characterised by more inclusive institutions, benefited from trade integration, and 3) globalisation was the major driver of the Great Divergence.

Policymakers who are willing to learn from history are advised to consider that a reduction in trade barriers across countries does not automatically produce large positive effects on economic development (at least, not in the short-run) and can increase inequality across nations.

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