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Evolution, Empowerment, and Emancipation

How Societies Ascend the Utility Ladder of Freedoms

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ABSTRACT

This article presents a new theory of development that unifies disparate insights into a single framework, focusing on human empowerment—a process that emancipates people from domination. Human empowerment sets in when mass-scale technological progress widens ordinary people's 'action resources.' As this happens, life turns from a source of threats into a source of opportunities, and societies climb the utility ladder of freedoms: universal freedoms become instrumental to take advantage of what a more promising life offers. Accordingly, people adopt 'emancipative values' that emphasize universal freedoms. With the utility and value of freedoms rising, 'civic entitlements' that guarantee these become undeniable at some point. Thus, human empowerment proceeds as the sequential growth in the utility, value, and guarantee of freedoms (*sequence thesis*). Because universal freedoms are a reciprocal good that flourishes through mutual recognition, the utility ladder of freedoms is a social ladder: people climb it in alliance with like-minded others who share similar utilities (*solidarity thesis*). Historically speaking, human empowerment on a mass scale started only recently because civilization matured late where natural conditions bestow an initial utility on freedoms that has been absent elsewhere (*initiation thesis*). However, globalization is about to break human empowerment free from its confinement to the initially favorable conditions (*contagion thesis*). Together, these theses form an *evolutionary theory of emancipation*. After unfolding this theory, the article presents evidence in support of its major propositions.

Key words: human empowerment, evolution theory of emancipation, freedom.
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INTRODUCTION

Why are some countries more developed than others? This question puzzles scholars since Adam Smith (1993 [1776]), arguably the first author to take a systematic account of the differences in development between countries. Despite recent criticism (cf. Sen, Stieglitz & Fitoussi 2010), per capita income is still the most widely accepted indicator of development (Barro 1997; Firebaugh 2010). As is well documented, per capita income differs indeed greatly between countries, although extreme differences are recent--historically speaking (Landes 1998; Nolan & Lenski 1999; Goldstone 2009). In numbers, Maddison's (2007) estimates suggest that before 1000 CE people in most societies around the world lived just slightly above the existential minimum and no society was more than double as rich as the poorest one. From 1000 until 1500 CE, income differences between countries grew just three-fold and in 1800 they were four-fold. Yet, in 1900 they reached a factor of fifteen and in 1950 a factor of twenty-five. In 2010, US-Americans are 170-times richer than Ethiopians (World Bank 2012).

Until 1500, 'Eastern' civilizations were richer than the 'West' (Maddison 2007; Morris 2010).[1] But the East led by a tiny margin compared to the Western income explosion after 1500. This 'reversal of fortunes' is the object of much debate (Jones 1987; Hall 1989; Acemoglu, Johnson & Robinson 2001; Pommeranz 2005; Goldstone 2009).

Descriptions of developmental differences highlight disparate factors. Many authors emphasize differences in the societies' stock of technological knowledge (Becker & Barro 1988; Romer 1990; Nolan & Lenski 1999; Galor 2011). Others champion cultural factors, especially the emancipation of individual initiative from rigid norms (Lal 1998; Landes 1998; Florida 2002). Still others stress institutional factors, most notably legal protection of freedoms (North 1990; North, Wallis & Weingast 2009; Acemoglu & Robinson 2012).

Debating which of these factors is more important hides a fundamental point, as I will show: technological progress, cultural emancipation, and institutional freedoms all reflect a *single syndrome* of development. This is an important insight. It points the finger to the root principle that integrates development into a syndrome. I suggest this principle is *human empowerment*—a process that emancipates people from domination. Historically speaking, human empowerment on a mass scale is a recent process whose emergence demarcates a sharp turn in the civilization process. And this turn gains significance because the trend towards human empowerment shows signs of spreading around the globe.

1 As the 'West' I define the Atlantic Northwest of Europe and its oceanic offshoots in North America, Australia, and New Zealand. Eurasian civilizations from the Middle East and Russia to China are 'Eastern' by this definition (cf. Fernandez-Armesto 2002).

As this article tries to demonstrate, looking at developmental differences and trends through the lens of human empowerment offers new insights that help us to better understand the nature of the process. The article proceeds in five sections. Section one reviews the literature on development, culture, and institutions and elaborates how the human empowerment concept unifies separately gained insights in a single framework. Section two derives from this framework six hypotheses. Section three describes the data and methods to test them. Section four presents the evidence. The article closes with a discussion of its findings' main implications.

THEORY

Converging Insights into Development, Culture, and Institutions

Without mutual notice, scientists from various disciplines formulated converging theories about development--especially as concerns the linkages between societies' existential conditions, cultural orientations, and institutional formats. Triandis (1995), to begin with, differentiates between 'collectivistic' cultures in which strict obligations tie people closely to their in-group, and 'individualistic' cultures in which people decide by themselves which group commitments they take on. The author argues that collectivism is the psychological response to existential hardship because hardship makes people dependent on in-group support. This condition requires collective discipline, which favors authoritarian institutions as a tool of enforcement. Conversely, individualism emerges under receding existential pressures because then collective discipline is no longer needed. This opens room for individual creativity and shifts utility to liberal institutions that protect creativity.

Triandis illustrates these propositions with a typology of selected countries. Gelfand et al. (2011), by contrast, present systematic data for more than thirty countries in support of similar propositions, albeit with different terminology. Specifically, the authors find that existential pressures influence whether a culture is 'tight' or 'loose.' Fading pressures diminish the need for rigid norms, which makes cultures loose: taboos become less important and tolerance of lifestyle diversity increases. Again, the nexus to institutional formats is obvious: tight cultures breed authoritarian institutions to enforce taboos; loose cultures favor liberal institutions to open room for tolerance.

A seventy-nation study by Fincher et al. (2008) identifies a particular source of reduced existential pressures: a lower natural disease load. As the data show, countries with lesser threats from diseases tend to favor inter-group exchange over in-group closure, individualism over collectivism, and liberalism over authoritarianism (Thornhill et al. 2009). Supporting this insight, Woodley and Bell (2013) find that societies with high disease threats foster group separation along kinship lines. This is evident in 'consanguinity': a marriage pattern that couples distant relatives instead of non-relatives. Consanguinity exemplifies a grouping pattern that associates people along kinship ties. The resulting clan-structure is yet another feature of collectivism that contrasts with the contractual pattern of group association under individualism. What is more, the clan pattern of group formation that prevails under consanguinity is linked with authoritarian institutions. Apparently, these institutions are needed to sustain the inner cohesion and outward closure of clan structures. By the same token, the contractual pattern of group formation that prevails under absent consanguinity goes hand in hand with liberal institutions. These institutions serve to guarantee associational freedom.

Evidence from group experiments also supports these linkages. For instance, Higgins (2005) shows that a 'prevention focus' guides people's actions when they are confronted with threats. Conversely, people switch into a 'promotion focus' when exposed to opportunities instead of threats. This is a switch from a fixation on discipline and routine to an emphasis on creativity and experimentation.[2] It is plausible to conclude from this evidence that most people in existentially stressed societies are *chronically* in a prevention focus. A chronic prevention focus should be a breeding ground for authoritarian institutions because these institutions enforce the discipline that 'preventionists' need. By contrast, existential bloom makes the promotion focus chronic. This should favor liberal institutions because they guarantee the room of manoeuver for which 'promotionists' seek.

Another paradigm in experimental psychology supports similar conclusions. Sidanius and Pratto (1999) demonstrate that threat perceptions feed a 'social dominance orientation.' People who feel vulnerable when left on their own seek for protection in a strong group. A group is perceived as strong when it is internally cohesive and shows superiority over other groups. Social dominance orientations, thus, support the oppression of non-conformity and the discrimination of out-groups. Under absent threats, however, people gain confidence in their individual strength, for which reason they don't feel the need for group protection. Therefore, weak social dominance orientations make people supportive of liberty and equality (Sidanius et al. 2000).

These findings are reminiscent of classical arguments by Adorno et al. (1950) about the 'authoritarian personality' and Lasswell (1951) about the 'democratic character.' In philosophical ways, these insights have been foreshadowed by Erich Fromm's *The Fear of Freedom* (2001 [1941]) and Karl Popper's *The Open Society and Its Enemies* (1971 [1962]). Another classic by Rokeach (1960) systematizes these ideas. In his conceptualization of belief systems, Rokeach distinguishes 'closed beliefs,' which involve dogmatism, rigidity, and authoritarianism, from 'open beliefs,' which involve relativism, flexibility, and liberalism. Closed beliefs characterize people who perceive life as a source of threats, whereas open beliefs are typical of people who see life as a source of opportunities. Once more, the link to institutions is obvious: closed beliefs lend themselves to authoritarian institutions, open beliefs to liberal institutions.

Studies in practically every country find that whether people perceive life as a source of threats or a source of opportunities is influenced by their socioeconomic status: people in lower status positions are more vulnerable and, thus, more likely to feel

2 In line with this, evolutionary anthropologist Henrich (2010) finds that not 'necessity' but 'opportunity' is the 'mother of innovation.'

threatened. People in higher status positions, by contrast, possess more options and tend to perceive life that way (Brint 1984; Lamont 1987; Goldthorpe 2001; Loftus 2001; Sullivan & Transue 2003).

Inglehart (1977, 2007) interprets the same regularity in terms of Maslow's (1988 [1954]) need hierarchy: people who live in dire conditions are forced to focus on their basic needs and cannot tolerate deviation from strict rules; people in more comfortable positions are freer to cultivate their predilections and to tolerate the diverse ways in which others cultivate theirs'. Inglehart tested and confirmed this theory for a set of Western democracies, demonstrating a generational shift from materialist to postmaterialist priorities among cohorts who grew up in peace and prosperity. This shift has also been described as one from authoritarian to liberal orientations (Flanagan 1987). The value shift, in turn, drives a transition from 'elite-guided' to 'elite-challenging' modes of citizen action (Inglehart 1990; Norris 2002; Dalton 2010).

Conversely, cross-national survey data show that support for the authoritarian ideologies of right-wing parties in the US and Western Europe is most widespread among the 'residual underclass': low-skilled workers in insecure jobs (Jackson et al. 2001; Scheve & Slaughter 2001; Norris 2005; Wilson 2005; Wagner et al. 2006; Coenders et al. 2008).

The logic that separates different population segments within the same societies also applies to differences between entire populations, which are often more pronounced. In fact, socioeconomic differences are still much larger between than within countries (Baldwin et al. 2001; Goesling 2001; Firebaugh 2012). Accordingly, differences in cultural orientations too are more pronounced between than within countries (Inglehart & Welzel 2010). Yet, the logic is the same for both types of differences: existential hardship breeds protective orientations that champion authoritarian institutions; existential bloom encourages emancipatory orientations that support liberal institutions.

Indeed, based on representative population surveys from some 80 countries around the world, Inglehart and Welzel (2005) demonstrate that people in stressed societies emphasize 'survival values': these values favor discipline, uniformity, and authority. By contrast, people in prospering societies emphasize 'self-expression values': these values favor creativity, diversity, and autonomy. As one would expect, authoritarian institutions dominate in survival-oriented societies; liberal institutions are more prevalent in self-expressive societies.

Summarizing these findings, there are two points of convergence. First, there is an intimate link between (a) existential conditions, (b) cultural orientations, and (c) institutional formats. Second, this link manifests itself in two polar configurations, each of which seems to exist in a self-sustaining cycle: a vicious cycle of existential hardship, protective orientations, and authoritarian institutions at one polar end, versus a virtuous cycle of existential thrive, emancipatory orientations, and liberal institutions at the opposite end--with transitory stages in between. This categorization echoes Galor's (2011) division of contemporary countries into three 'clubs' of development: a 'stagnation club,' a 'growth club,' and a 'transition club' in between the two.

In terms of the human condition, the stagnation-growth polarity is better described as one between disempowerment and empowerment: under existential hardship, protective orientations, and authoritarian institutions, ordinary people have little control over their lives and their societies' agendas—they are disempowered. With existential thrive, emancipatory orientations, and liberal institutions, ordinary people have significant control over their lives and their societies' agendas—they are empowered.

An Evolutionary Theory of Emancipation

To provide a comprehensive understanding of human empowerment, I present an *evolutionary theory of emancipation* (for a book-length treatment see Welzel 2013). This theory centers on the human desire for a life free from domination. It locates the source of this desire in a root principle of human existence: the *utility ladder of freedoms*. This principle resides in an evolved 'gift' of our species: human *agency*, that is, people's faculty to act with purpose (Nussbaum 1993; Sen 1999).

Agency is an inherently emancipatory quality that has been selected for its power to shape reality (Geary 2007). Agency embodies the desire to be unrestricted in the usage of one's potential for agency—which is the seed of our wish for an existence free from constraints (Deci & Ryan 2000). Every world religion appeals to this desire by the idea of salvation in an eternal afterlife (Dumont 1986). But how much people pursue the desire for emancipation in *this* life, waxes and wanes in response to existential pressures beyond their control (Welzel 2013). This adaptability in the emancipatory drive is vital: it ties subjective values to objective utilities. Without this value-utility link, human lives would be out of touch with reality and our species had gone extinct since long.

The graveness of existential pressures is visible in a shortage of action resources among ordinary people. To what extent ordinary people have control over action resources depends on mass-scale technological progress (Bell 1973; Toffler 1990; Drucker 1993; Florida 2002; Baker 2007). Technologically advanced societies prolong human lives and equip people with tools that free up time from doing unpleasant work for doing more exciting things. As Veenhoven (2005) shows, longer lives with less time wasted for unpleasant things lead to a measurable increase in 'happy life years.' Technological progress also amplifies labor productivity, which enhances the value of our work hours, thus elevating incomes and purchasing power. Moreover, modern-day technological progress feeds itself from mobilizing intellectual capacities on a mass level, which involves expanding education and information. Finally, technological progress interlinks people in wide-ranging webs of exchange. All in all, technological progress enhances ordinary people's material means, intellectual skills, and connective opportunities. These are resources of action because each of them widens the options of what people can do at will. Action resources unlock the gift of agency.

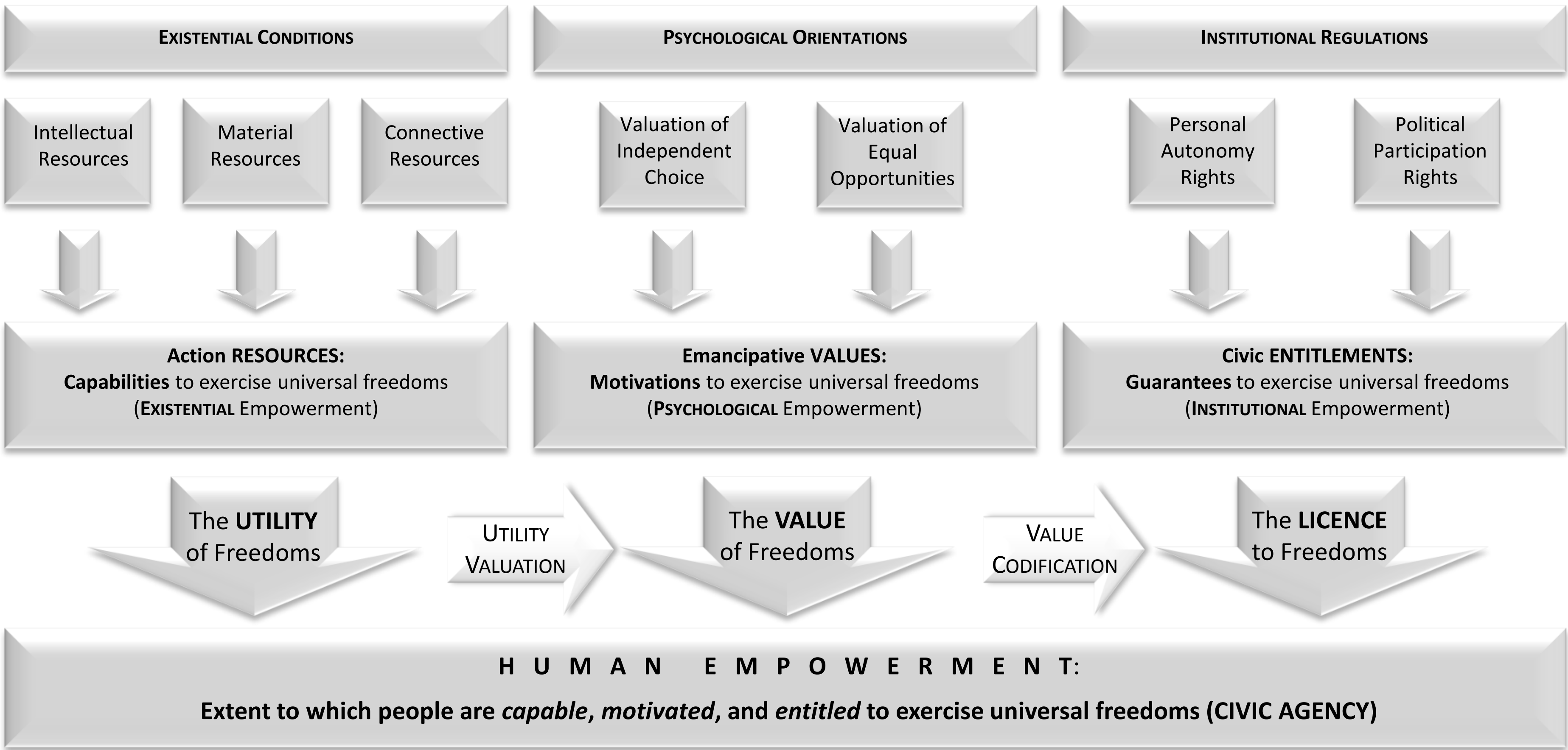

Figure 1. The Human Empowerment Framework of Welzel (2013)
Source: Welzel (2013).

As this happens, life turns from a source of threats into a source of opportunities, and societies ascend the utility ladder of freedoms: universal freedoms become increasingly instrumental to take advantage of what a more promising life offers. Recognizing this, people begin to value freedoms accordingly: they adopt emancipative values. Again, this value-utility link is vital to keep human lives in touch with reality. With the utility and value of freedoms rising, denying their guarantee becomes ever more costly and turns eventually into an unsustainable option. Thus, if it proceeds, human empowerment proceeds as the sequential growth in the utility, value, and guarantee of freedoms. Figure 1 depicts this sequence, pinpointing two processes: the 'utility-valuation' process due to which action resources give rise to emancipative values; and the 'value codification' process according to which emancipative values make civic entitlements more likely.

The utility ladder of freedoms is a *social* ladder. No individual climbs the ladder in isolation; instead, people ascend in alliance with others, embedded in the stream of their society. The reason why the ascension is a solidary process lies in the fact that universal freedoms are a *reciprocal* good. Reciprocal goods come to fruition through mutual recognition. Hence, the value and guarantee of universal freedoms rise when expanding action resources enhance people's *joint* utilities from freedoms.

Of course, there is no iron law preventing human empowerment from stagnation or recession. And even though the desire for emancipation does not guarantee that human empowerment always progresses, it directs the human effort towards this end—as much as external circumstances allow. In this sense, humans are evolutionary 'programmed' to work *upward* the utility ladder of freedoms.

Nevertheless, human empowerment on a mass scale is, historically speaking, a recent process. To get started human empowerment needed civilization to mature in an environment that bestows an initial utility on freedoms. Consequently, human empowerment started where urban civilization emerged first with this initial utility endowment in place. As Powelson (1997) notes, this happened with the rise of pre-industrial capitalism and the subsequent industrial revolution, first in the 'Atlantic West' and then in Japan (cf. Jones 1987; McNeil 1990; Landes 1998). Western Europe and Japan were belated civilizations and they both matured in an environment that is markedly different from that of all other urban civilizations in world history (Jones 1987; Fernandez-Armesto 2002). Indeed, these were the only two civilizations in pre-industrial times to reach urban maturity in a relatively cold climate with continuous rainfall over the seasons—a constellation I call the 'cool-water-condition' (henceforth: CW-condition).

It is well known that lower temperatures diminish an environment's disease load, decelerate soil nutrient depletion and--in combination with continuous rainfall--increase the return to labor on land (Weischet 1993; Gallup & Sachs 2000; Masters & Wiebe 2000; Deschenes & Greenstone 2007; Zivin & Neidell 2010; Dell, Jones & Olken 2011).

But what is most significant about CW-environments is that they harbour an original form of existential autonomy: easy, equal, and permanent access to water resources. 'Water autonomy' in this sense closes a main historic route to despotism: central control over water supply. This classical argument by Wittfogel (1957) has been rediscovered by Midlarsky (1997) and been confirmed on a broad empirical basis by Bentzen, Kaarsen and Wingender (2012). Giving overlords less control over their subjects, water autonomy becomes the source of derivative autonomies once urban markets emerge—including autonomy in marketing one's skills, ideas, and produce. Once emerging markets offer opportunities for profit, water autonomy and its derivative autonomies create incentives to innovate—the engine of mass-scale technological progress and its emancipatory consequences (Goldstone 2009; Galor 2011).

Arguably, then, the breakthrough into the modern era of explosive technological progress occurred in Western Europe because it was the first civilization worldwide to reach urban maturity in a CW-environment. This happened with the rise of pre-industrial capitalism in the 15th and 16th centuries--the approximate period when Western Europe's urbanization broke even with Mediterranean Europe, the Middle East, India, China and other areas that were at the forefront of the civilization process since long (de Vries 1984; Jones 1987; Hall 1995; Bairoch 1995; Goldstone 2009). Western Europe's breakthrough was repeated some hundred years later, with the beginning of the Tokugawa era in Japan--the second civilization to reach urban maturity in a CW-environment (McNeil 1990; Powelson 1997; Landes 1998; Bentley, Ziegler & Streets-Salter 2010). From Europe, colonial settlement transplanted technological progress and its emancipatory consequences to all other areas on the globe with a similar CW-environment, including the coastal areas of North America, the Southeast of Australia and New Zealand (Acemoglu et al. 2001; Fernandez-Armesto 2002).

As I will demonstrate, this is visible in a strikingly strong correlation between the presence of the CW-condition in a country and its level of technological progress—a correlation born by the emergence of vibrant urban markets in CW-environments.

Throughout the colonial period, Western people monopolized the emancipatory gains of human empowerment. Since the beginning of decolonization, this monopoly shows signs of erosion. With the acceleration of globalization in the early 1990s, this erosion picks up speed: human empowerment and its emancipatory consequences diffuse beyond societies with Western-like initial endowments. In the age of the Internet and global communications, the florescence of emancipatory societies in terms of human longevity, prosperity and creativity reaches ubiquitous visibility. If the desire for emancipation was not a natural human aspiration, the heightened visibility of emancipatory gains wouldn't call much attention in other parts of the world. Yet, it strikes a chord with people around the world who still live in poverty and oppression—but no longer in ignorance--and now increasingly question their condition and mobilize for change (Clark 2009; Tilly & Wood 2009; Carter 2012). This does not mean the Westernization of the world but, on the contrary, its de-Westernization. For the West's monopoly over emancipation is about to fade (cf. Morris 2010).

Compatible Theories

Despite climatic fluctuations, the *big pattern* with regard to which territories on the globe are hotter and which colder and which are dryer and which rainier can be considered as more or less constant over the last couple of centuries (Peel et al. 2007; Kuhle 2011). Hence, the CW-environment describes a condition that is temporally very remote to the explosive development that humanity experiences since the Industrial Revolution. Accordingly, there must be more proximate conditions through which the CW-environment exerts its hypothesized impact on technological progress.

There are indeed many theories about the more proximate conditions of development. These are not necessarily incompatible with the hypothesis of a technological impact of the CW-environment. The proximate factors might simply pinpoint the mediating mechanisms through which the CW-environment operates. This possibility makes it worthwhile to oversee the potentially mediating factors.

Since recently, an increasing number of scholars suggest genetic factors as a source of development (Hatemi 2012). Demographic variation in the frequency of two genes calls particular attention: the 'Val$^{108/158}$Met' polymorphism of the COMT (catechol-o-methyltransferase) gene, and the long-allelic version of the 5-HTTLPR gene. Both genes affect the chronic emission level of stimulating hormones: dopamine in the case of the COMT gene, serotonin in the case of the HTTLPR gene. Data from the 'allele frequency database' (ALFRED) at Yale University suggest that both genes exist in different frequencies in different populations. What is more, both genes are linked with traits that supposedly stimulate experimentation—the driving activity of technological progress. In the case of the COMT gene, there is a positive link with two of the 'Big Five' personality traits that supposedly encourage experimentation: 'openness' and 'extraversion.' Likewise, the demographic prevalence of the COMT gene shows a negative link with the personality trait that supposedly discourages experimentation: 'neuroticism' (Stein et al. 2005; Wichers et al. 2008).[3] In the case of the HTTLPR gene, there is a positive link of its long-allelic version with cultural individualism—a trait that supposedly stimulates experimentation (Chiao & Blizinsky 2010).

If the CW-condition bestows indeed utility on freedoms, experimentation is more rewarding under the CW-condition. Possibly, then, the CW-condition establishes a selective advantage for genes favoring the traits that encourage experimentation. If so, the technological impact of the CW-condition should be mediated by the demographic prevalence of the respective genes and the prevalence of their supposedly favoured traits, including openness, extraversion, and individualism.

Additional cultural traits that supposedly affect technological progress include 'cultural looseness,' 'consanguinity' as well as Protestantism and Islam. Cultural looseness measures how much a society tolerates deviating behavior. Following Gelfand et al. (2011), this trait should stimulate experimentation. Consanguinity denotes a marriage pattern that keeps marriage circles narrow in preferring distant relatives over non-relatives. According to Woodley and Bell (2013), the effect on technological progress is expected to be negative. Protestantism, by contrast, is expected to have a positive ef-

3 The other two traits are 'agreebleness' and 'conscienteousness.' For the definition and measurement of the 'Big Five' personality traits (cf. Matthews et al. 2003).

fect on technological progress (Lal 2001), while Islam's effect should be negative (Kuran 2004).

Another set of factors addresses long lasting institutional path-dependencies. These include the timing of the Neolithic Revolution (Putterman 2008) and 'state antiquity,' a measure of the historic endurance of regulatory state capacities (Bockstette et al. 2002). The proponents of these measures argue that the longer the Neolithic Revolution and regulatory capacities date back, the more time a society had to expand its stock of knowledge, which should be visible in technological progress today. Thus, it is quite possible that the technological effect of the CW-condition is mediated by these factors.

A colonial pattern with a lasting influence on development has been identified by Acemoglu, Johnson and Robinson (2001). The authors claim that where the 'white settler mortality' was high, development was hampered, whereas it was boosted where the white settler mortality was low. Acemoglu, Johnson and Robinson justify this thesis with an institutional argument: development depends on liberal institutions (they call them 'inclusive institutions'). These institutions evolved in Western Europe and were transplanted only to those colonial areas where a low 'white' mortality allowed Europeans to settle in large numbers: temperate or cold areas outside the tropics. Conversely, in tropical areas where a high 'white' mortality hindered large-scale European settlement, smaller numbers of European colonizers came to extract natural resources. Finding physical work insufferable, European rent-seekers forced indigenous people and slaves imported from Africa to work on plantations and in mines. Tropical areas were, thus, left with a legacy of 'labor-repressive' institutions—a manifest hindrance to human capital formation (Engerman & Sokoloff 1997).

The thesis that development favours democracy is one of the most researched topics in political science, usually with confirmatory results (cf. Teorell 2010; Benhabib et al. 2011). The opposite thesis that democracy also favours development has produced conflicting evidence (Krieckhaus 2004). Yet, as Gerring et al. (2005) show, most findings are misleading because they test an immediate effect of democracy, ignoring that the impact of democracy lies in its *long-term* endurance. Thus, they claim that the democratic tradition shows a pronounced effect on development. Possibly, then, the democratic tradition mediates the effect of the CW-condition on technological progress.

Other institutional factors that might mediate the technological effect of the CW-condition relate to contemporary institutional qualities of the state. These include 'state integrity,' that is, a low incidence of corruption among office holders (Kaufman et al. 2007). Equally important might be 'order and stability' as much as 'continuous peace' (Gleditsch et al. 2002). Most strongly emphasized among institutional economists are civic entitlements that guarantee universal freedoms, thus providing what North et al. (2009) call 'open access orders' or what Acemoglu and Robinson (2012) label 'inclusive institutions.'

Finally, *unified growth theory* (Galor 2011) argues that the breakthrough into the modern era of explosive, mass-scale technological progress needed a broad shift in life strategy: people must sacrifice their *demographic* productivity for their *economic* productivity. Only then are surpluses directed from population growth to skill growth.

When this happens, it becomes visible in the combination of low fertility with high education--indeed a close connection: *low* levels of fertility associate strongly with *high* levels of education.[4] The pronounced polarity between high-fertility/low-education and low-fertility/high-education reflects opposite life strategies: a *quantity-breeding* strategy versus a *quality-building* strategy (Becker & Barro 1988; Guinnane 2008).[5] And while a breeding strategy supplies cheap mass labor, a building strategy keeps the size of the workforce limited at the same time as it enhances its skill level. This makes labor the costly production factor. Once emerging urban markets increase labor demands under this condition, a powerful incentive for technological progress emerges. For technology saves labor.

I suggest that, among these potential mediating factors, low fertility preferences are the best candidate. Low fertility preferences should emerge naturally from the utilities that the CW-condition bestows on freedoms under emerging markets. In fact, this thesis suggests that emerging urban markets generate a preference for low fertility *only* to the extent that the CW-condition is present. The reason is simple: markets offer opportunities for profit only to those who have the autonomy to access these markets. Only for autonomous people do markets create an incentive to sacrifice demographic productivity for economic productivity. What is more, the higher disease security inherent in the CW-condition means lower child mortality and, thus, reduces the need of high fertilities to sustain the workforce (Gallup & Sachs 2000).[6] This is yet another reason why emerging markets more likely foster a preference for low fertilities under the CW-condition.

Consider the older civilizations outside the CW-areas: Mediterranean Europe, Northern Africa, the Middle East, India, China as well as the Amerindian civilizations. All of these had flourishing urban markets since centuries and millennia (Jones 1987; Fernandez-Armesto 2002). Yet, in none of these civilizations did markets favor a preference

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4 As Welzel (2013) points out, the correlations between a society's fertility rate and the average person's mean years of schooling in this society are: $r = -.80$ ($p < .001$; $N = 91$) in 1960; $r = -.86$ ($p < .001$; $N = 93$) in 1970; $r = -.85$ ($p < .001$; $N = 97$) in 1980; $r = -.82$ ($p < .001$; $N = 98$) in 1990; $r = -.78$ ($p < .001$; $N = 94$) in 2000. Controlling the fertility-education nexus for per capita GDP, the partial correlation between fertility and education drops to -.58 in 1970, -.56 in 1980, -.62 in 1990 and -.61 in 2000 but remains highly significant ($N = 76, 80, 82, 82$; $p < .001$ at all time points).

5 It is important to note that fertility differences are not a recent phenomenon of post-industrial times. Fertility differences already existed in pre-industrial times. Through prolonged lactation, certain diets, and behavioral taboos women knew how to control fertility if this was a socially desired preference (Blumberg 2004).

6 Child mortality is, of course, lower under higher material wealth. But it is also lower under a lower natural disease load. Disease security explains at least 40 per cent of the cross-national variation in infant mortality, in every year from 1985 to 2005 across 175 societies. Controlling for a society's per capita GDP of the same year, disease security still explains some 12 per cent of the cross-national differences in infant mortality. The effect is highly significant and, of course, negative: higher disease security comes with lower infant mortality. The partial effect of per capita GDP accounts for 11 per cent of the cross-national variation in infant mortality.

for low fertilities. Surplus gains continued to be channeled into population growth rather than skill growth (Galor 2011). By contrast, Western Europe and Japan had later marriages and lower fertilities *already in pre-industrial times*. For Western Europe, the evidence is documented in Flinn (1981), Hajnal (1982) and Hartman (2004), for Japan in Kiyoshi (1999) and Bentley, Ziegler and Streets-Salter (2010). In both CW-civilizations, women did not marry before their early-to-mid twenties, practiced fertility control before marriage, and marriage led to the establishment of an own household. This pattern is known as 'neolocality' and contrasts with the practice of 'patrilocality' that is dominant for about 70 per cent of the world population (Korotayev 2001). What makes the neolocal pattern a significant factor in development is that it requires a relatively long premarital period to accumulate savings, equipment, and skills.[7]

To summarize this discussion, I suggest that the strongest mediating factor of the CW-condition's technological impact is fertility control. This factor addresses mass patterns in household formation and, thus, lends itself to the grassroots perspective of the human empowerment theme.

[7] A late average age of women's first marriage is a strong indicator of low fertility: the percentage of women in a society married below the age of twenty correlates at $r = .71$ ($N = 158$; $p < .001$) with the fertility rate (data taken from Gapminder at www.gapminder.org). Hence, evidence showing that the two civilizations in cool-water-areas--Western Europe and Japan--had later marriages before pre-industrial time is important. It lends credibility to my argument that water autonomy establishes an incentive for lower fertility, once urban markets flourish. The evidence indeed exists. Based on an examination of forty-five studies, Flinn (1981) calculates a mean age of first marriage for women in Northwestern Europe over the pre-industrial era of 25 years. This corresponds with Hajnal's (1982) estimate of a female average marriage age of 23 for the pre-industrial period in Northwestern Europe. For other pre-industrial urban civilizations, from Eastern and Southern Europe to the Middle East, India and China, Hajnal estimates much lower marriage ages, usually in the late teens. His estimate for China, for instance, is 17.5 years. Japan lies in between the Western and non-Western pattern. Kiyoshi (1999: 132) reports a female marriage age of 20.2 years at the beginning of the Tokugawa period in around 1600, followed by a *continuous rise* throughout the Tokugawa period—which started an increasing economic florescence of urban centers. Figures for the year 1800 confirm the pattern of late marriages in the West, early marriages in the East, and Japan in between: the figures are 17 years for India, 18 years for Egypt, 19 years for Russia and China, 21 years for Japan and 23 years for the US and the UK (data taken from Gapminder at www.gapminder.org). Historic fertility estimates support the argument that water autonomy favored fertility control already in pre-industrial times even clearer. For the year 1800 (a time before industrialization picked up speed in most societies), estimates for the number of born children per women are as follows: 4.0 Denmark, 4.1 Japan, 4.4 France, 5.5 China and Italy, 6.0 India, 6.7 Bangladesh, Pakistan and Russia, 6.8 Mexico, 6.8 Zimbabwe, 7.2 Ethiopia, 7.3 Iran. Hence, at beginning of the industrial age, fertility in urban civilizations *is only* low in the West and Japan.

HYPOTHESES

The propositions of the above outlined theory of emancipation can be summarized in six hypotheses:

1. *Syndrome Thesis*: Development is a coherent syndrome of empowering technological, cultural, and institutional conditions, visible in a high cross-country correlation between technological progress, emancipative values, and civic entitlements.
2. *Sequence Thesis*: Technological progress, emancipative values, and civic entitlements merge into a syndrome by the sequential growth in the utility, value, and guarantee of freedoms.
3. *Solidarity Thesis*: Universal freedoms are a reciprocal good. Therefore, emancipative values arise from people's shared utilities rather than their unique utilities. Accordingly, the action resources that people have in common with most others in their society strengthen their emancipative values more than the resources they have on top of others.
4. *Initiation Thesis*: To get started, human empowerment needed civilization to mature where natural endowments bestow an initial utility on freedoms. This is the case in CW-areas whose original form of existential autonomy frees up more time for skill investment and offers higher returns for innovation, once urban markets turn vibrant. Thus, the initiation of mass-scale technological progress and its continuation to this day correlate with the CW-condition—ever since the first emergence of urban maturity in a CW-area.
5. *Fertility Thesis*: The CW-condition's technological impact is most strongly mediated by this condition's tendency to favor low fertilities. Lower fertility indicates the orientation of human efforts towards economic productivity and increases the factor costs of labor, creating an incentive to invent labor-saving technologies, as soon as emerging urban markets increase labor demands.
6. *Contagion Thesis*: The CW-condition's impact on development is declining since recently, indicating that technological progress and its emancipatory consequences break free from their original confinement to the CW-condition. The reason for this is the increasing global exchange of information, which strengthens expectations for a better life among the many people in the world who still suffer from poverty and oppression but are now no longer ignorant about the improvability of their lot.

DATA AND METHODS

To save space, details of a technical nature—including descriptive statistics, measurement procedures, and scaling information--are documented in the extensive Appendix at the end of this article. The Appendix also includes data for replication analyses. The following paragraphs, hence, provide only short descriptions of the key variables and reference their sources.

To test the syndrome thesis, I employ a simple cross-country correlation analysis, showing how societies that are technologically more advanced also have more widespread emancipative values and more extensive civic entitlements. I measure technological progress with the World Bank's (2008) 'knowledge index' over the period 1995 to 2005, as described in Appendix 1. The index is a summary measure of a society's high-tech production per capita, level of education, and penetration with information technology. Data are available for 146 countries and shown in Appendix-Table 5 (p. 13 ff.).

Emancipative values measure a population's mean emphasis on freedom of choice and equality of opportunities based on twelve items from representative population polls included in the 1995-2005 World Values Surveys (World Values Survey Association 2010). The index is known in the literature through the works of Inglehart and Welzel (2010), Alexander and Welzel (2010), Deutsch and Welzel (2011) and Welzel (2012). Appendix 2 provides a detailed description of items, index construction as well as reliability and validity statistics, especially as concerns population aggregates of emancipative values. Data are available for 96 countries and shown in Appendix-Table 5.

Civic entitlements are a combined measure of the 1995-2005 freedom ratings by Freedom House (2008) and human rights assessments over the same period by Cingranelli and Richards (2010), as described in Appendix 3. A detailed validation of the civic entitlements index is available in Welzel (2013). Data are available for 145 countries and shown in Appendix-Table 5.

All three variables are available for 85 countries. These countries are from all over the world, include the countries with the largest economy and biggest population in each world region and cover the entire range of variation among these three variables. There is no sampling bias. Appendix-Table 5 (p. 13 ff.) documents the composition of the country sample.

To test the sequence thesis, I create a time-pooled-cross-sectional dataset to examine in a system of reciprocal panel regressions the dominant temporal order in the occurrence of technological progress, emancipative values, and civic entitlements. In this setting, I model each of these three elements of human empowerment as an outcome of earlier measures of the other—taking into account the earlier elements' dependence on even earlier measures of the outcome element. So letting P, V, and E denote technological progress, emancipative values, and civic entitlements, I examine the following three-equation system:

$$(1) \quad P(T_0) = c + b_1{*}V(T_{-1}) + b_2{*}E(T_{-1}) + b_3{*}P(T_{-2}) + \varepsilon$$
$$(2) \quad V(T_0) = c + b_1{*}P(T_{-1}) + b_2{*}E(T_{-1}) + b_3{*}V(T_{-2}) + \varepsilon$$
$$(3) \quad E(T_0) = c + b_1{*}V(T_{-1}) + b_2{*}P(T_{-1}) + b_3{*}E(T_{-2}) + \varepsilon$$

Note: c is a constant, b_1 to b_3 are regression coefficients, and ε is an error term.

The grey-shaded parts of the equations mark the direction of impact postulated by the sequence thesis. Accordingly, technological progress should have a positive effect on emancipative values, and then the two together should have a positive effect on civic entitlements. Conversely, the effect of civic entitlements on emancipative values should be much weaker than the opposite effect. And technological progress should not or only weakly be influenced by the other two elements within the cycle of human empowerment. Technological progress needs to be initiated by a utility endowment *from outside* the cycle--as suggested by the initiation thesis.

Unfortunately, the direct measures of technological progress, emancipative values, and civic entitlements used to examine the syndrome thesis are not available in sufficient time series. Hence, for an examination of the sequence thesis I must use proxies.

Vanhanen (2003) provides resource measures and democracy measures for all independent countries for times reaching back to 1850-60. The temporal intervals of these data are decades, from 1850-60 to 1990-2000. These are relatively large time intervals but when we deal with human empowerment, we face a glacial process that advances slowly. Thus, significant progress becomes visible only after considerable time, which justifies the use of wide time intervals. From Vanhanen's data, I create proxy measures for technological progress and civic entitlements.

To begin with technological progress, I use Vanhanen's estimates of a given society's literacy and urbanization rates. The assumption is that societies with higher literacy rates have accumulated larger stocks of technological knowledge because a more literate population obviously is more knowledgeable. A higher urbanization rate, too, indicates larger stocks of technological knowledge because of the infrastructure and specialization needed to sustain city life. Literacy and urbanization also indicate greater intellectual and connective resources at the disposal of individuals. To combine the two measures, I weight a society's urbanization rate by its literacy rate. Thus, if the urbanization rate is .60 (60%) and the literacy rate is .50 (50%), the final score for the proxy of technological progress is (.50 * .60 =) .30. Like Vanhanen, I use a multiplicative instead of an additive combination because I assume that, in generating technological progress, intellectual and connective resources amplify rather than supplement each other. That this measure is a reasonable proxy for technological progress is evident from the fact that the proxy measure for 2000 correlates with technological progress in 2000 at $r = .91$ ($N = 180$; $p < .001$). The correlation of an additive combination of literacy and urbanization with technological progress is more than .10 points lower. Appendix 4 provides the measurement details. Descriptive statistics are shown in Appendix-Table 7 (p. 19) and data are displayed on a country-per-decade basis in Appendix-Table 8 (p. 20 ff.).

As a proxy for civic entitlements, I use Vanhanen's index of democratization. The index is based on Dahl's (1971) definition of 'polyarchy' as the interaction of (a) political inclusion/participation and (b) political competition/pluralism. Political inclusion/participation is measured as the turnout in national parliamentary elections (calculated for the adult residential population); political competition/pluralism is the seat share not captured by the largest party in parliament. After standardization into a 0-to-1.0 range, the two indices are multiplied to yield the overall index of democratization. The multiplicative combination treats the two components as necessary-but-insufficient conditions of democracy. Appendix 5 describes this proxy measure in detail. Arguably, a high degree of both participation and pluralism requires a strong institutionalization of civic entitlements. Hence, the index of democratization is a reasonable proxy for civic entitlements. This is obvious from the fact that the measure of civic entitlements used in the previous section correlates with Vanhanen's index of democratization in 2000 at $r = .88$ ($N = 170$; $p < .001$).[8] Appendix-Table 7 (p. 19) shows descriptive statistics and Appendix-Table 8 (p. 20 ff.) displays the data on a country-per-decade basis.

Data for emancipative values are unavailable for any society before 1981, and even then they exist for just two dozen societies. However, recent analyses by Welzel (2013) suggest that the cohort differences in emancipative values exhibit the footprints of value change in a society's past. Stunning in its simplicity, the basic pattern is that younger cohorts emphasize emancipative values more than older cohorts in societies from all culture zones around the world. What varies is merely the strength of this pattern. Moreover, Welzel's results indicate that the younger cohorts' stronger emancipative values are definitely *not* a lifecycle phenomenon. Hence, it is safe to conclude that the cohort differences reflect generational value change. If this is true, the cohort differences provide a valid basis to estimate how much weaker a society's emancipative values have been in the past. Hence, we can estimate how much weaker a society's emancipative values have been a decade ago by calculating how much weaker these values are among the cohort born a decade before the youngest cohort. Likewise, we can estimate how much weaker the emancipative values of this society have been two, three, four and even five decades ago by calculating how much weaker these values are among cohorts born this number of decades before the youngest cohort. Doing so, we obtain backward estimates for each society whose recent emphasis on emancipative values is known and for which the cohort differences in these values are known too. If we divide each society into eight successive cohorts, each spanning a decade, and restrict ourselves to cohorts that include at least fifty respondents in each society, we can calculate estimates for past emancipative values for six decades back in time, covering the decennial sequence from 1940-1950 to 1990-2000. Appendix 6 documents the details of this and alternative estimation procedures. Appendix-Table 7 (p. 19) shows descriptive statistics and Appendix-Table 8 (p. 20 ff.) displays the data on a country-per-decade basis.

Under these premises, I probe into simulation and estimate emancipative values for 96 societies over six decades. For 85 of these, I also have the proxy measure of civic entitlements documented in Appendix 5. Theoretically, this sums up to 510 country-per-decade observations. For 74 of the 85 countries, the proxy measures of technological progress reported in Appendix 4 is available too. This yields a dataset with a maximum of 444 country-per-decade observations. Yet, when we introduce double-time lagged

[8] Another indicator of democracy with a wide temporal scope is the 'democracy-autocracy index' from the Polity Project (Marshall & Jaggers 2004). Using this index instead of that by Vanhanen in the analyses of Table 1 produces weaker results: civic entitlements are less strongly determined by emancipative values and action resources, while they continue to have no effect of their own on either emancipative values or action resources. The weaker pattern found with the Polity proxy echoes the validity test by Alexander and Welzel (2011).

variables, we lose two decades with 74 countries each, leaving us with 296 country-per decade observations. Still, not all 74 countries were independent in every decade from 1940 to 2000. Hence, the proxy measures of technological progress and civic entitlements are not available in every decade either. In the worst situation, this leaves us with 230 country-per-decade observations, as documented in Appendix 6. Appendix-Table 8 (p. 20 ff.) displays the data on a country-per-decade basis.

Based on this dataset, I run temporally ordered panel regressions to examine the above formalized equation system. To handle the problem of serial dependence, estimations are based on panel-corrected standard errors. For further robustness checks, I use multiple imputations to replace missing values with expected values and analyze a complete data matrix of 510 country-by-decade observations (85 countries and 6 decades). Then I run the same panel regressions with the five different imputed datasets in two versions: with panel-corrected standard errors and with a system of 'seemingly unrelated regression' (SUR). Results are similar, as documented in Appendix 7. Appendix-Table 9 (p. 32) and Appendix-Table 10 (p. 33) show these results.

From an individual-level perspective, technological progress is important because it indicates the abundance of people's action resources, including material, intellectual, and connective resources. Now, to test the solidarity thesis, I use multi-level models in which individual-level emancipative values are explained by (a) how much a person's own action resources deviate from what is common in her country and by (b) the common level of the respective type of resource in her country. Individual-level resource measures are country-mean centered because then they indicate an individual's deviating resource control. For this reason, there is no overlapping variance between individual-level resource measures and the country-level measure of the same resource. Hence, we can separate the individually unique from the collectively common resources and isolate their distinct effects on emancipative values. This is examined separately for material, intellectual, and connective resources as well as the combination of the three. Material resources at the country level are measured by the per capita Gross Domestic Product (GDP) at the time of the survey. Data are taken from the World Bank's (2012) Development Indicators Series. At the individual level, material resources are measured by a ten-point household income scale from the World Values Surveys (World Values Survey Association 2010). Intellectual resources at the country-level are the mean schooling years of the average person (Barro & Lee 2010). At the individual level, I use a nine-point index of a respondent's education. Connective resources at the country-level are the per capita internet hosts at the time of the survey. At the individual-level, I use a nine-point index indicating the number of different sources from which a respondent reports to obtain information. At the individual-level, the combined resource measure is simply the average of an individual's score over the material, intellectual, and connective resources, each of which is standardized into the same scale range from minimum 0 to maximum 1.0. At the country-level, in one model the combined resource measure is the index of technological progress detailed in Appendix 1 (because technological progress is a good indicator of all three types of resources).[9] In another model, I use a factor-weighed combination of the three separate country-level resource measures. The multi-level models include the respondents' biological sex and age as routine demographic controls. Appendix 8 (p. 34) documents these data in detail.

To test the initiation thesis, I create a cool-water-index (CW-index). Specifically, I calculate the fraction of a country's inhabitable territory in cold and temperate zones with no dry season, in excess of the fraction in dry and hot zones, based on the Koeppen-Geiger classification of climate zones. Data are taken from Mellinger, Sachs and Gallup (2010). However, these area proportions still show considerable variation in (a) the amount of continuous rainfall as well as (b) the abundance of naturally navigable waterways—two important factors of water autonomy. Hence, I use a weighting procedure to factor in this uncovered variation, so as to create a truly fine-grained index. The precipitation data are from Parker (2000), indicating the minimum rainfall as an average over a country's entire territory in the driest month of the year. Waterways data are again from Mellinger, Sachs and Gallup, measuring the fraction of a country's territory in a 100-kilometers reach of permanently ice-free rivers and oceans. The ultimate CW-index varies between 0 for the complete absence of the cool-water-features to 1.0 for their maximal presence. The CW-index is at the same time a measure of water autonomy. The exact steps of the index construction are detailed in Appendix 9 (p. 35 ff.). The index is available for 173 countries and index scores are shown in Appendix-Table 13 (p. 38 ff.). I consider country differences in the CW-index as constant over the observation period.

A favorable feature linked with the CW-condition is a low threat from tropical and subtropical diseases. I use data on a society's natural disease load from Murray and Schaller (2010).[10] The data measure to what extent a society's natural environment harbors various infectious diseases, not how large a proportion of the population actually falls ill. This is important because disease measures of the latter type are endogenous to technological progress: technologically advanced societies have more elaborate medical and hygienic facilities that prevent infections even if there is a high natural disease load. Measuring *natural* disease load avoids this problem.[11] Because I am interested in the role of disease *security*, I invert Murray and Schaller's measures, so that higher scores indicate a lower threat from diseases. A detailed description is provided in Appendix 10. The index is available for 187 countries and scores are shown in Appendix-Table 14 (p.

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[9] Technological progress correlates with schooling years at $r = .93$ ($N = 93$), with internet access at $r = .81$ ($N = 139$), and with per capita GDP at $r = .84$ ($N = 136$). It is, hence, a formidable indicator of the prevalence of all three types of action resources. In a factor analysis, schooling years, internet access, and GDP/capita represent a single dimension: action resources. This dimension captures 90 percent of the variance in its three components. Technological advancement correlates with this dimension at $r = .95$ ($N = 88$).

[10] I thank Randy Thornhill for making me attentive to Murray and Schaller's article.

[11] That this is not a far-fetched possibility can be seen from the fact that, across the 92 societies for which measures of both disease security and emancipative values are available, the two correlate at $r = .65$ ($p < .001$).

43). Again I consider country differences on this index as constant over the period of study.

A striking irony of history is the fact that civilization lagged long behind in CW-areas. The two Eurasian CW-areas, Western Europe and Japan, urbanized late. Outside Eurasia, CW-areas did not urbanize at all until European settlement. I hypothesize that one reason for this delay is the late arrival of modern humans in CW-areas because of these areas' large geographical distance from the human origin in East Africa. To measure the geographic distance, I calculate the longitudinal and latitudinal 'block distance' of a country's centroid from Ethiopia's centroid based on the data by Gallup, Mellinger and Sachs (2010). The measure is documented in Appendix 11. The measure is surely imprecise because it does not take into account the topographic characteristics of given distances, ignoring mountain, desert or water barriers. Nevertheless, the measure provides a fairly reasonable proxy of the earliness of human arrival in a region, as documented by the measure's close correlation with regional estimates of real human arrival times from Oppenheimer (2004). Yet, I prefer the geographical distance to this direct estimate of human arrival times because the former is available on a country-level basis and not only for regions. This is documented in Appendix 12. To indicate *earliness* of human arrival I inverse the geographic distance, indicating proximity to the human origin. Data are available for 159 countries and displayed in Appendix-Table 15 (p. 49 ff.).

To test the fertility thesis, I use a variable labeled fertility control, which is simply the inverse of a society's fertility rate (World Bank 2010). As documented in Appendix 13, I take a measure of fertility control from 1980, so that it clearly predates the technological progress measure from 2005 (the latest point for which this is available at the time of this writing). This is done to order the variables truly sequentially. Data on fertility control are available for 170 countries; scores are shown in Appendix-Table 15 (p. 49 ff.).

The variables described in the theory section as competing mediators of fertility control are taken from the sources listed in the following paragraphs. A detailed documentation is provided in Appendix 14 and scores for all variables are shown in Appendix-Table 18 (p. 58 ff.). Data for the demographic variation in the COMT gene are from Inglehart et al. (forthcoming), data for the HTTLPR gene from Chiao and Blizinsky (2010). Data for demographic variation in 'Big-Five' personality types are from Schmitt et al. (2012) and data for cultural individualism from Hofstede (1997) as well as Suh, Diener, Oishi and Triandis (1998).

Data on the demographic prevalence of cultural looseness are from Gelfand et al. (2011). From Woodly and Bell (2013) I take estimates of the demographic prevalence of consanguinity. Data on the proportion of Protestants and Muslims per society are from the Quality of Governance Database (Quality of Governance Institute 2012).

Data on the timing of the Neolithic Revolution are from Putterman (2008) and data on 'state antiquity' from Bockstette et al. (2002). Data on the 'white settler mortality' are from Acemoglu, Johnson and Robinson (2001). Data on the endurance of democratic traditions are from Gerring et al. (2005).

To measure 'state integrity' I use the 'control of corruption' index from the World Bank's quality of governance project (Kaufman et al. 2007). From the same data source, I use the 'political stability and absence of violence index' to measure order and stability in more recent times. Then I measure 'continuous peace' using Gleditsch et al.'s (2002) 'armed conflict dataset.' The variable indicates for each society the number of armed conflicts in which it has been involved since the end of World War II. All these contemporary institutional qualities are measured five years before technological progress, in the year 2000.

Based on these variables, I use temporally ordered regression analyses to demonstrate that fertility control is the only mediator that largely absorbs the technology effect of the CW-condition. Thereafter, I use a two-stage-least-squares regression to examine the degree endogeneity of fertility control to economic development. I find very little such endogeneity. After that, I specify a temporally ordered path model to demonstrate the causal flow from geographic origin distance to disease security and the CW-condition to fertility control to technological progress.

To see how far the technological impact of the CW-condition can be traced back in time, I use historic estimates of per capita income from Maddison (2007) for 32 exemplary countries around the world. The income estimates are treated as a proxy for technological progress and reach back in decennial and centennial time intervals to the year One. I interpolate data for large sections of time between Maddison's estimates for the years 1, 1000, and 1500. The interpolation assumes relative constancy in intra-regional and inter-temporal income differences over the pre-Columbian period. This is admittedly a strong assumption and yet it is reasonable. Development economists point out that, over the long Malthusian era, both spatial and temporal differences in per capita incomes were negligible compared to what happened after the breakthrough into the modern era (Bairoch 1984; Jones 1987; Landes 1998; Pommeranz 2007; Goldstone 2009; Galor 2011). Before this breakthrough, ordinary people lived *nowhere* far above the existential minimum (Maddison 2007). Appendix 15 documents Maddison's income estimates and Appendix-Table 19 (p. 65 ff.) displays the data.

To examine the contagion thesis, I measure change in a society's per capita GDP using the time series data from the World Bank (2012) with yearly observations from 1960 to 2010 for all countries in the world, as detailed in Appendix 16. Using longitudinal cross-country regressions, I explain decennially ordered change in per capita GDP by the CW-condition and measures of economic, social, and political globalization from Dreher et al. (2008). These are available in time series from 1970 to 2000 on an annual basis. Appendix 17 documents the globalization measurement.

FINDINGS

The Syndrome Thesis

Contemporary measures of technological progress, emancipative values, and civic entitlements correlate strongly, positively, and significantly across countries. Measured over the period 1995 to 2005, technological progress correlates at *r* = .81 with emancipative values (*N* = 92); emancipative values correlate at *r* = .82 with civic entitlements (*N* = 85); and civic entitlements correlate at *r* = .73 with technological progress (*N* = 129). Of course, such highly correlated variables reflect a single underlying dimension, with factor loadings of .95 for emancipative values, .92 for both civic entitlements and technological progress. The shared variation among the three variables is 86 percent. The three-dimensional scatter plot in Figure 2 visualizes the techno-culture-institution nexus that merges these variables into different stages of human empowerment writ large. It is clear from this figure that development is consistent across the technological, cultural, and institutional domains of human existence. The syndrome thesis is confirmed beyond reasonable doubt.

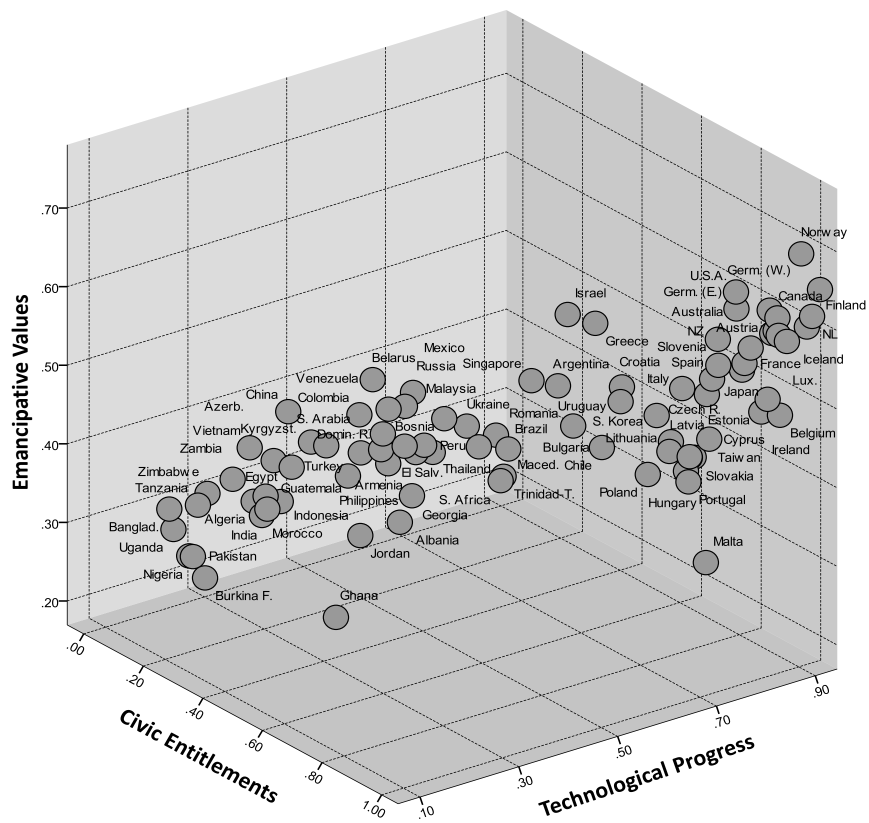

Figure 2. The Threefold Syndrome of Human Empowerment

Note: Variables are described in Appendix 1 to 3 and data are shown in Appendix-Table 5 (p. 13 ff.).

The Sequence Thesis

Technological progress, emancipative values, and civic entitlements are highly correlated. But correlation is not causation. To examine causality, one needs longitudinal data to run temporal order models in alternative directions to figure out in which direction among correlated variables the stronger flow of impact operates.

The three panel regressions in Table 1 apply this logic to the proxy measures described in the data and methods section. If we accept these proxies as valid measurements, the results are straightforward. Note that, as the variance inflation factors indicate, collinearity is not a problem in these regressions. The reason is that temporally separated measures of human empowerment are not as strongly correlated as contemporaneous measures. But let's first inspect the visual evidence. For better visibility, Figure 3 arranges the 85 societies covered by this analysis into ten global culture zones, as indicated by the Inglehart-Welzel Map (Inglehart & Welzel 2005). Note that these ten culture zones account for 79 per cent of the cross-national variation in civic entitlements, 78 per cent in technological progress, and 72 per cent in emancipative values. Hence, summarizing countries into culture zones comes with relatively little loss of information. On this basis, Figure 3 shows how technological progress, emancipative values, and civic entitlements increase from the first decade of observation, 1940-50, to the last decade of observation, 1990-2000. It is evident that the elements of human empowerment co-evolve and that progress clearly prevails in each of them: there is a long-term global trend towards human empowerment.

Figure 3 divides the picture according to the two processes posited by the human empowerment model in Figure 1. The left-hand diagram shows the 'utility-valuation' process due to which the action resources that emerge with technological progress give rise to emancipative values. The right-hand diagram shows the 'value codification' process according to which rising emancipative values make wider civic entitlements likely.

In the relationship between emancipative values and civic entitlements, a move in values usually predates that in entitlements. This is evident from a pattern in which the trend lines move to the right first before a steep move upward follows. This is particularly obvious for the societies in the two ex-communist zones. For the 'Ex-communist West' especially, we see a build-up of emancipative values for quite some time, until the downfall of Soviet imperialism opens the gate for democratization. Once this happened, these societies' civic entitlements jumped rapidly where rising emancipative values should have pulled them already earlier, were it not for the overriding veto of the Red Army.

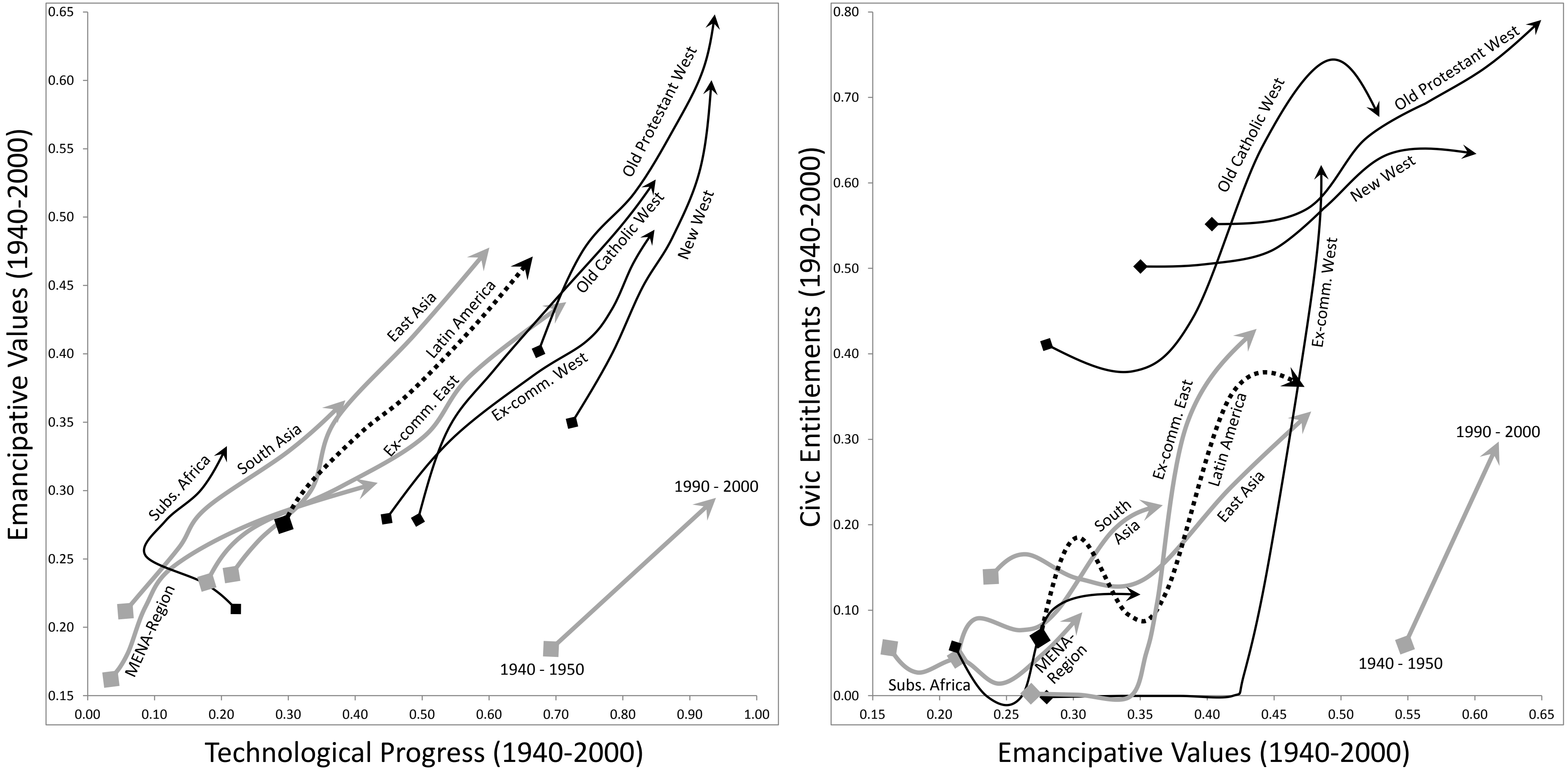

Figure 3. The Co-Evolution of the Three Elements of Human Empowerment in Global Culture Zones from 1940 to 2000
Note: Variables are described in Appendix 4 to 6. Grouping of countries into culture zones documented at the bottom of Appendix 6 (p. 30). Data are displayed in Appendix-Table 8 (p. 20 ff.).

Table 1. Time-pooled Cross-Sectional Model of a Reciprocal System of Temporally Ordered Effects

Lagged Predictors:	*Dependent Variables* at time T_0: Technological Progress[a)]	Emancipative Values[b)]	Civic Entitlements[c)]
Technol. Progress at time T_{-1}		.07 (4.17) ***	.26 (1.76) *
Emancipative Values at time T_{-1}	.08 (0.70) †		.93 (4.80) ***
Civic Entitlements at time T_{-1}	- .00 (0.09) †	.01 (0.90) †	
Dependent Variable at time T_{-2}	.93 (29.20) ***	.89 (15.60) ***	.33 (1.50) †
Constant	.14 (3.72) ***	.08 (5.90) ***	- .21 (- 3.40) ***
Adj. R^2	.93	.91	.70
N (observations)	232	260	253
N (societies)	68	74	74
N (decades)	max. 4, mean 3.4	max. 4, mean 3.5	max. 4, mean 3.4

Notes: Time-pooled-cross-sectional regressions with 'panel corrected standard errors' calculated in STATA 11.2. Entries are unstandardized regression coefficients with their panel -corrected T-values in parentheses.
T_{-1} is the decade preceding any given decade (T_0); T_{-2} is any decade preceding T_{-1}.
Tests for heteroskedasticity (White -test), influential cases (DFFITs), and multicollinearity (variance inflation factors) reveal no violation of OLS-assumptions.
Significance levels (two-tailed): † $p \geq .100$, * $p < .100$, ** $p < .050$, *** $p < .005$.
Included are all societies with available measures on each of the involved variables.
a) Proxy for Technological Progress is a combined and indexed measure of a society's literacy and urbanization rates in a given decade from Vanhanen (2003).
b) Emancipative values in a given decade are estimated from the contemporary cohort pattern in these values with society-specific trend adjustments as detailed in Appendix 4.
c) Proxy measure for a society's civic entitlements in a decade is Vanhanen's index of democratization for that decade. See Vanhanen (2003).
Measurement procedures and data are documented in OA _ .

Note: Variables are described in Appendix 4 to 6. Data are displayed in Appendix-Table 8 (p. 20 ff.).

The right-hand diagram of Figure 3 discloses another historical pattern. The link between emancipative values and civic entitlements is uniform in the sense that, over short or long, rising emancipative values bring wider civic entitlements. But while the rise of emancipative values in non-Western societies is more recent and linked with steeper gains in civic entitlements, the gains among Western societies occur on a higher plateau from the start. Most likely, the West's higher plateau reflects its historic imprint from emancipatory movements, especially the Enlightenment, and the early rights struggles inspired by these movements. On the other hand, at the time Western societies began to be shaped by emancipatory gains, they used their power to deny such gains to the societies they colonized (except 'white' settler colonies). Even after the colonial period, Western societies propped up authoritarian regimes in Latin America, Africa and Asia for a long time. Hence, because of blockades erected by colonialism and neo-colonialism, emancipative values in non-Western societies had to surpass a higher threshold to yield similar achievements in civic entitlements as those observed in Western societies.

Incorporating this historic pattern, the panel regressions in Table 1 examine the causal relationship between the three elements of human empowerment, as formalized by the three-equation system in the data and methods section. The results indicate that technological progress at time T_0 obtains no effect from either emancipative values or civic entitlements at T_{-1}, controlling for these elements' dependence on technological progress at T_{-2}. Emancipative values, however, do obtain an independent and positive effect from technological progress, though none from civic entitlements. Civic entitlements, for their part, obtain an effect from both technological progress and emancipative values while the one from emancipative values is stronger. Due to these findings, technological progress is the founding element, emancipative values the linking element, and civic entitlements the completing element of the human empowerment syndrome. Hence, if freedoms grow, they grow in a utility-value-guarantee sequence.

The Solidarity Thesis

The multi-level models in Table 2 examine how the action resources that mass-scale technological progress plays into the hands of ordinary people affect their emancipative values.

For each of the three different types of action resources, it is the part that most people in a country have in common which strengthens emancipative values, rather than what people have on top of most others in their country. This is evident from the larger coefficients[12] of the country-level resource measures compared to the individual-level resource measures, and from the fact that the country-level component of each model explains more variance in people's emancipative values than does the individual-level component. It is also noteworthy that, even though all three types of resources are conducive to emancipative values, intellectual and connective resources contribute more than material ones. Yet, the crucial point is that the solidarity thesis is confirmed: action resources shape emancipative values by the part that most people in a country have in common. The value of universal freedoms originates in socially *shared* utilities.

[12] Coefficients are directly comparable as concerns effect size because all variables are standardized into a scale range from minimum 0 to maximum 1.0.

Table 2. Multi-level Models of the Impact of Action Resources on Emancipative Values

	DEPENDENT VARIABLE: Emancipative Values				
PREDICTORS:	*Material* Empowerment[a)]	*Intellectual* Empowerment[a)]	*Connective* Empowerment	*Combined* Empowerment[b)]	*Combined* Empowerment II
• Constant	.43***(55.9)	.43***(47.1)	.44*** (47.4)	.46***(47.5)	.46***(46.3)
Country-level Effects:					
• Per Capita GDP	.51***(5.9)				
• Schooling Years		.46***(9.7)			
• Internet Access			.61***(9.2)		
• Technological Progress[b)]				.52***(9.1)	.41***(9.9)
Individual-level Effects:					
• Female Sex	.02***(10.5)	.02***(11.5)	.03***(11.2)	.03***(11.5)	.03***(11.5)
Cross-level Interactions:					
• Birth Year (indexed)	.14***(19.9)	.11***(12.3)	.09***(10.1)	.07***(6.8)	.07***(7.2)
*GDP/cap	.28***(5.0)				
*Schooling Years		.28***(6.6)			
*Internet Access			.14***(2.6)		
*Technological Advancement[b)]				.28***(4.4)	.17***(4.8)
• Household Income	.09***(16.6)			.02***(3.6)	.02***(3.7)
*GDP/cap	N.S.				
*Schooling Years					
*Internet Access					
*Technological Advancement[b)]				N.S.	N.S.
• Formal Education		.12***(19.0)		.10***(12.0)	.10***(12.6)
*GDP/cap					
*Schooling Years		.11***(4.2)			
*Internet Access					
*Technological Advancement[b)]				.21***(4.5)	.12***(5.1)
• Informational Connectedness			.08***(15.7)	.04***(11.0)	.04***(11.0)
*GDP/cap					
*Schooling Years					
*Internet Access			N.S.		
*Technological Advancement[b)]				N.S.	N.S.
Reduction of Error (of total):					
Within-country Variation of DV	08% (05%)	13% (09%)	08% (05%)	12% (08%)	12% (08%)
Between-country Variation of DV	57% (20%)	60% (21%)	71% (25%)	79% (28%)	77% (27%)
Variation in Age Effect	36%	41%	13%	31%	40%
Variation in Income Effect	ZERO			ZERO	ZERO
Variation in Education Effect		13%		28%	35%
Variation in Connectivity Effect			ZERO	ZERO	ZERO
Total Variance Explained	25%	30%	30%	36%	35%
N (number of observations)	128,908 individuals in 81 societies	116,390 individuals in 62 societies	58,272 individuals in 45 societies	41,808 individuals in 33 societies	41,808 individuals in 33 societies

[a)]The material and intellectual empowerment models cover data all societies surveyed in the last two rounds of the WVS, using the latest survey from each society (ca. 2000-2005) and weighting each national sample to equal size. The other models only cover data from WVS (ca. 2005) because the questions used to measure informational connectedness were only fielded then.
[b)]In the first combined model, instead of technological advancement[b)] I use the average of GDP/capita, schooling years, and internet access to measure combined action resources at the societal level. In all models, societal-level variables are taken from the year of the survey.

Notes: Entries are unstandardized regression coefficients (*b*'s) with T-ratios in parentheses. Models calculated with HLM 6.01. Societal-level variables are global-mean centered; individual-level variables (except female sex) are country-mean centered. Reduction of error calculated from change in random variance component relative to the empty model. 65% of the total variance in emancipative values is within, 35% between societies. Significance levels: * $p < .050$; ** $p < .010$; *** $p < .001$; N. S. not significant ($p > .050$).

Note: Variables are described in Appendix 8 (p. 34).

The Initiation Thesis

As the left-hand diagram in Figure 4 illustrates, the countries' CW-condition explains 73 per cent of the cross-national variation in technological progress today (*N* = 145). As the right-hand diagram shows, the CW-condition of 25 global regions explain almost 90 per cent of the inter-regional variance in technological progress (*N* = 25).

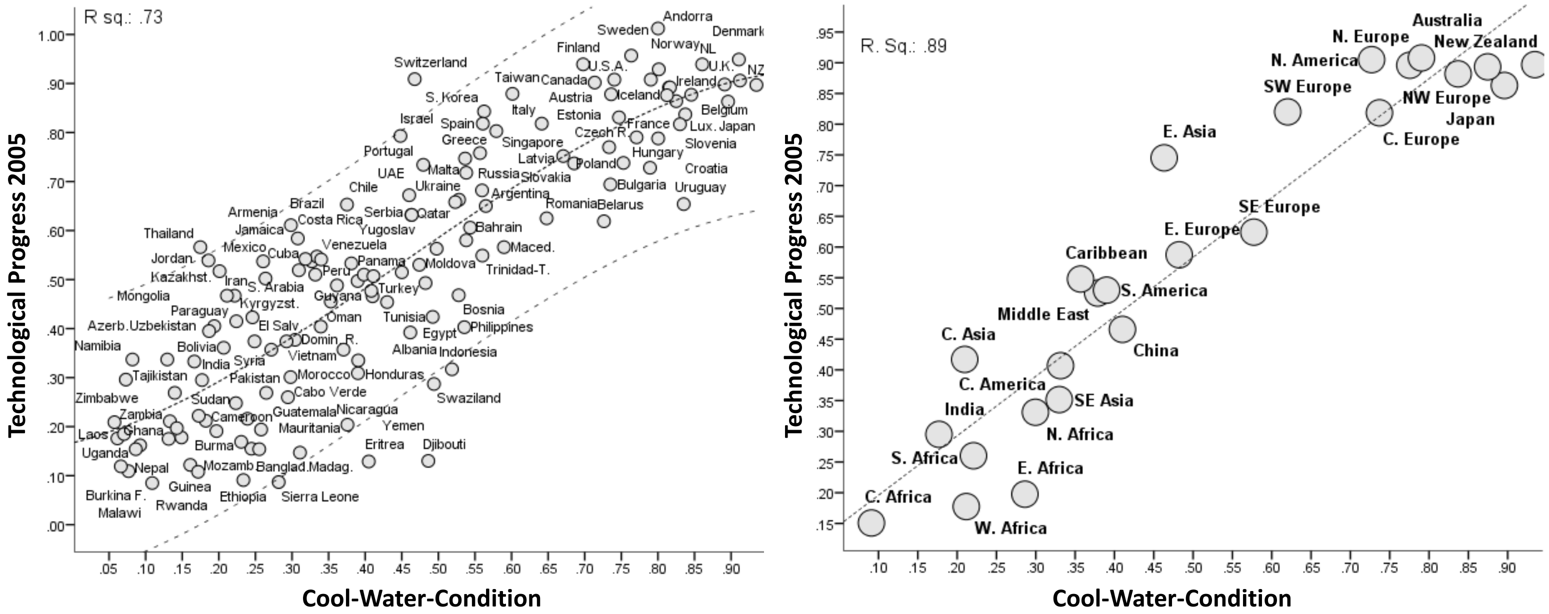

Figure 4. The Cross-national and Cross-regional Technological Impact of the CW-Condition
Note: Variables are described in Appendix 9. Data are displayed in Appendix-Table 13 (p. 38 ff.).

Of course, even an explained variance as high as 73 per cent does not justify environmental determinism. As the left-hand diagram shows, countries distribute along a relatively broad corridor around the regression line. We might label this the 'possibility corridor' with respect to technological progress. Hardly any society escapes this corridor. But within its borders there is room for human agency: apparently, the countries' choices decide whether they move along the floor or the ceiling of their technological possibilities.

Even if the CW-condition does by no means fully determine a country's technological progress, the clarity of this condition's impact is astounding given the fact that this is a very remote condition. Hence, there must be more proximate conditions over which the CW-condition exerts its effect. To figure out which condition this is, we probe into a mediation analysis to see which conditions absorb the technological impact of the CW-condition.

The Fertility Thesis

Table 3 correlates contemporary technological progress with the variety of potential mediators discussed in the data and methods section. Table 4 uses multivariate regressions to examine which of these potential mediators absorbs the technological impact of the CW-condition. Arguably, the potential mediator that absorbs most of the technological impact of the CW-condition explains why that impact exists.

Table 4 shows the variables' *partial* effects on technological progress, controlling for the CW-condition and disease security. These can be compared with the partial effects of the CW-condition and disease security further to the left. Comparing the partial effects, we see how much of the technological impact of the CW-condition and disease security is absorbed by each of the other variables.

In Table 3, all variables—except the COMT gene and the 'Big Five' personality traits—show a significant effect on technological progress in the expected direction. Among the variables measured for more than a hundred societies, the largest uncontrolled effect on technological progress derives from fertility control (r = .87), followed by the CW-condition (r = .84), state integrity (r = .78), civic entitlements (r = .73), disease security (r = .72), order and stability (r = .71), the democratic tradition (r = .51), 'white' settler mortality (r = -.44), 'state antiquity' (r = .36) and continuous peace (r = .36). Thus, only fertility control trumps the uncontrolled impact of the CW-condition on technological progress.

Controlling each of these variables' effects for the impact of the CW-condition and disease security, the effect sizes drop considerably in the case of most variables. For instance, the effect of state integrity drops from r = .78 to r_{partial} = .47 and that of civic entitlements and the democratic tradition, respectively, from an r of .73 and .51 to a partial r of .36 and .30. For all variables, except fertility control, the partial effect on technology is *much weaker* than that of the CW-condition, even though the CW-condition is temporally more remote to technological progress than each of these factors.

Two of the most prominent variables in the development literature show a largely diminished or completely insignificant effect, once we control for the CW-condition: Protestantism and the 'white' settler mortality. In fact, these variables' technological effects are largely explained by the CW-condition. Protestantism and the institutions of white settlers evolved *exclusively* in societies where the CW-condition is pronounced and this is the reason why these factors *seem* to have a strong effect on technological progress. Once we control for the CW-condition, the apparent effect largely diminishes or vanishes.

Table 3. Correlation of Technological Progress with the CW-Condition and Its Suspected Mediators

PREDICTORS of Technological Advancement:	CORRELATION with Technological Advancement 2005	*N* (societies)
• Fertility Control, 1980	.87 ***	141
• Cool Water, historic	.84 ***	142
• State Integrity, 2000	.78 ***	143
• Civic Entitlements, 2000	.73 ***	130
• Disease Security, historic	.72 ***	143
• Order and Stability, 2000	.71 ***	143
• Cultural Individualism, 1990s	.70 ***	84
• Consanguinity (logged)	- .70 ***	66
• 'Val158Met' COMT Gene	.52 ***	50
• Democratic Tradition, until 2000	.51 ***	151
• 'White' Settler Mortality, historic	- .44 ***	108
• Cultural Looseness, 1990s	.40 **	33
• Continuous Peace, post WWII	.36 ***	142
• State Antiquity Index	.36 ***	121
• % Muslims, 1990s	- .33 ***	142
• % Protestants, 1990s	.31 ***	140
• Time since Neolithic Revolution	.28 ***	138
• Long-allele 5-HTTLPR Gene	.27 *	46
• % Catholics, 1990s	.19 **	142
• Neuroticism (Big 5), 1990s	.18 †	44
• Extraversion (Big 5), 1990s	.16 †	44
• Openness (Big 5), 1990s	- .02 †	44

Note: Entries are correlation coefficients (*r*). Included are all societies with available data on the respective variables.

Significance levels (two-tailed): † $p \geq .100$, * $p < .100$, ** $p < .050$, *** $p < .005$.

For documentation of data and variables, see OA 14 and OA-Table 18 (p. 58 ff.).

Table 4. Simultaneous Effects of the CW-Condition and Its Suspected Mediators on Later Technological Progress

	Simultaneous EFFECTS on Technological Advancement 2005:			
Alternate PREDICTORS:	Cool Water Controlling for Disease Security and Alternate Predictor	Disease Security Controlling for Cool Water and Alternate Predictor	Alternate Predictor Controlling for Cool Water and Disease Security	*N*
• Fertility Control	.41 ***	.28 ***	.61 ***	131
• State Integrity	.52 ***	.33 ***	.47 ***	138
• Civic Entitlements	.63 ***	.29 ***	.36 ***	127
• Long-allele 5-HTTLPR Gene	.68 ***	.37 **	.57 ***	48
• Order and Stability	.59 ***	.29 ***	.38 ***	138
• Cultural Individualism	.66 ***	.17 †	.34 ***	81
• State Antiquity Index	.69 ***	.35 ***	.34 ***	123
• Cultural Looseness	.79 ***	.19†	.32 *	31
• Democratic Tradition	.62 ***	.39 ***	.30 ***	137
• Consanguinity (logged)	.66 ***	.32 **	- .25 *	67
• Neuroticism (Big 5)			.25 †	
• Openness (Big 5)	.51 ***	.36 **	.03 †	48
• Extraversion (Big 5)			.00 †	
• 'White' Settler Mortality	.70 ***	.32 ***	- .21 **	105
• Time since Neolithic Revolution	.70 ***	.35 ***	.22 **	132
• % Muslims			- .12 †	
• % Protestants	.67 ***	.36 ***	.02 †	136
• % Catholics			.05 †	
• Continuous Peace	.67 ***	.36 ***	.09 †	137
• 'Val158Met' COMT Gene	.72 ***	.17 †	.17 †	49

Note: Entries are partial correlation coefficients to indicate each predictor's partial explanatory power for technological advancement. Each line represents a separate regression of technological advancement simultaneously on the cool-water-condition, disease security, and one of the alternate predictors shown in the left-hand column. Example: in the first line, the coefficient .41 indicates the partial effect of the cool-water-condition, .28 that of disease security, and .61 the one of fertility control.

Tests for heteroskedasticity (White-test), influential cases (DFFITs), and multicollinearity (variance inflation factors) reveal no violation of OLS-assumptions in any regression series.

Significance levels (two-tailed): † $p \geq .100$, * $p < .100$, ** $p < .050$, *** $p < .005$.

Gray-shaded coefficients show the strongest effect for each regression. For detailed description of variables, data sources, and a display of data see OA 14 and OA-Table 18 (p. 58 ff.).

The *only* variable that seriously diminishes and clearly exceeds the technological impact of the CW-condition is fertility control: under simultaneous inclusion, the technological impact of the CW-condition amounts to a partial *r* of .41, while that of fertility control amounts to a partial *r* of .61. This suggests that the CW-condition favors technological progress mainly because it encourages fertility control.

This conclusion rests on the assumption that fertility control is not itself endogenous to technological progress. Some scholars might question this assumption. The reason is that technological progress produces prosperity and it has been argued that fertility declines because of rising prosperity (Becker 1981; Becker & Barro 1988). If this is correct, fertility control is a consequence of technological progress and not a cause of it. In this case, fertility control could not explain the impact of the CW-condition on technological progress.

The two-stage-least-squares regressions in Table 5 test this possibility, using per capita GDP from the same year as fertility control to measure prosperity. In the first stage, I instrument fertility control with the CW-condition, disease security, and per capita GDP. The results of this regression show that fertility control is much more strongly determined by the remote CW-condition than by per capita GDP. The three instruments explain 69 percent of the cross-national variance in fertility control. Of these 69 per cent, only 5 percent are accounted for by per capita GDP.[13] Because disease security is insignificant, the CW-condition accounts for most of the remaining 64 per cent of explained variance in fertility control. In version B of this first-stage regression, I instrument fertility control only with the CW-condition and disease control, leaving out per capita GDP. We explain almost the same amount of variance: 63 per cent. In the second stage, I use the two instrumented versions of fertility control—each one at a time—to predict technological progress in 2005. The version in which fertility control is instrumented without per capita GDP explains just 5 percentage points less variance in technological progress than the version in which fertility control is instrumented under the inclusion of GDP. In short, there is *very little* endogeneity of fertility control to prosperity.

As far as one can tell, the cross-national fertility differences found in 1980 are not only representative for this particular time. Instead, they partly reflect differences reaching farther back in time[14], even to pre-industrial times. As detailed in footnote 8, we find a similar pattern of fertility differences in 1800 as in later times--similar at least insofar as Japan and the West are at the forefront of low fertilities. In fact, in 1800 these are the only urban civilizations with low fertilities--as their exceptionally strong CW-condition suggests. Supporting this interpretation, Welzel (2013) uses anthropological data from 34 pre-industrial populations around the world, showing that the presence of the CW-condition explains a significant 38 per cent of the cross-cultural variation in 'female reproductive autonomy'—a precondition of fertility control (Boserup 1974; Blumberg 2004). All this suggests that the CW-condition indeed encourages lower fertilities.

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[13] The partial correlation coefficient of GDP/p.c. is .23, so the partial *r* squared is .05.

[14] From 1960 to 2000, the correlation between fertility and the CW-condition is consistently at the .75-level for a constant set of 155 countries.

Table 5. Two-Stage Least Squares Regression to Estimate Fertility Control's Degree of Endogeneity to GDP/p.c.

	STAGE 1(Fertility Control 1980 is DV)		STAGE 2 (Technological Progress 2005 is DV)	
PREDICTORS:	Version A	Version B	Version A	Version B
• Constant	.20 (5.42) ***	.14 (4.94) ***	- .12 (-3.28) ***	- .10 (-2.99) ***
• CW-Condtion, historic	.63 (6.10) ***	.67 (9.26) ***		
• Disease Security, historic	.13 (1.17) †	.32 (4.03) ***		
• GDP/p.c. (indexed), 1980	.25 (2.56) **			
• Predicted Fertility Control			1.11 (18.72) ***	1.07 (18.51) ***
Adjusted R^2	.69	.67	.81	.72
N (societies)	94	153	82	132

Note: Entries are unstandardized regression coefficients with their T-values in parentheses.

Tests for heteroskedasticity (White-test), influential cases (DFFITs), and multicollinearity (variance inflation factors) reveal no violation of OLS-assumptions.

In the first stage, water autonomy and disease security dating back to historic times as well as GDP/p.c. in 1980 (version B without the latter) are used as instruments to calculate predicted scores of fertility control in 1980. In the second stage, these predicted scores are used to predict technological progress in 2005.

Significance levels (two-tailed): † $p \geq .100$, * $p < .100$, ** $p < .050$, *** $p < .005$.

Note: Data documented in Appendix 10.

For how long can we trace back the technological impact of the CW-condition? I would presume not longer than to the point when the first civilization in a CW-area reached the mature stage of urbanity. For it needs vibrant markets to make investments into technological progress profitable. The only two Eurasian civilizations in areas with high CW-scores were Western Europe and Japan. Of these two, Western Europe did not reach urbanization levels known from India, the Middle East, China or Southern Europe before about 1500 CE (de Vries 1984) and Japan did not reach them before the beginning of the Tokugawa period in about 1600 CE (Bentley, Ziegler & Streets-Salter 2010).[15] Only since then should the technology impact of the CW-condition surface. And it should turn stronger over time because European settlement transplanted technological progress into all outer-Eurasian CW-areas where urban civilization did not emerge before European colonialism.

15 Comparing de Vries's (1984) data with those of Acemoglu, Johnson and Robinson (2001), one finds that in 1500 CE the Netherlands reach an urbanization rate of 15 per cent, overtaking Northern Africa (10%), India (9%), Mesoamerica (8%) and China (3%).

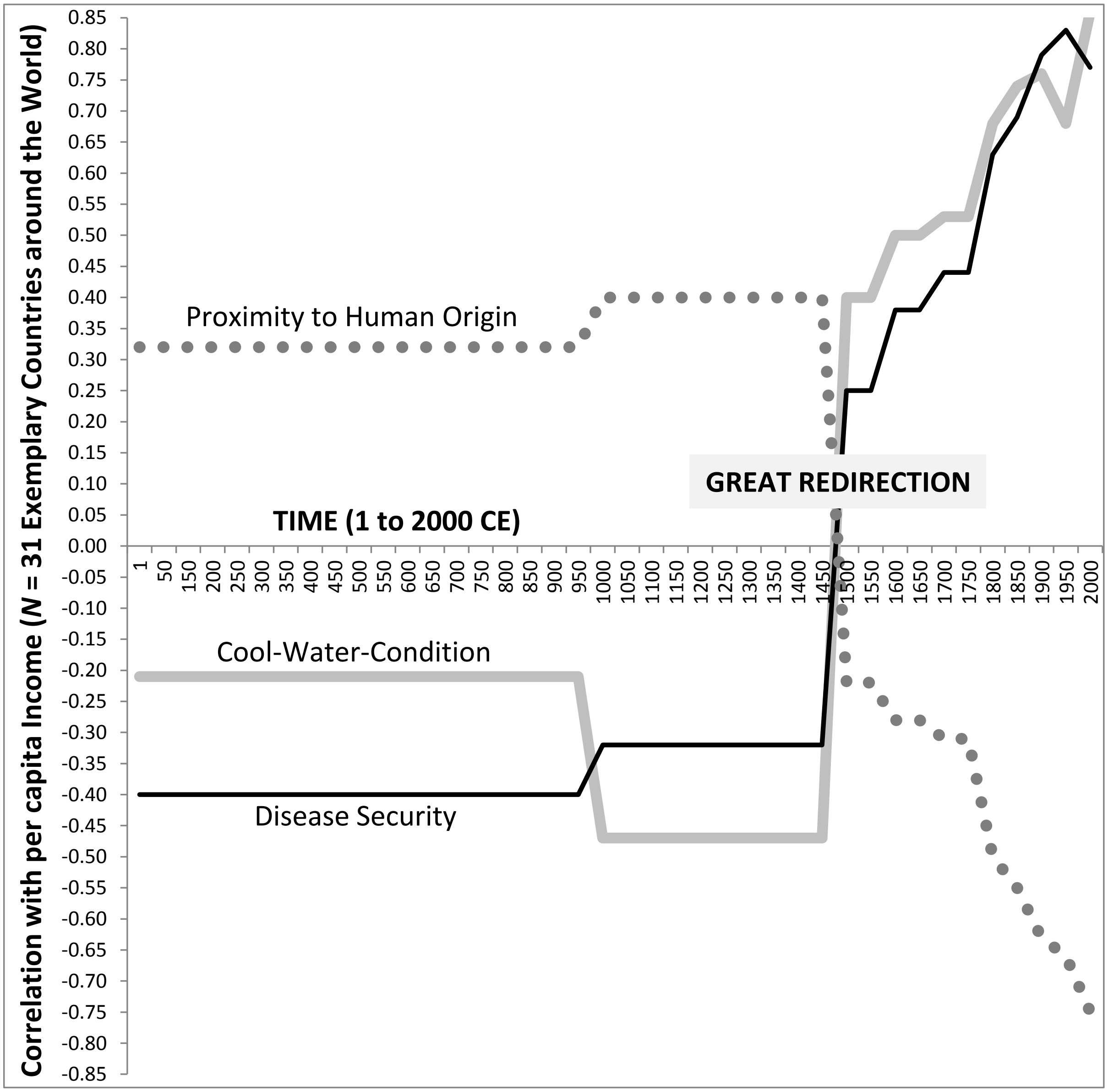


Figure 5. Inter-Regional Correlation of the CW-Condition, Disease Security, and Early Human Arrival with Income/p.c. over the Last 2000 Years
Note: Data documented in Appendix 15, see in particular Appendix-Table 19 (p. 65) and Appendix-Table 20 (p. 67 f.).

Figure 5 confirms this expectation with striking clarity. The diagram uses Maddison's (2007) historic estimates of the per capita incomes of exemplary countries from around the world. I interpret per capita income as a proxy for technological progress: the assumption is that societies with higher per capita incomes are richer because they have developed more productive technologies. Under this premise, Figure 5 illustrates powerfully that global history takes a sharp turn in about 1500 CE: the strong positive correlation between the CW-condition and development literally leaps out, reversing a slightly and insignificant *negative* correlation that goes all the way back to the year One.[16]

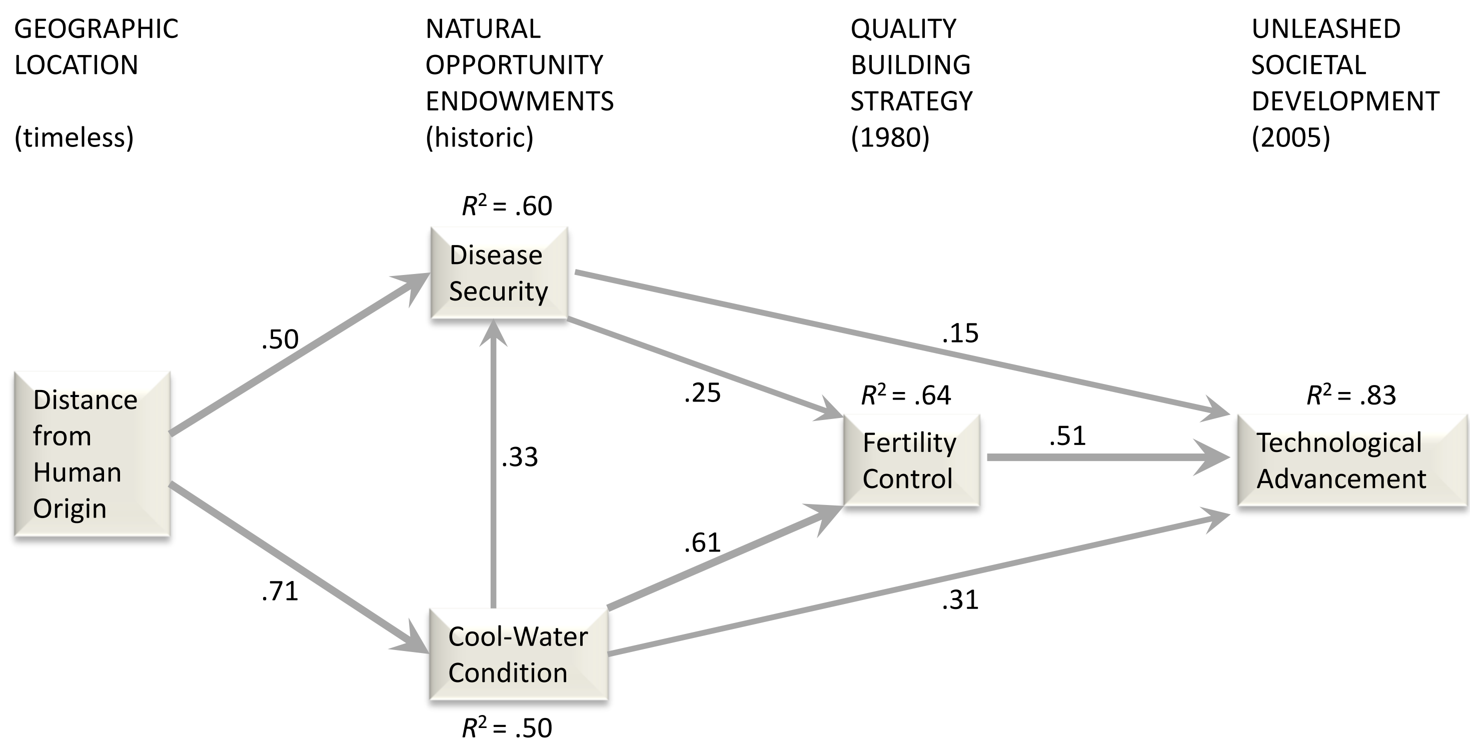
Figure 5 suggests an answer why the two CW-civilizations did not break through before 1500. This is obvious from the correlation of the countries' per capita incomes with their geographic proximity to the human origin. Proximity shows a strongly positive correlation with cross-country income differences until 1500. This reflects the fact that the old civilizations in the belt from the Mediterranean to India, which were ahead for a long time, were also closer to the human origin. Accordingly, they have been populated earlier by modern humans and also developed intensive agriculture and urban markets earlier than the remote and belated civilizations of Western Europe and Japan. Hence, until about 1500, people in the old and proximate civilizations had slightly but consistently higher incomes than people elsewhere.

But then, with the sudden rise of the two remote civilizations, the positive proximity-income correlation abruptly turns negative: the early civilizations now fall quickly behind. With the transplantation of modern civilization into the even more remote and later populated CW-areas overseas, this pattern became more pronounced.

Now, the pieces seem to fall in place. CW-areas are located in relatively large migratory distance from the human origin in East Africa. For this reason, these areas adopted intensive surplus agriculture late and reached the urban stage of civilization late as well. But ever since urban markets emerged, the existential autonomies that the CW-environment embodies bestow utilities on freedoms. These utilities encourage a low fertility preference and households begin to sacrifice demographic for economic productivity. This shortens the supply of cheap mass labor. Rising labor demands of growing cities must be met by labor-saving technology when the factor cost of labor is high. This fuels technological progress. The path diagram in Figure 6 fully supports this narrative with temporally ordered data from some 130 countries around the world.

Technological progress is the founding element of the human empowerment process from which emancipative values and civic entitlements follow. Therefore, providing an exogenous explanation of technological progress is to explain the initiation of the human empowerment process writ large.

16 Since Maddison provides no estimates for the time between 1000 and 1500, it is technically speaking possible that Western Europe's rise happened one, two, three or four hundred years before 1500. But considering the setback of the Black Death in 1348 and available trend figures for urbanization, this seems implausible. An earlier rise would also be at odds with the entire 'Rise of the West' literature, which consistently considers the epochal turn to begin around 1500 CE (Jones 1987; Hall 1989; Landes 1998; Pommeranz 2005; Goldstone 2009; Morris 2011).



Note: Entries are partial correlation coefficients, calculated with AMOS 19. Units of observation are national societies: *N* is 127, incl all societies with available data on each variable. Fertility Control in this model is *exogenous* to prosperity: it is the residuals in fertili control not predicted by per capita GDP in the same year. Goodness of fit indices: GFI .94, NFI .97, IFI .97, CFI .97. All effects are significant at the .001-level. To inspect the data matrix for the 127 societies included in this analysis, see Appendix 11

Figure 6. Path Diagram Illustrating the Causal Flow Suggested by the Initiation Thesis and the Fertility Thesis
Note: Variables are described in Appendix 1 and 9 to 13. Data matrix is displayed in Appendix-Table 15 (p. 49 ff.).

The Contagion Thesis

Fortunately, the human empowerment process is not doomed to remain limited to societies with Western-like CW-conditions. Although I have emphasized that entrapments in cycles of human oppression are self-sustaining, this is only true as long as oppressive societies remain shielded from exposure to emancipatory societies. This is where globalization comes in. The most important fact about globalization is that it perforates the stabilizing shield of oppressive societies. The global flow of information in particular gives ubiquitous visibility to the conditions under which large segments of the population in emancipatory societies live (Pierotti 2013). If emancipation wasn't a universal human desire, the visibility of emancipatory gains would leave oppressed people cold. Yet, people power movements around the world seem to indicate that oppressed people in many places begin to question their condition and to mobilize for change (Tilly & Wood 2009; Clark 2009; Carter 2012). If this is so, we should see that human empowerment dissociates from the CW-condition. At the same time, the degree to which societies around the world open themselves to globalization should fuel the dissociation of human empowerment from the CW-condition. The dissociation should first be visible in the source element of human empowerment: technological progress.

Even though per capita income is not everything, it is a proxy for technological progress. Hence, if the contagion thesis is correct, the CW-condition should show a diminishing impact on per capita income growth while progressing globalization explains this shrinkage in impact.

Many scholars argue that the globalization process picked up speed with the breakdown of Soviet communism (Dreher 2006). Thus, the period for which we have sufficient data divides up into a pre-globalization period and a globalization period: separating the growth periods 1970 to 1990 and 1990 to 2010. To illustrate this point, Figure 7 visualizes the results of two cross-country regressions in which the growth in per capita GDP from 1970 to 1990 and then from 1990 to 2010 is predicted by a country's CW-condition and its degree of globalization at the beginning of the period. The bars indicate the size of the partial effects of these two variables (using the partial *r*). The result is clear: even though the CW-condition and globalization show a positive growth effect in both regressions, they switch positions as concerns their predictive power. In the prediction of growth over the 1970-1990 period, the partial effect of the CW-condition points to .48 and that of globalization to .25 (N = 97); over the period 1990-2010, the partial effects are .19 for the CW-condition and .46 for globalization (N = 127).[17]

[17] Running the second regression over the same set of 97 countries as in the first one, the result remains the same.

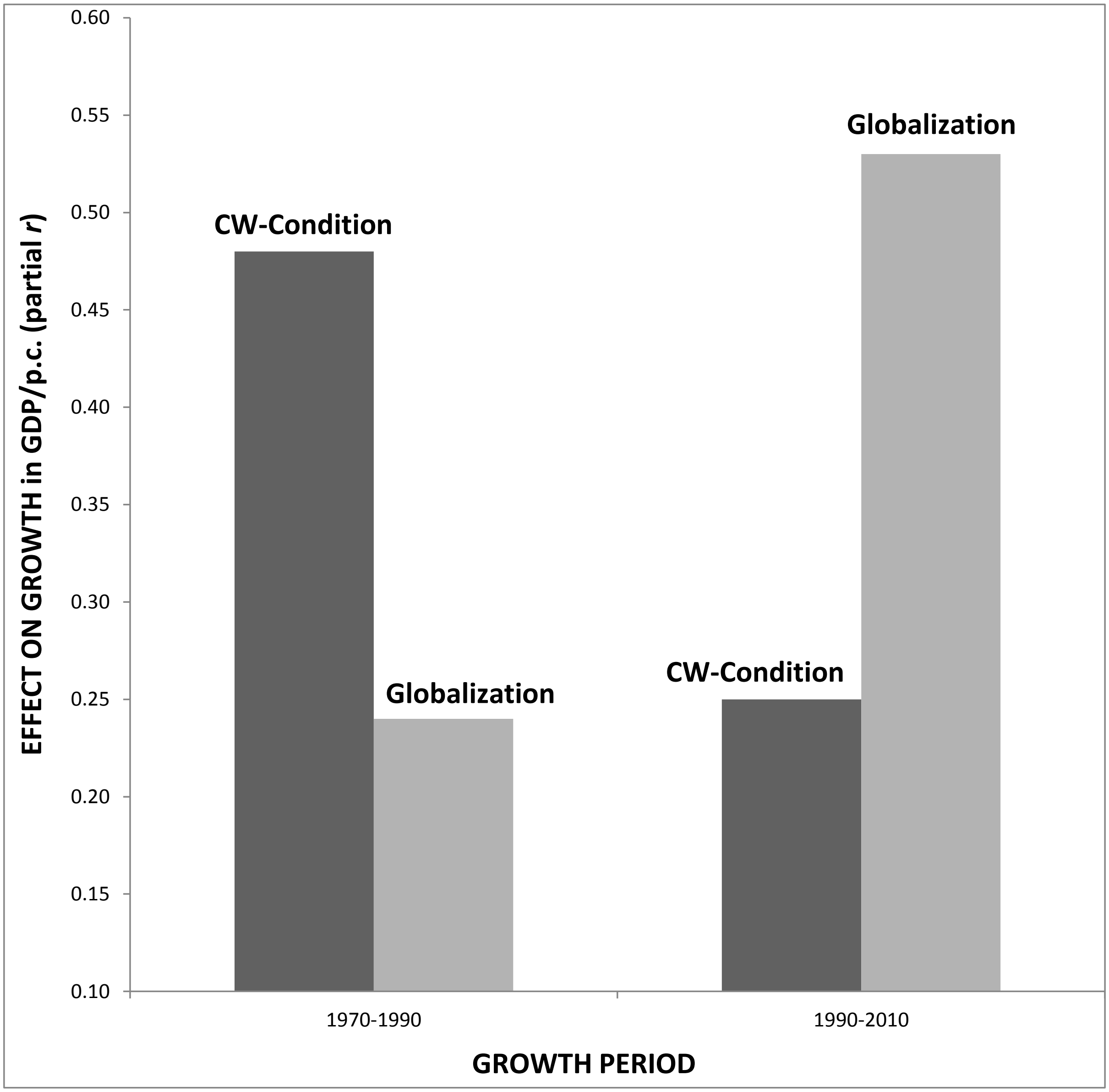


Figure 7. The Partial Growth Effects of the CW-Condition and Globalization over Two Phases

Note: Data documented in Appendix 15 and 16.

Figure 8 provides more detailed temporal evidence, showing a steeply decreasing impact of the CW-condition on ten-year growth figures, using moving averages from 1960 to 2010 (*N* = 156). The decrease in the determining power of the CW-condition is paralleled by an increase in the world's globalization. In fact, rising globalization explains 56 per cent of the declining impact of the CW-condition. At least, this is so when we take into account the phase shift that occurred with the entrance of Soviet successor states into the international arena. This phase shift temporarily re-enhanced the CW-condition's impact. Yet, before the phase shift and after the phase shift, it is evident that increasing globalization neatly coincides with a decreasing impact of the CW-condition. We can also model the temporary phase shift by a cubic function and we still explain 56 per cent of the decreasing impact of the CW-condition by rising globalization. This is shown in Figure 9.

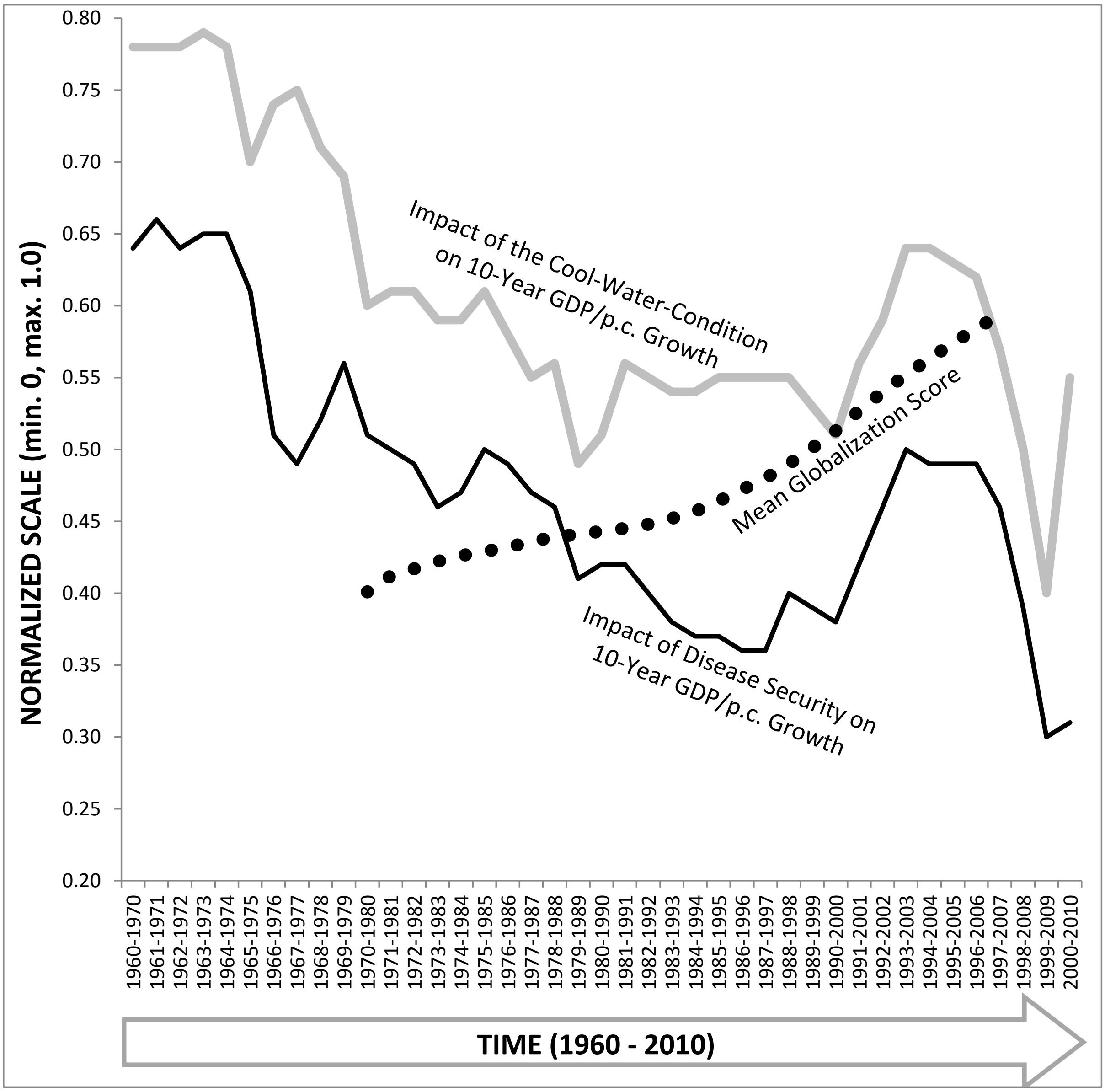
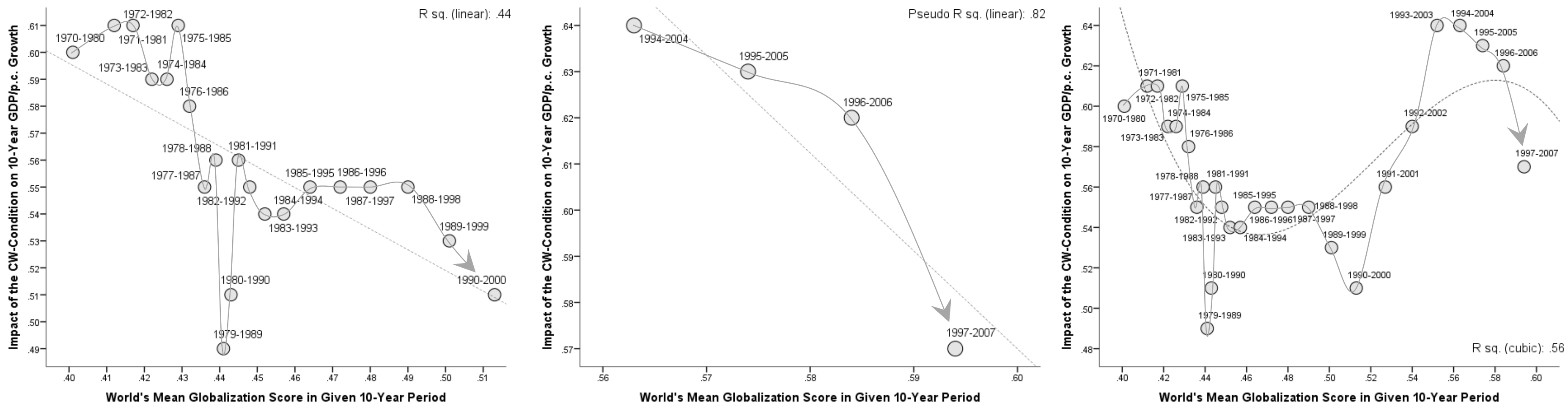


Figure 8. The Shrinking Growth Effect of Natural Conditions and the World's Increasing Globalization Score

Note: Variables are described in Appendix 16 and 17.



Before the Post-Communist Phase Shift

After the Post-Communist Phase Shift

Over the Post-Communist Phase Shift

Figure 9. The World's Increasing Globalization Scores and the CW-Condition's Shrinking Growth Effect in Three Phases
Note: Variables are described in Appendix 16 and 17.

CONCLUSION

This article tried to show that disparate insights into development fall in place when considered in the framework of an evolutionary theory of emancipation. The evidence available at the theory's level of generality confirms its propositions, although two caveats are due. To obtain evidence that allows one to test the sequence thesis, I had to estimate emancipative values for backward times. Similarly, to examine the initiation thesis I needed to interpolate historic income estimates for large sections of time. These estimations and interpolations involve assumptions that are not directly testable. And even though there are good reasons to believe that these assumptions are defensible, there remains a speculative element in these parts of emancipation theory. A way to reduce the speculation is to test the hypotheses in microscopic contexts: can, for instance, regional variation in water autonomy within nations explain differences in technological progress? In an article-length treatment, this question could not be addressed (but see Dell, Olken and Jones 2011 with supportive evidence for US-regions).

Other elements of emancipation theory stand on firm ground, however. A key regularity that is central to this theory indeed shows striking robustness: the value-utility link that ties emancipative values to action resources. Without a single exception, in each country covered by the World Values Surveys, people who control greater action resources emphasize emancipatory orientations more than others. And the resource-rich people hold more strongly to emancipatory orientations, the more numerous they are. Hence, if life improves on a mass level, a drive towards emancipatory gains emerges naturally from the grassroots of society. This value-utility link keeps human lives in touch with reality; it is, thus, a major force of social evolution.

Mass level emancipative values are an indicator of where on the utility ladder of freedoms a society is positioned. Guarantees for freedoms tend to be fixed at a level that fits a society's position on the utility ladder. Liberal institutions, thus, evolve from value-utility links at the grassroots of society; they are not an act of sheer voluntarism by elites.

What can we learn from these insights? In my eyes, the most important lesson is a change in perspective, away from the view that development is all about proper institutional choices. There is no question that institutions, in particular liberal institutions, are part of the story. But instead of being the source of development, they are more the consequence of it. Moreover, institutions are usually considered as the direct outcome of discrete historic choices by elites. This top-down perspective appears short-sighted to me. For it overlooks that elite choices are socially embedded, taking place under pressures that are fuelled by naturally evolving utilities and values from below. This calls for a bottom-up perspective that pays special attention to grassroots dynamics.

This can be a healthy change in perspective because it undermines the self-congratulatory tendency inherent in theories that attribute Western dominance to 'smart' institutional choices.

REFERENCES

Acemoglu, D., S. Johnson & J.A. Robinson (2001). "The Colonial Origins of Comparative Development." *The American Economic Review* 91: 1369–1401.

Acemoglu, D. & J.A. Robinson (2012). *Why Nations Fail*. London: Crown Publishers.

Alexander, A. & C. Welzel (2010). "Empowering Women: The Role of Emancipative Values." *European Sociological Review* 27: 364-384.

Alexander, A. & C. Welzel (2011). "Measuring Effective Democracy." *Comparative Politics* 43: 271-289.

Baldwin, R.E., P. Martin & G. Ottaviano (2001). "Global Income Divergence, Trade, and Industrialization." *Journal of Economic Growth* 6: 5–37.

Barro, R.J. (1997). *Determinants of Economic Growth*. Cambridge: MIT Press.

Becker, G.S. & R.J. Barro (1988). "A Reformulation of The Economic Theory of Fertility." *Quarterly Journal of Economics* 103: 1-25.

Bell, D. (1973). *The Coming of Post-Industrial Society*. New York: Basic Books.

Benhabib, J., A. Corvalán & M. Spiegel (2011). "Reestablishing The Income-Democracy Nexus." Cambridge, Mass: National Bureau of Economic Research.

Bentley, J.H., H.F. Ziegler & H.E. Streets-Salter (2010). *Traditions and Encounters* (Volume II). New York: McGraw-Hill.

Blumberg, R.L. (2004). "Extending Lenski's Schema to Hold up Both Halves of The Sky." *Sociological Theory* 22: 278-91.

Bockstette, V., A. Chanda & L. Putterman (2002). "States and Markets: The Advantage of An Early Start." *Journal of Economic Growth* 7: 347–369.

Breen, R. & J.H. Goldthorpe (2001). "Class, Mobility and Merit: The Experience of Two British Birth Cohorts." *European Sociological Review* 17: 81–101.

Brint, S. (1984). ""New-Class" and Cumulative Trend Explanations of The Liberal Political Attitudes of Professionals." *American Journal of Sociology* 90: 30–71.

Chiao, J. Y. & K.D. Blizinsky (2010). "Culture-Gene Coevolution of Individualism-Collectivism and The Serotonin Transporter Gene." *Proceedings of The Royal Society B: Biological Sciences* 277 (1681): 529–537.

Cingranelli, J. & D.L. Richards (2010). CIRI Dataset 2008 (online at: ciri.binghamton.edu/index.asp).

Clark, H. (2009). "Introduction." In H. Clark (ed.), *People Power: Unarmed Resistance and Global Solidarity*. London: Pluto Press, pp. 1-22.

Coenders, M., M. Lubbers & P. Scheepers (2008). "Support for Repatriation Policies of Migrants." *International Journal of Comparative Sociology* 49: 175–194.

Dahl, R.A. (1971). *Polyarchy*. New Haven, Conn: Yale Univ. Press.

Dalton, R., A. van Sickle & S. Weldon (2010). "The Individual–Institutional Nexus of Protest Behaviour." *British Journal of Political Science* 40: 51-73.

Dell, M., B.F. Jones & B.A. Olken (2012). "Temperature Shocks and Economic Growth." *American Economic Journal: Macroeconomics* 4: 66-95.

Deschenes, O. & M. Greenstone (2007). "The Economic Impacts of Climate Change" *American Economic Review* 97: 354-385.

Deutsch, F, & C. Welzel (2011). "Emancipative Values and Nonviolent Protest: The Importance of 'Ecological' Effects." *British Journal of Political Science* 42: 465-479.

Dreher, A. (2006). "Does Globalization Affect Growth?" Applied Economics 38: 1091–1110.

Drucker, P. (1993). *Post-Capitalist Society*. New York: Harper Collins.

Dumont, L. (1986). *Essays on Individualism*. Chicago Ill: University of Chicago Press.

Engerman, S. & K.L. Sokoloff (1997). "Factor Endowments, Institutions, and Differential Paths of Growth Among New World Economies." In S.H. Haber (ed.), *How Latin America Fell Behind*. Stanford: Stanford University Press, pp. 260-304.

Fernandez-Armesto, F. (2002). *Civilizations*. New York: Simon & Schuster.

Fincher, C.L., R. Thornhill, D.R. Murray & M. Schaller (2008). "Pathogen Prevalence Predicts Human Cross-Cultural Variability in Individualism/Collectivism." *Proceedings: Biological Sciences* 275 (1640): 1279–1285.

Firebaugh, G. (1999). "Empirics of World Income Inequality." *American Journal of Sociology* 104: 1597–1630.

Florida, R. (2002). *The Rise of the Creative Class*. New York: Basic Books.

Fromm, E. (2001 [1941]). *The Fear of Freedom* [German Original: Die Furcht der Freiheit]. London: Routledge.

Gallup, J.L. & J.D. Sachs (2000). „Agriculture, Climate, and Technology: Why Are The Tropics Falling Behind?" *American Journal of Agricultural Economics* 82: 731–737.

Gallup, J.L., A. Mellinger & J.D. Sachs (2010). Geography Datasets. (http://hdl.handle.net/1902.1/14429 UNF:5:SnYwMY387RxYcu3OxaSFgA), Murray Research Archive, V1-Version. (2010). Available online at http://hdl.handle.net/1902.1/14429.

Geary, D.C. (2007). "The Motivation to Control and the Evolution of General Intelligence." In S.W. Gangestad & J.A. Simpson (eds.), *The Evolution of Mind*. New York: Guilford Press, pp. 305-12.

Gelfand, M. et al. (2011). "Differences Between Tight and Loose Cultures." *Science* 27: 1100-1104.

Gerring, J., P. Bond, W.T. Barndt & C. Moreno (2005). "Democracy and Economic Growth." *World Politics* 57: 323-64.

Gibson, J.L. (2007). "Political Intolerance in the Context of Democratic Theory." In R.J. Dalton & H.D. Klingemann (Eds.): *Oxford Handbook of Political Behavior*. New York: Oxford University Press, pp. 323–341.

Gleditsch, K.S. et al. (2002). "Armed Conflict 1946–2001: A New Dataset." *Journal of Peace Research* 39: 615-37.

Goesling, B. (2001). "Changing Income Inequalities within and between Nations: New Evidence." *American Sociological Review* 66: 745–761.

Guinnane, T.W. (2008). "The Historical Fertility Transition and Theories of Long-Run Growth." *Journal of Economic Literature*: forthcoming.

Hajnal, J. (1982). "Two Kinds of Pre-Industrial Household Formation Systems." In R. Wall, J. Robin & P. Laslett (eds.), *Family Forms in Historic Europe*. Cambridge: Cambridge University Press, pp. 65-104.

Hall, J.A. (1995). "A Theory of The Rise of The West." *METU Studies in Development* 22: 231–241.

Hartman, M.S. (2004). *The Household and the Making of History*. Cambridge: Cambridge Univ. Press.

Hatemi, P.K. (2012). "The Political Psychology of Biology, Genetics and Behavior." *Political Psychology* (3): 307–418.

Higgins, T.E. (2005). "Value from Regulatory Fit." *American Psychological Society* 14: 209-13.

Hofstede, G.H. (1997). *Cultures and Organizations*. New York: McGraw-Hill.

Inglehart, R. (1977). *The Silent Revolution*. Princeton: Princeton University Press.

Inglehart, R. (2007). "Postmaterialist Values and the Shift from Survival to Self-Expression Values." In R.J. Dalton & H.D. Klingemann (Eds.): *The Oxford Handbook of Political Behavior*. New York: Oxford University Press, pp. 223–240.

Inglehart, R. & C. Welzel (2005). *Modernization, Cultural Change, and Democracy*. New York: Cambridge University Press.

Inkeles, A. (1969). "Participant Citizenship in Six Developing Countries." *American Political Science Review* 63: 1120–1141.

Inkeles, A. (1983). *Exploring Individual Modernity*. New York: Columbia University Press.

Kaufman, D., A. Kraay & M. Mastruzzi (2007). "Governance Matters VI: Aggregate and Individual Governance Indicators 1996–2006." *Policy Research Working Paper* 4280.

Krieckhaus, J. (2004). "The Regime Debate Revisted." *British Journal of Political Science* 34: 635–655.

Kuran, T. (2004). "Why The Middle East Is Economically Underdeveloped." *Journal of Economic Perspectives* 18: 71–90.

Kiyoshi, H. (1999). "Marriage Patterns and the Demographic System of Late Tokugawa Japan." *Japan Review* 11: 129-144.

Lal, D. (2001). *Unintended Consequences*. Boston: MIT Press.

Lamont, M. (1987). "Cultural Capital and the Liberal Political Attitudes of Professionals: Comment on Brint." *American Journal of Sociology* 92: 1501–1506.

Lipset, S.M. (1960). *Political Man*. Garden City, NY: Doubleday.

Loftus, J. (2001). "America's Liberalization in Attitudes toward Homosexuality." *American Sociological Review* 66: 762–782.

Maddison, A. (2007). *Contours of The World Economy 1-2030 AD*. New York: Oxford University Press.

Marshall, M.G. & K. Jaggers (2004). Polity IV Project (Data Users Manual). University of Maryland.

Maslow, A. (1988 [1954]). *Motivation and Personality*. New York: Harper & Row.

Masters, W.A. & K.D. Wiebe (2000). "Climate and Agricultural Productivity." Harvard University. Center for International Development.

Matthews, G., I.J. Deary & M.C. Whiteman (2003). *Personality Traits*. New York: Cambridge University Press.

Mellinger, A.D., J.D. Sachs & J.L. Gallup (2000). "Climate, Coastal Proximity, and Development." In G.L. Clark, M.P. Feldman & M.S. Gertler (eds.), *Oxford Handbook of Economic Geography*. New York: Oxford University Press, pp. 169-94.

Midlarsky, M.I. & E. Midlarsky (1997). "Environmental Influences on Democracy." In M.I. Midlarsky (ed.): *Inequality, Democracy, and Economic Development*. Cambridge: Cambridge University Press, pp. 1–10.

Morris, I. (2010). *Why the West Rules – For Now*. New York: W.W. Norton.

Murray, D.R. & M. Schaller (2010). "Historical Prevalence of Infectous Diseases within 230 Geopolitical Regions." *Journal of Cross-Cultural Psychology* 41: 99-108.

Norris, P. (2002). *Democratic Phoenix*. New York: Cambridge University Press.

Norris, P. (2005). *Radical Right*. Cambridge: Cambridge University Press

North, D.C., J.J. Wallis & B.R. Weingast (2009). *Violence and Social Orders*. New York: Cambridge University Press.

North, D.C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.

Nussbaum, M.C. (ed.) (1993). *The Quality of Life*. Oxford: Clarendon Press.

Oppenheimer, S. (2004). *Out of Eden*. London: Robinson.

Parker, P.M. (2000). *Physioeconomics*. Cambridge, MA: MIT Press.

Peel, M.C., B.L. Finlayson & T.A. McMahon (2007). "Updated World Map of The Köppen-Geiger Climate Classification." *Hydrology and Earth System Sciences* 4: 439–473.

Pinker, S. (2011). *The Better Angels of Our Nature*. London: Allen Lane.

Powelson, J.P. (1997). *Centuries of Economic Endeavour*. Ann Arbor: University of Michigan Press.

Putterman, L. (2008). "Agriculture, Diffusion, and Development." *Economica* 75: 729-48.

Rokeach, M. (1960). *The Open and the Closed Mind*. New York: Basic Books.

Romer, P. (1990). "Endogenous Technological Change." *Journal of Political Economy* 98: 71-102.

Schmitt, D.P. et al. (2012). "The Worldwide Distribution of Big-Five Personality Traits" (manuscript available online at: www.maryannefisher.com/wp-content/uploads/2011/01/Schmitt-JCCP.pdf).

Schwartz, S.H. (1999). "A Theory of Cultural Values and Some Implications for Work." *Applied Psychology* 48: 23–47.

Schwartz, S.H., G.V. Caprara & M. Vecchione (2010). "Basic Personal Values, Core Political Values, and Voting." *Political Psychology* 31: 421–452.

Sen, A. (1999). *Development as Freedom*. New York: Alfred Knopf.

Sidanius, J. & F. Pratto (1999). *Social Dominance*. Cambridge: Cambridge University Press.

Sidanius, J., S. Levin, J. Lin & F. Pratto (2000). "Social Dominance Orientation, Anti-Egalitarianism, and the Political Psychology of Gender." *European Journal of Social Psychology* 30: 41-67.

Solomon, S. (2011). *Water*. New York: McMillan.

Sullivan, J.L. & J.E. Transue (1999). "The Psychological Underpinnings of Democracy." *Annual Review of Psychology* 50: 625–650.

Teorell, J. (2010). *Determinants of Democratization*. Cambridge: Cambridge University Press.

Thornhill, R., C.L. Fincher & D. Aran (2009). "Parasites, Democratization, and The Liberalization of Values across Contemporary Countries." *Biological Reviews* 84: 113–131.

Tilly, C. & L.J. Wood (2009). *Social Movements, 1768-2008*. New York: Paradigm.

Toffler, A. (1990). *Power Shift*. New York: Bantham.

Triandis, H.C. (1995). *Individualism and Collectivism*. Boulder: Westview Press.

Vries, J. de, (1984). *European Urbanization 1500-1800*. London: Methuen & Co.

Weischet, W. (1993). *The Persisting Ecological Constraints of Tropical Agriculture*. Harlow: Longman Scientific & Technical.

Welzel, C. (2012). "The Myth of Asian Exceptionalism." *Journal of Cross-Cultural Psychology* 43: 1039-1054.

Welzel, C. (2013). *Freedom Rising: Human Empowerment and the Quest for Emancipation*. New York: Cambridge University Press.

Wichers, M. et al. (2008). "The Catechol-O-Methyl Transferase Val158Met Polymorphism and Experience of Reward in the Flow of Daily Life." *Neuropsychopharmacology* 33: 3030–36.

Wittfogel, K.A. (1957). *Oriental Despotism*. New Haven: Yale University Press.

Woodley, M. & J. Bell (2013). "Consanguinity as a Major Predictor of Levels of Democracy." *Journal of Cross-Cultural Psychology* 42: forthcoming.

APPENDIX

Evolution, Empowerment, and Emancipation:
How Societies Ascend the Utility Ladder of Freedoms

OVERVIEW

Appendix 1: Technological Progress Index in Figure 2

To measure technological progress, I use the World Bank's (2008) 'knowledge index (KI)', using the mean of the 1995 and 2005 measures of this index. The index indicates "a society's ability to generate, adopt and, diffuse knowledge. The KI is the simple average of the normalized scores of a society on the key variables in the three knowledge economy pillars: education, innovation, and ICT" (World Bank, 2008). The knowledge index combines data on education (using indicators like the tertiary enrolment ratio), on innovation (using indicators like the number of patents per 10,000 inhabitants), and on information technology (using indicators like the number of internet hosts per 1,000 inhabitants). I rescale the index into a range from 0 to 1.0, with higher values indicating a more advanced knowledge economy and thus farther advanced technology. A description of index construction and data are available online at: http://info.worldbank.org/etools/kam2/ KAM_page5.asp. Data are displayed in Appendix-Table 3 below.

Appendix 2: Emancipative Values Index in Figure 2

Emancipative values are a multi-point index from minimum 0 to maximum 1.0 based on twelve items from the World Values Surveys (World Values Survey Association 2010). The World Values Surveys have been conducted in five waves in more than 90 countries around the globe. Samples represent the adult residential population of a country (people at and above 18 years of age), with sample sizes averaging at 1,200 respondents per country. Interviews are based on a fully standardized master questionnaire, translated (with back-translation checks) and pre-tested in local languages. Details on fieldwork, questionnaire, sampling methods, and data are available online at: www.worldvaluessurvey.org.

The countries sampled by the World Values Surveys represent almost 90 per cent of the world population and include the countries with the largest populations and biggest economies in each world region. They cover the full range of variation in cultural traditions, levels of development, and political regimes that exists in the world.

On the conceptual level, emancipative values appreciate a life free from external domination, for which reason these values emphasize equal freedoms for everyone. Thus, emancipative values involve a double emphasis on freedom of choice and equality of opportunities. Screening the World Values Surveys for items that have been fielded repeatedly, I identified twelve items that represent an emphasis on freedom of choice or equality of opportunities or both. I average scores on the twelve items in a two-step procedure. In the first step, I average scores on the twelve items into four, domain-specific sub-indices, each consisting of three items. In the second step, I average the scores on the four domain-specific sub-indices into the overall index of emancipative values. Before averaging, all items are re-coded into the same polarity from low scores indicating weaker emancipative values, to high scores indicating stronger emancipative values. Also, all items are standardized into the same scale range, from minimum 0 to maximum 1.0. Data are displayed in Appendix-Table 3 below. What follows is a description of the two-step index construction procedure.

First Step: Creating Four *Sub-Indices* of Emancipative Values

(1) *Autonomy Index*: Four-point index from 0 to 1.
Question Wording:
"Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important?

	Mentioned	Not mentioned
Independence	1	2
Hard work	1	2
Feeling of responsibility	1	2
Imagination	1	2
Tolerance and respect for other people	1	2
Thrift, saving money and things	1	2
Determination, perseverance	1	2
Religious faith	1	2
Unselfishness	1	2
Obedience	1	2"

Mentioning of 'independence' and 'imagination' are both coded 1 and 0 otherwise. Mentioning of 'obedience' is coded 0 and 1 otherwise. Codes are averaged over the three items.

(2) *Equality Index*: Twelve-point index from 0 to 1.
Question Wording:
"For each of the following statements I read out, can you tell me how strongly you agree or disagree with each. Do you strongly agree, agree, disagree, or strongly disagree?
- A university education is more important for a boy than for a girl.
- On the whole, men make better political leaders than women do.

Do you agree, disagree or neither agree nor disagree with the following statements?

- When jobs are scarce, men should have more right to a job than women."

For the first two items, strongly is coded 0, agree is coded 0.25, disagree is coded 0.75 and strongly disagree is coded 1. For the third item, agree is coded 0, neither nor is coded 0.5 and disagree is coded 1. Codes are averaged over the three items.

(3) *Choice*: Thirty-point index from 0 to 1.
Question Wording:
"Please tell me for each of the following actions whether you think it can always be justified, never be justified, or something in between using this card (10-point scale):

Homosexuality	1	2	3	4	5	6	7	8	9	10
Abortion	1	2	3	4	5	6	7	8	9	10
Divorce	1	2	3	4	5	6	7	8	9	10
	Never justifiable								Always justifiable	

Codes are rescaled from minimum 0 to maximum 1 for each of the three items. Then the codes are averaged over the three items.

(4) *Voice Index*: Six-point index from minimum 0 to maximum 1.
Question Wording:
"People sometimes talk about what the aims of this country should be for the next ten years. On this card are listed some of the goals which different people would give top priority. Would you please say which one of these you, yourself, consider the most important? (…) And second most important?
There are twelve aims in total, among them:

- Giving people more say in important government decisions
- Protecting freedom of speech
- Seeing that people have more say about how things are done at their jobs and in their communities."

An emphasis on these items is coded: 1.0=first priority, 0.5=second priority, 0=not mentioned.

Second Step: Creating the *Overall Index* of Emancipative Values
The overall index of emancipative values is the average over the four sub-indices, yielding a multi-point scale from minimum 0 to maximum 1. This procedure is justified on the basis of the hierarchical factor analysis shown below.

The logic of this index construction is *not* to create a latent variable that reflects a one-dimensional construct: there is no claim to uni-dimensionality in the construct of emancipative values. Instead, the measurement follows the logic of 'formative index construction.' Emancipative values are measured that way because theoretically they are defined as such: survey responses are measured against this theoretically pre-defined standard, irrespective of how large the overlapping variance between constituent items is across respondents. Indeed, it is assumed that the combination of items has important consequences exactly because they are *not* fully equivalent: only under imperfect equivalence can the combination make a difference. In formative index construction, items are combined because (a) the combination represents a meaningful theoretical concept and because (b) the combination is supposed to be consequential for other phenomena, more consequential than each of its components is. In contrast to a 'reflective scale,' a 'formative index' assumes at least some degree of complementarity, instead of maximum equivalence, among constituent components.

For a formative index like the index of emancipative values, information about the dimensionality is simply descriptive but not the basis to justify the index construction. Appendix-Table 2 describes the dimensionality of the twelve items of the emancipative values index.

Appendix-Table 2. The Items of Emancipative Values and their Organization

SINGLE ITEMS	L1 Loa-dings	Level-1 CONSTRUCTS	L2 Loa-dings	Level-2 CONSTRUCT
Toleration of Abortion	.86			
Toleration of Divorce	.85	**Choice**	.77	
Toleration of Homosexuality	.80			
Women's Equality: Politics	.81			
Women's Equality: Education	.77	**Equality**	.73	
Women's Equality: Jobs	.72			**EMANCIPATIVE VALUES**
Priority More Say: Local	.77			
Priority More Say: National	.77	**Voice**	.68	
Freedom of Speech	.60			
Independence a Desired Quality	.73			
Obedience NOT a Desired Quality	.71	**Autonomy**	.60	
Imagination a Desired Quality	.50			
Kaiser-Meyer-Olkin Measure	.77		.70	
Cronbach's Alpha	.68		.65	
Explained Variance	60%		50%	
N	152,315 respondents from 95 societies			

Note: Results are from hierarchical factor analysis with oblique rotation ('direct oblimin') at the first level (delta: .20) and no rotation at level two. Factor analysis conducted with the country-pooled individual-level data of all 95 societies surveyed at least once by the WVS/EVS, using from each society the latest available survey (1995-2005). National surveys weighted to equal sample size. Number of extracted factors at both levels due to the Kaiser-criterion. Pairwise exclusion of missing values.

The hierarchical factor analysis in Appendix-Table 2 demonstrates that the twelve constituent items share overlapping variances that group them into the four domain-specific sub-indices. These in turn have overlapping variances that group them into emancipative values. But these overlaps are not so large that this suggests creating emancipative values as a latent variable. In other words, despite sizeable overlaps, variance components are still sufficiently complementary to follow a formative construction strategy. Conceptually speaking, this is suggested anyways, yet the empirical pattern would tell us it makes no difference if the overlapping variances are close to perfection.

Appendix-Table 3. Cross-cultural Factor Analysis of the Components of Emancipative Values and Self-expression Values

Emanc. Values Components:	Catholic West	Protestant West	English West	Ex-comm. West	Ex-comm. East	MENA Region	South Asia	East Asia	Latin America	Sub-saharan Africa	Global Mean (variance coefficient)
Choice	.75	.75	.75	.63	.65	.57	.62	.69	.67	.59	.67 (.09)
Equality	.66	.66	.68	.73	.60	.63	.27	.60	.57	.50	.59 (.22)
Autonomy	.60	.68	.64	.59	.57	.62	.52	.51	.55	.66	.59 (.10)
Voice	.63	.59	.53	.56	.45	.49	.68	.58	.60	.38	.55 (.16)
Mean	.66	.67	.65	.63	.57	.58	.52	.60	.60	.53	**.60 (.08)**
Dissimilarity[a)]	.06	.07	.06	.05	.04	.04	.14	.02	.03	.10	**.06**
Self-ex. Values Components:	Catholic West	Protestant West	English West	Ex-comm. West	Ex-comm. East	MENA Region	South Asia	East Asia	Latin America	Sub-saharan Africa	Global Mean (variance coefficient)
Tolerance	.67	.73	.68	.62	.53	.59	.65	.65	.64	.55	.63 (.10)
Postmaterialism	.69	.65	.62	.60	.63	.62	.71	.65	.67	.21	.60 (.23)
Petitioning	.64	.60	.63	.59	.48	.61	.32	.60	.52	.64	.56 (.18)
Trust	.41	.53	.42	.41	.36	- .26	- .27	.17	.36	.50	.26 (1.11)
Happiness	.18	.16	.06	.39	.32	- .19	.23	.16	.05	.39	.18 (1.00)
Mean	.52	.53	.48	.52	.46	.27	.33	.45	.45	.46	**.45 (.18)**
Dissimilarity[a)]	.07	.10	.08	.08	.09	.20	.19	.04	.07	.20	**.12**
N	37,047	31,931	27,388	37,589	42,193	33,400	23,093	21,630	41,675	28,733	**327,829**

Note: Figures based on explorative factor analysis with the full-blown, time-and-country-pooled individual-level dataset of WVS rounds one to five (respondents distribute across 95 countries in ten culture zones). Factor analysis conducted separately for respondents in the ten culture zones of the Inglehart/Welzel (2005) cultural map. National samples weighed to equal impact.

[a)] Duncan Index of Dissimilarity for deviation of culture-zone specific loadings from the global mean loadings.

For the factor analyses, all samples are weighted to equal size (N = 1,200), without changing the average sample size. National samples are grouped into culture zones as follows. *Catholic West*: Andorra, Austria, Belgium, (Cyprus), France, (Greece), Ireland, (Israel), Italy, Luxembourg, Malta, Portugal, Spain; *Protestant West*: Denmark, Finland, Germany (West), Iceland, Netherlands, Norway, Sweden, Switzerland; *English West*: Australia, Canada, New Zealand, UK, USA; *Ex-communist West*: Croatia, Czechia, Estonia, Germany (East), Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia; *Ex-communist East*: Albania, Armenia, Azerbaijan, Belarus, Bosnia, Bulgaria, Georgia, Kyrgyzstan, Macedonia, Moldova, Romania, Russia, Serbia, Ukraine; *MENA Region*: Algeria, Egypt, Iran, Iraq, Jordan, Morocco, Saudi Arabia, Turkey; *South Asia*: Bangladesh, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Thailand; *East Asia*: China, Hong Kong, Japan, South Korea, Taiwan, Vietnam; *Latin America*: Argentina, Brazil, Chile, Colombia, Dominican Republic, El Salvador, Guatemala, Mexico, Peru, Venezuela, Trinidad and Tobago, Uruguay; *Sub-saharan Africa*: Burkina Faso, Ghana, Mali, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Zambia, Zimbabwe.

As the separate factor analysis for respondents from the ten different global culture zones in Appendix-Table 3 shows, the overlapping variances among the four sub-indices of emancipative values are largely similar across culture zones. As the analyses also shows, this cannot be said of Inglehart and Welzel's (2005) measure of self-expression values—the conceptual predecessor of emancipative values. With self-expression values, especially the trust and happiness components show pronounced cross-cultural differences—yet these are not part of the measure of emancipative values.

Using WVS data, Appendix-Table 4 correlates the emancipative values index as well as its four components and its predecessor, self-expression values, with theoretically expected correlates at the individual level and the societal level. At the individual level, two of the specified correlates—formal education and informational connectedness—are expected antecedents that give rise to emancipative values. Two other correlates—social movement activity and understanding democracy—are expected consequences that follow from emancipative values.

Formal education measures the highest school level a respondent attained, in ascending order on a nine-point scale, from no formal education to university degrees. The relevant question in the 2005 WVS questionnaire is V238. Informational connectedness measures the variety of sources a respondent uses to obtain information, in ascending order on a nine-point scale from no source to eight sources. The respective questions in the WVS 2005 questionnaire are V223 to V230. Social movement activity measures the variety of social movement activities a respondent has been or considers to be involved in, on a seven-point scale in ascending order from no participation or intention of participation in any social movement activity, including petitions, peaceful demonstrations, and consumer boycotts. Despite only three types of activities asked for, the scale is that fine-grained because intention to participate is coded as a state in between rejection to participate and actual participation. The reliability and validity of this variable is shown in Deutsch and Welzel (2012). The respective variables are V96 to V99 in the 2005 WVS questionnaire. Understanding democracy measures how strongly a respondent's notion of democracy coincides with democracy's liberal definition, on a multi-point scale in ascending order. The information is taken from a battery asking respondents on a 1-to-10 scale how strongly they support each of ten stated meanings of democracy. Four of these meanings denote a liberal or procedural definition of democracy: free elections (V154), civil rights (V157), legal equality (V161), and referenda votes (V160). I average the respondents' support ratings for these four meanings and subtract from this their average support rating of four non-liberal meanings of democracy: military political intervention (V156), religious political authority (V153), harsh crime punishment (V159) and economic growth (V158). The resulting index has been analysed and validated by Welzel (2010).

To make sure that the same validity conclusions hold over the Western/non-Western divide, the individual-level data in Appendix-Table 4 are analyzed separately for Western and non-Western samples. At the societal level, technological progress is an expected antecedent and civic entitlements an expected consequence of emancipative values. To summarize them, I construct a factor combination of technology and entitlements. This is the third correlate at the societal level.[18]

To justify the summary of components into the emancipative values index, we require the encompassing index to associate with the correlates at least as strong as the strongest component does, in any instance. For most cases, the encompassing index should actually associate more closely with the respective correlates than its strongest component.

[18] I use the indicators of technological progress and civic entitlements described in Appendix 1 and Appendix 3.

Appendix-Table 4 shows a somewhat more pronounced correlation pattern for the Western than for the non-Western samples. Furthermore, correlations at the societal level are, as usual[19], much stronger than at the individual level. Otherwise, the same conclusions apply to all three panels of the table.

[19] The fact that aggregate-level attitudes show stronger correlations than their individual-level measures is not the result of 'aggregation bias.' On the contrary, aggregation eliminates random measurement error at the individual level and unmasks, for this reason, a correlation's true strength (on the widely misconceived problem of the 'ecological fallacy,' see Inglehart & Welzel 2005: 231-244).

Appendix-Table 4. Validity Testing Emancipative Values and Self-Expression Values

NON-Western Surveys:	EV-INDEX	AUTONOMY	EQUALITY	CHOICE	VOICE	Self-ex. Values	*N*
Formal Education	.28	.17	.17	.16	.13	.17	113,310
Informational Connectedness	.25	.18	.15	.14	.11	.21	44,357
Social Movement Activity	.18	.09	.08	.14	.12	NA[a)]	100,891
Understanding Democracy	.25	.06	.25	.19	.08	.11	40,819
WESTERN Surveys:	**EV-INDEX**	**AUTONOMY**	**EQUALITY**	**CHOICE**	**VOICE**	**Self-ex. Values**	***N***
Formal Education	.31	.24	.18	.24	.15	.29	51,212
Informational Connectedness	.30	.23	.20	.22	.14	.34	25,680
Social Movement Activity	.38	.23	.24	.30	.24	NA[a)]	52,326
Understanding Democracy	.37	.24	.26	.32	.15	.30	22,911
SOCIETAL Level:	**EV-INDEX**	**AUTONOMY**	**EQUALITY**	**CHOICE**	**VOICE**	**Self-ex. Values**	***N***
Technological Progress	.79	.61	.66	.75	.54	.69	93
Civic Entitlements	.80	.48	.67	.65	.60	.72	86
Technology & Entitlements	.84	.58	.72	.76	.59	.73	86

Note: Entries are Pearson correlation coefficients (*r*). Correlation analysis in the top two panels conducted with the country-pooled individual-level data of all societies surveyed at least once by the WVS/EVS, using the most recent survey from each society (ca. 1995-2005). Number of included societies in the top two panels is 95 for formal education and social movement activity and 50 for informational connectedness and understanding democracy (the latter two variables are only available from round five of the WVS). National samples in the top two panels are weighed to equal sample size. In the lower panel, societal averages of the values measures are used from the latest available survey and correlated with technological advancement, democratic achievement, and the factor combination of the two (technology & entitlements), measured over the period 1995-2005. As Western I categorize samples from societies grouped into one of the four Western culture zones in the footer of Appendix-Table 3. Samples from all other societies are classified as non-Western. All correlations significant at the .001-level (two-tailed). Gray-marked coefficients indicate strongest association with a given correlate of emancipative values.

a) Not applicable: correlation would be semi-tautological because self-expression values include a component measure of social movement activity, namely signing petitions.

All correlations in Appendix-Table 4 are positive and statistically significant. If we had to rely on a single component of emancipative values, the 'choice index' would be our best pick. Among the four components, this one usually shows the strongest association with the expected antecedents and consequences of emancipative values, followed by the 'equality index.' Nevertheless, in every instance but one, the encompassing index of emancipative values associates stronger with its expected antecedents and consequences than each of its components. In fact, there is not a single instance in which the encompassing index of emancipative values does not associate at least as strong as its strongest component. In every instance, the index of emancipative values associates more closely with its expected antecedents and consequences than its predecessor, Inglehart and Welzel's (2005) measure of self-expression values.

There are other value measures that scholars use to pinpoint the most salient cultural differences between societies. For instance, Hofstede (2001 [1980]), Suh, Diener, Oishi and Triandis (1998) and Gelfand, Bhawuk, Nishii and Bechthold (2004) use measures of 'collectivism-vs.-individualism' to describe cultural differences: collectivistic cultures place the authority of the group over the rights of the individual; individualistic cultures do the opposite. Another measure of collectivism-vs.-individualism, labelled 'embeddedness-vs.-autonomy,' is provided by Schwartz (1992; 2004; 2007): embeddedness describes a culture in which individuals emphasize their belongingness to closely knit in-groups; autonomy describes cultures in which they emphasize their independence from such groups. In addition, Gelfand et al. (2011) describe cultural differences in terms of 'tightness-vs.-looseness': tight cultures show low tolerance of deviant behavior; loose cultures do the opposite.

Conceptually speaking, one would expect that collectivism overlaps with embeddedness and tightness. By the same token, individualism should overlap with autonomy and looseness (Triandis 1995). Also, there is an obvious connection between these culture measures and societal development. As Welzel (2013) shows, collectivism, embeddedness, and tightness associate consistently with low levels of development, as indicated by more than a dozen measures of a society's life quality, including--among other things—income, education, longevity, gender equality, rule of law, peace, security and democracy. Vice versa, individualism, autonomy, and looseness associate consistently with high levels of development.

Given that these alternative measures are so clearly linked with development, the obvious question is whether they provide a better indication of human empowerment's cultural domain than emancipative values. Welzel examines this possibility, correlating emancipative values with the same large set of indicators of societal development, including technological progress and civic entitlements. Not surprisingly, Welzel finds that emancipative values correlate with technological progress and civic entitlements, and with all other indicators of development, in the same way as the alternative measures of culture do. The correlations always point in the same direction and are of roughly comparable magnitude, except for 'tightness-vs.-looseness' whose associations are consistently weaker. The similarity of the correlation pattern between emancipative values and individualism as well as autonomy is reassuring: it documents that emancipative values capture the same societal differences as other measures of culture. In fact, emancipative values capture these differences better in fourteen out of fifteen indicators of development: in all these instances, emancipative values correlate more strongly with development than the alternative measures of culture. From that point of view, emancipative values are the preferable measure of the cultural domain of human empowerment.

This is true for a couple of additional reasons. First, emancipative values are available for ninety-five societies worldwide; the other measures exist for a considerably smaller number and variety of societies. Second, emancipative values are taken from random national samples that are representative for entire societies; the other cultural measures are taken from convenient samples of specific sub-populations, such as students. An exception is the 'embeddedness-vs.-autonomy' measures from the European Social Survey and the WVS. But here the number of measures is limited to fifty societies. Third, only emancipative values are available in considerable time series, so among the existing cultural measures only this one is suited to trace value change.[20] For all these reasons, we can safely conclude that emancipative values are a valid and preferable measure of the cultural differences linked with human empowerment and other aspects of development.

One more thing needs to be emphasized. To obtain country-level measures of emancipative values, I simply calculate the sample average of each respondent's score on the emancipative values index. The resulting mean national scores are no artificial creation. They really represent social facts. This is not only obvious from the strong and manifold links of these scores to other, very manifest social phenomena, from life expectancy to prosperity to democracy and peace. It is also evident in the fact that individual respondents cluster strongly around the sample mean of their country: in all national samples, individuals distribute over the index of emancipative values in a bell-shaped, single-peaked curve that centers on the mean. Thus, national mean scores in emancipative values really indicate a society's cultural gravity point in these values. Accordingly, the national clustering accounts for roughly 30 per cent of the total individual-level variance in emancipative values, pointing to a pronounced intra-class correlation of .55.

[20] I searched the literature for other cross-national measures of culture that could show a stronger link than emancipative values with the capability and guarantee domains of human empowerment. I found indicators of the demographic prevalence of the so called 'Big Five' personality attributes as well as the prevalence of 'social dominance orientations.' Apart from the fact that these indicators are only available for much smaller sets of societies, their link with human empowerment and societal development does not come close to emancipative values.

Appendix 3: Civic Entitlements Index in Figure 2

Civic entitlements are measured in two steps. In the first step, I invert the two 1-to-7 scales for civil liberties and political rights by Freedom House (2012) (so that higher scores mean more freedom). Then I add the two scores and normalize the sum into a scale range from minimum 0 (no freedoms) to 1.0 (full amount of freedoms). In the second step, the freedom scores are weighted down to the extent that they fail to tap human rights violations. The latter data are taken for the same years from the Cingranelli and Richards (CIRI) Human Rights Project (2010). I use the indices for non-repression of ‘physical integrity rights’ (an eight-point scale) and ‘empowerment rights’ (a ten-point scale), normalize them into a range from minimum 0 (maximum repression) to maximum 1 (minimal repression) and average the two scores. These non-repression scores are then used as a weight for the freedom scores, using multiplication. Thus, a society that has a high freedom score of, say, 0.80 but a lower non-repression score of, say, 0.60, obtains a final score of (0.60 * 0.80 =) 0.48 in civic entitlements. The emphasis of this measurement procedure is on civic entitlements that are truly respected in practice. Since emancipative values in Figure 2 cover the period from 1995 to 2005, I average each country’s yearly civic entitlements scores over these years. The index is validated in comparison with six other, most widely used measures of democracy by Welzel (2013). Data are displayed in Appendix-Table 5 below.

Appendix-Table 5. Data Table (covered period is 1995-2005)

COUNTRY:	Technological Progress	Emancipative Values	Civic Entitlements
Albania	0.36	0.35	0.40
Algeria	0.34	0.29	0.08
Andorra	0.90	0.68	1.00
Argentina	0.66	0.49	0.55
Armenia	0.54	0.34	0.22
Australia	0.92	0.57	0.91
Austria	0.89	0.56	0.81
Azerb.	0.46	0.34	0.11
Banglad.	0.16	0.36	0.27
Belarus	0.62	0.38	0.07
Belgium	0.89	0.48	0.92
Bosnia	0.43	0.39	0.15
Brazil	0.56	0.40	0.43
Bulgaria	0.69	0.43	0.47
Burkina F.	0.12	0.30	0.32
Canada	0.93	0.59	0.95
Chile	0.64	0.44	0.65
China	0.41	0.37	0.01
Colombia	0.50	0.39	0.20
Croatia	0.72	0.50	0.50
Cyprus	0.73	0.44	0.79
Czech R.	0.76	0.50	0.84
Denmark	0.95	0.62	0.99
Domin. R.	0.37	0.46	0.50
Egypt	0.43	0.26	0.06
El Salv.	0.38	0.36	0.59
Estonia	0.80	0.42	0.84
Ethiopia	0.12	0.47	0.14
Finland	0.95	0.58	0.99
France	0.89	0.53	0.86
Germ. (E.)	0.90	0.57	0.86
Georgia	0.55	0.33	0.28
Germany	0.90	0.60	0.86
Ghana	0.20	0.29	0.51
Greece	0.76	0.53	0.63
Guatemala	0.28	0.41	0.36
Hungary	0.77	0.40	0.86
Iceland	0.89	0.56	1.00
India	0.30	0.33	0.28
Indonesia	0.32	0.33	0.08
Iran	0.43	0.33	0.01
Iraq		0.24	0.01
Ireland	0.89	0.44	0.93
Israel	0.81	0.51	0.49
Italy	0.82	0.49	0.84
Japan	0.88	0.53	0.86
Jordan	0.52	0.23	0.16
S. Korea	0.83	0.42	0.60

to be continued …

COUNTRY:	Technological Progress	Emancipative Values	Civic Entitlements
Kyrgyzstan	0.44	0.38	0.21
Latvia	0.69	0.42	0.72
Lithuania	0.69	0.43	0.84
Lux.	0.84	0.52	1.00
Maced.	0.54	0.41	0.50
Malaysia	0.59	0.39	0.19
Mexico	0.55	0.43	0.33
Moldova	0.51	0.38	0.41
Morocco	0.34	0.30	0.12
NL	0.94	0.60	0.99
NZ	0.91	0.57	0.98
Nigeria	0.23	0.26	0.08
Norway	0.94	0.68	0.99
Pakistan	0.24	0.25	0.06
Peru	0.49	0.43	0.33
Philippines	0.44	0.37	0.38
Poland	0.72	0.40	0.78
Portugal	0.75	0.41	0.91
Romania	0.58	0.40	0.51
Russia	0.67	0.37	0.13
S. Arabia	0.49	0.33	0.00
Singapore	0.80	0.40	0.24
Slovakia	0.72	0.42	0.75
Slovenia	0.81	0.54	0.87
Spain	0.82	0.52	0.83
Sweden	0.96	0.70	0.96
Switzerland	0.92	0.60	0.95
Taiwan	0.86	0.37	0.72
Tanzania	0.17	0.36	0.23
Thailand	0.55	0.37	0.45
Trinidad-T.	0.56	0.40	0.74
Turkey	0.49	0.35	0.17
Uganda	0.17	0.30	0.14
Ukraine	0.65	0.37	0.30
U.K.	0.92	0.54	0.82
U.S.A.	0.93	0.53	0.83
Uruguay	0.65	0.51	0.80
Venezuela	0.56	0.41	0.32
Vietnam	0.32	0.35	0.01
Zambia	0.23	0.40	0.28
Zimbabwe	0.34	0.30	0.11
MEAN	0.62	0.43	0.52
SD	0.25	0.11	0.33
MINIMUM	0.12 (Burkina Faso)	0.23 (Jordan)	0.00 (Saudi Arabia)
MAXIMUM	0.96 (Sweden)	0.70 (Sweden)	1.00 (Iceland)

Appendix 4: Proxy for Technological Progress in Table 1

Because the technological progress measure described in Appendix 1 does not go farther back in time than 1995, I rely on a proxy using data that Vanhanen (2003) had compiled to cover various decades back in time. Based on evidence that technological progress depends on and strongly correlates with the size of the literate urban workforce (de Vries 1984; Bairoch 1995; Acemoglu, Johnson & Robinson 2001; Maddison 2007), I weight a society's urbanization rate by its literacy rate using multiplication, after having standardized both variables into a range from minimum 0 to maximum 1.0. Thus, if the urbanization rate is 0.60 (60%) and the literacy rate is 0.50 (50%), the final score for the proxy of technological progress is (0.50 * 0.60 =) 0.30.

That this measure is a reasonable proxy for technical progress is evident from the fact that the proxy measure for 2000 correlates with my measure of technological progress described in Appendix 1 at $r = 0.91$ ($N = 180$; $p < 0.001$, two-tailed).

Data for this proxy of technological progress are available from 1850 onward in decade-wise measures, for most nationally independent societies in each decade. For the longitudinal analysis in Table 1 of the article, I use the decade measures for 1940-50, 1950-60, 1960-70, 1970-80, 1980-90, 1990-2000. I am not going farther back in time than the decade 1940-50 because this is the farthest point back in time for which reasonable estimates of a society's emancipative values can be calculated (see Appendix 5 below). Since emancipative values are one of the key three variables in Table 1, this restricts the possible temporal scope.

Appendix 5: Proxy for Civic Entitlements in Table 1

As a proxy for institutional freedom, we use the index of democratization by Vanhanen (2003), standardized into a 0-to-1.0 scale format (0 indicating no democracy, 1.0 indicating maximum democracy). The index is based on Dahl's (1973) seminal definition of democracy. Dahl defines democracy as the interaction between (a) political inclusion/participation and (b) political competition/pluralism. Political inclusion/participation is measured as the turnout in national parliamentary elections (calculated for the adult residential population); political competition/pluralism is the seat share not captured by the largest party in parliament. After standardization, these two indices are multiplied to yield the overall index of democratization. Note that this index has the intended property that, when the participation is 100% because all voters vote while pluralism is zero because all votes go to one party (a situation closely approximated in societies of the former Soviet bloc), the index of democratization yields a score of 0. The multiplicative combination treats the two components of participation and pluralism as necessary-yet-insufficient conditions of democracy—as it should be due to the theoretical notion of democracy.

Arguably, a high degree of both participation and pluralism requires a strong institutionalization of civil and political freedom. Hence, the index of democratization is a reasonable proxy for civic entitlements for times for which a more direct measure of the latter is not available. Empirically, this is obvious from the fact that my measure of civic entitlements described in Appendix 3 correlates with Vanhanen's index of democratization in 2000 at r = 0.88 (N = 170; $p < 0.001$, two-tailed).

Data for this proxy of civic entitlements are available from 1850 onward in decade-wise measures. For the longitudinal analysis in Table 1 of the article, I use the decade measures for 1940-50, 1950-60, 1960-70, 1970-80, 1980-90, 1990-2000. I am not going farther back in time than the decade 1940-50 because this is the farthest point for which reasonable estimates of a society's emancipative values can be calculated (see Appendix 6 below). Since emancipative values are one of the key variables in Table 1, this restricts the temporal scope of the analyses.

Another widely used indicator of democracy whose temporal coverage goes as far back as Vanhanen's index of democratization is the 'democracy-autocracy index' from the Polity IV Project (data and description available at: www.systemicpeace. org/polity/polity4.htm). Using this index instead of that by Vanhanen as a proxy for civic entitlements in the analyses of Table 1, we obtain weaker results: civic entitlements are significantly but less strongly determined by emancipative values and technological progress and continue to have no effect of their own on either emancipative values or technological progress (these results are available upon request from the authors). From the viewpoint of nomological validity, this finding validates the democratization index by Vanhanen as a better measure of civic entitltements than the Polity IV autocracy-democracy index. This is not surprising if one takes into account that the Vanhanen index is entirely based on official statistical data while the Polity index is the result of subjective expert judgments (see Munck & Verkuilen 2002).

Appendix 6: Estimates of Emancipative Values in Table 1

Data for emancipative values are unavailable for any society before 1981, and even then they exist for just two dozen societies. However, the detailed analyses by Welzel (2013) find pronounced cohort differences in these values and strong evidence that these cohort differences show the footprints of value change in a society's past. Stunning in its simplicity, the basic pattern is that younger cohorts emphasize emancipative values more than older cohorts. And this regularity is cross-culturally universal. What differs is merely how pronounced the pattern is. Because Welzel shows that the younger cohorts' stronger emancipative values are definitely not a lifecycle phenomenon, it is certain that the cohort differences reflect generational value change. If this is true, the cohort differences provide a valid basis to estimate how much weaker a society's emancipative values have been in the past. Hence, we can estimate how much weaker a society's emancipative values have been a decade ago by calculating how much weaker these values are among the cohort born a decade before the youngest cohort. Likewise, we can estimate how much weaker the emancipative values of this society have been two, three, four and even five decades ago by calculating how much weaker these values are among cohorts born this number of decades before the youngest cohort. Doing so, we obtain backward estimates for each society whose recent emphasis on emancipative values is known and for which the cohort differences in these values are known too. Restricting ourselves to cohorts that include at least fifty respondents per society, we can do this six decades back in time, covering the decennial sequence from 1940-1950 to 1990-2000.

Unfortunately, the world is complicated and there are two more things to be considered. To begin with, backward estimates derived solely from cohort differences of a recent cross-section ignore that emancipative values do not only rise through the cohort succession. As Figure 4.1 in Welzel (2013) shows, emancipative values also rise through the time trend within each cohort. Neglecting the trend factor, we certainly overestimate each society's past emancipative values. In fact, we overestimate them the more, the farther back in time our estimates reach because--with each decade in the past--we miss a bigger chunk of the trend. To correct this error, we must subtract from the backward estimates the average decennial increase in emancipative values, multiplied by the number of decades that the retrospection reaches back. By a rough estimate, the recent decennial increase in emancipative values within cohorts has been .05 scale points on average.[21] This suggests to subtract from each retrospective estimate another .05 points for every decade it reaches back into the past.[22]

The second complication is that the time trend has certainly not been uniform across all societies. Instead, societies on a higher level of emancipative values today obviously climbed to this level by a more pronounced emancipatory trend than societies on a lower level of these values today. Hence, the recently reached level of emancipative values indicates

21 Among a constant set of ten advanced postindustrial democracies, emancipative values rose by .05 scale points from an average of .51 to an average of .56 in the period between 1990 and 2000. For this calculation, the ten societies are weighted to equal sample size and include: Canada, France, Germany (West), Italy, Japan, The Netherlands, Norway, Sweden, the US and the UK.

22 There are good reasons to assume that the time trend is a more recent phenomenon, linked with the rise of knowledge economies in the postindustrial era. This suggests that the emancipatory trend picked up speed, starting from a base of zero during WWII. To model this assumption, I employ a backward deceleration factor, so that the trend decreases for each decade farther back in time. If the trend started from a zero-base and then continuously approached the .05-point decennial increase of the recent decade, the backward deceleration factor amounts to .01 points for every decade back in the past. Thus, I assume a decennial increase in emancipative values of .05 scale points from 1990 to 2000, .04 points from 1980 to 1990, .03 points from 1970 to 1980, .02 points from 1960 to 1970, .01 points from 1950 to 1960 and zero from 1940 to 1950. The regression results in Table 4.2 are based on estimates using this deflator. Not using the deflator produces weaker results but the conclusions as concerns the determination pattern among the three elements of human empowerment remain the same.

how strong the emancipatory trend has been in this society. This allows us to calculate *specific* decennial subtraction scores for each society, rather than subtracting the same scores across the board. We calculate country-specific subtraction scores by weighting the constant .05-point subtraction score for each society's recent level of emancipative values.[23] As a result, decennial subtraction scores are larger for societies with higher levels of emancipative values today. An immediate consequence of this adjustment is that societies whose levels of emancipative values are far apart today were closer to each other in the past. This implication is intuitively plausible. Postmaterialist orientations, for instance, did not become a mass phenomenon before the late 1960s, and even this only in the most advanced postindustrial societies. Likewise, societies whose gender norms and sexual liberties appear advanced today were probably not quite as traditional as the most traditional societies of today but they were certainly closer to them.

In summary, we derive retrospective estimates of emancipative values for a given decade by three pieces of information:

(1) *cohort differences*: we subtract from a society's recent emancipative values the difference in these values between the youngest cohort and the cohort which is born as many decades before the youngest as the number of decades the retrospective estimate reaches back;

(2) *decennial trend*: for further subtraction we assume a constant score of .05 points for each additional decade in the past;

(3) *outcome level*: we use a given society's outcome level in emancipative levels to adjust the .05-point decennial subtraction score, assuming steeper trends with higher outcome levels.

Substantively speaking, this estimation procedure recognizes that emancipative values have been rising (i) by the succession of cohorts and (ii) by an emancipatory trend throughout all cohorts, the steepness of which differs (iii) with the outcome level of emancipative values. The scheme below illustrates how the estimation has been performed on a country-by-country basis:

Appendix-Table 6. Scheme for Backward Estimation of Emancipative Values

Backward-estimated EV for Decade	Cohort-specific EV Today	Recent EV Country Mean	Accumulated Decennial Trend
EV in 1990-2000 =	EV of 1970-1980 Cohort Today -	(Recent EV Country Mean *	.00)
EV in 1980-1990 =	EV of 1960-1970 Cohort Today -	(Recent EV Country Mean *	.05)
EV in 1970-1980 =	EV of 1950-1960 Cohort Today -	(Recent EV Country Mean *	.09)
EV in 1960-1970 =	EV of 1940-1950 Cohort Today -	(Recent EV Country Mean *	.12)
EV in 1950-1960 =	EV of 1930-1940 Cohort Today -	(Recent EV Country Mean *	.14)
EV in 1940-1950 =	EV of 1920-1930 Cohort Today -	(Recent EV Country Mean *	.15)

Due this scheme, the backward estimated score for emancipative values is lower (i) when the emancipative values of the cohort born in the decade before are lower and (ii) when the product between a country's current score in emancipative values and the accumulated trend is higher. I have experimented with various other estimation schemes but this one proved the most powerful one.

[23] Western societies in which the emancipatory trend has been most pronounced have an average score in emancipative values of .60 scale points. I equate .60 with 1.0 and standardize all other scores for this value. Then I use these standardized scores as weights with which I multiply the .05-point decennial subtraction score.

Under these premises, I probe into simulation and estimate emancipative values for 85 countries over six decades (of all 95 countries surveyed once by the WVS, we lack cohort data for ten). This provides a data matrix of 510 country-per-decade observations. For 74 of these, we also have the proxy measures of technological progress and civic entitlements, as reported in Appendix 4 and Appendix 5. Theoretically, this sums up to 444 country-per-decade observations in a time-pooled-cross-sectional dataset. Yet, when we introduce double-time lagged variables, we lose two decades with 74 countries each, leaving us with 296 country-per decade observations. Still, not all 74 countries were independent in every decade from 1940 to 2000. Hence, the proxy measures of technological progress and civic entitlements are not available in every decade either. In the worst situation, this leaves us with 230 country-per-decade observations. As the data in Appendix-Table 7 below show, the 85 countries in this dataset show no sampling bias: they are from all world regions, include the largest population of each region, and cover the whole range of variation in all three variables of interest.

Appendix-Table 7. Descriptives for the Data Analyzed in Table 1

MEASURES:	*N*	Minimum	Maximum	Mean	Std. Deviation
Technological Progress at T_0[1)]	398	0.00	0.97	0.50	0.32
Technological Progress at T_{-1}[1)]	314	0.00	0.97	0.46	0.31
Technological Progress at T_{-2}[1)]	239	0.00	0.96	0.42	0.30
Emancipative Values at T_0[2)]	510	0.10	0.76	0.36	0.12
Emancipative Values at T_{-1}[2)]	425	0.10	0.66	0.34	0.11
Emancipative Values at T_{-2}[2)]	340	0.10	0.62	0.32	0.10
Civic Entitlements at T_0[3)]	423	0.00	1.00	0.30	0.30
Civic Entitlements at T_{-1}[3)]	340	0.00	1.00	0.27	0.29
Civic Entitlements at T_{-2}[3)]	257	0.00	0.89	0.23	0.28
Valid N (listwise)	230				

Notes: Times T_0, T_{-1}, and T_{-2} do not signify some specific decade but refer to any given decade (T_0), its previous decade (T_{-1}), and the pre-previous decade (T_{-2}).

1) Proxy for Technological Progress described in Appendix 4

2) Proxy for Emancipative Values described in Appendix 6

3) Proxy for Civic Entitlements described in Appendix 5.

Appendix-Table 8. Matrix of Time-Pooled-Cross-Sectional Data

Key:
TecPro: Proxy for Technological Progress described in Appendix 4
EmaVal: Proxy for Emancipative Values described in Appendix 6
CivEnt: Proxy for Civic Entitlements described in Appendix 5.

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Albania	1940-1950	0.05			0.19			0.00		
Albania	1950-1960	0.10	0.05		0.24	0.19		0.00	0.00	
Albania	1960-1970	0.23	0.10	0.05	0.25	0.24	0.19	0.00	0.00	0.00
Albania	1970-1980	0.35	0.23	0.10	0.29	0.25	0.24	0.00	0.00	0.00
Albania	1980-1990	0.28	0.35	0.23	0.34	0.29	0.25	0.11	0.00	0.00
Albania	1990-2000	0.44	0.28	0.35	0.45	0.34	0.29	0.56	0.11	0.00
Algeria	1940-1950				0.16					
Algeria	1950-1960				0.19	0.16		0.00		
Algeria	1960-1970	0.06			0.24	0.19	0.16	0.00	0.00	
Algeria	1970-1980	0.11	0.06		0.27	0.24	0.19	0.00	0.00	0.00
Algeria	1980-1990	0.23	0.11	0.06	0.28	0.27	0.24		0.00	0.00
Algeria	1990-2000	0.43	0.23	0.11	0.30	0.28	0.27	0.33		0.00
Argentina	1940-1950	0.61			0.30			0.11		
Argentina	1950-1960	0.64	0.61		0.37	0.30		0.11	0.11	
Argentina	1960-1970	0.73	0.64	0.61	0.41	0.37	0.30	0.00	0.11	0.11
Argentina	1970-1980	0.79	0.73	0.64	0.44	0.41	0.37	0.00	0.00	0.11
Argentina	1980-1990	0.83	0.79	0.73	0.48	0.44	0.41	0.56	0.00	0.00
Argentina	1990-2000	0.86	0.83	0.79	0.52	0.48	0.44	0.56	0.56	0.00
Australia	1940-1950	0.81			0.35			0.56		
Australia	1950-1960	0.84	0.81		0.41	0.35		0.56	0.56	
Australia	1960-1970	0.86	0.84	0.81	0.48	0.41	0.35	0.67	0.56	0.56
Australia	1970-1980	0.91	0.86	0.84	0.51	0.48	0.41	0.67	0.67	0.56
Australia	1980-1990	0.93	0.91	0.86	0.57	0.51	0.48	0.67	0.67	0.67
Australia	1990-2000	0.94	0.93	0.91	0.63	0.57	0.51	0.78	0.67	0.67
Austria	1940-1950	0.66			0.31			0.67		
Austria	1950-1960	0.67	0.66		0.41	0.31		0.67	0.67	
Austria	1960-1970	0.75	0.67	0.66	0.44	0.41	0.31	0.67	0.67	0.67
Austria	1970-1980	0.83	0.75	0.67	0.52	0.44	0.41	0.67	0.67	0.67
Austria	1980-1990	0.90	0.83	0.75	0.56	0.52	0.44	0.78	0.67	0.67
Austria	1990-2000	0.93	0.90	0.83	0.61	0.56	0.52	0.78	0.78	0.67
Banglad.	1940-1950				0.23					
Banglad.	1950-1960				0.25	0.23				
Banglad.	1960-1970				0.25	0.25	0.23	0.00		
Banglad.	1970-1980	0.06			0.29	0.25	0.25	0.11	0.00	
Banglad.	1980-1990	0.05	0.06		0.32	0.29	0.25	0.22	0.11	0.00
Banglad.	1990-2000	0.11	0.05	0.06	0.33	0.32	0.29	0.33	0.22	0.11
Belarus	1940-1950				0.22					
Belarus	1950-1960				0.26	0.22				
Belarus	1960-1970				0.31	0.26	0.22			
Belarus	1970-1980				0.36	0.31	0.26			
Belarus	1980-1990				0.41	0.36	0.31	0.11		
Belarus	1990-2000	0.77			0.47	0.41	0.36	0.22	0.11	
Belgium	1940-1950	0.82			0.31			0.67		
Belgium	1950-1960	0.86	0.82		0.36	0.31		0.67	0.67	

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Belgium	1960-1970	0.90	0.86	0.82	0.43	0.36	0.31	0.78	0.67	0.67
Belgium	1970-1980	0.95	0.90	0.86	0.45	0.43	0.36	0.78	0.78	0.67
Belgium	1980-1990	0.96	0.95	0.90	0.49	0.45	0.43	1.00	0.78	0.78
Belgium	1990-2000	0.96	0.96	0.95	0.52	0.49	0.45	0.89	1.00	0.78
Brazil	1940-1950				0.31					
Brazil	1950-1960	0.20			0.26	0.31		0.00		
Brazil	1960-1970	0.29	0.20		0.31	0.26	0.31	0.00	0.00	
Brazil	1970-1980	0.37	0.29	0.20	0.33	0.31	0.26	0.00	0.00	0.00
Brazil	1980-1990	0.47	0.37	0.29	0.37	0.33	0.31	0.44	0.00	0.00
Brazil	1990-2000	0.62	0.47	0.37	0.46	0.37	0.33	0.44	0.44	0.00
Bulgaria	1940-1950	0.15			0.25			0.00		
Bulgaria	1950-1960	0.22	0.15		0.30	0.25			0.00	
Bulgaria	1960-1970	0.38	0.22	0.15	0.35	0.30	0.25	0.00		0.00
Bulgaria	1970-1980	0.53	0.38	0.22	0.38	0.35	0.30	0.00	0.00	
Bulgaria	1980-1990	0.64	0.53	0.38	0.44	0.38	0.35	0.78	0.00	0.00
Bulgaria	1990-2000	0.82	0.64	0.53	0.49	0.44	0.38	0.67	0.78	0.00
Burkina F.	1940-1950				0.22					
Burkina F.	1950-1960				0.19	0.22		0.00		
Burkina F.	1960-1970	0.01			0.23	0.19	0.22	0.00	0.00	
Burkina F.	1970-1980	0.01	0.01		0.24	0.23	0.19	0.00	0.00	0.00
Burkina F.	1980-1990	0.02	0.01	0.01	0.28	0.24	0.23	0.00	0.00	0.00
Burkina F.	1990-2000	0.03	0.02	0.01	0.30	0.28	0.24	0.00	0.00	0.00
Canada	1940-1950	0.70			0.40			0.44		
Canada	1950-1960	0.79	0.70		0.45	0.40		0.44	0.44	
Canada	1960-1970	0.85	0.79	0.70	0.49	0.45	0.40	0.44	0.44	0.44
Canada	1970-1980	0.91	0.85	0.79	0.52	0.49	0.45	0.56	0.44	0.44
Canada	1980-1990	0.94	0.91	0.85	0.57	0.52	0.49	0.56	0.56	0.44
Canada	1990-2000	0.96	0.94	0.91	0.63	0.57	0.52	0.44	0.56	0.56
Chile	1940-1950	0.47			0.25			0.11		
Chile	1950-1960	0.55	0.47		0.28	0.25		0.22	0.11	
Chile	1960-1970	0.59	0.55	0.47	0.33	0.28	0.25	0.00	0.22	0.11
Chile	1970-1980	0.65	0.59	0.55	0.39	0.33	0.28	0.00	0.00	0.22
Chile	1980-1990	0.75	0.65	0.59	0.45	0.39	0.33	0.44	0.00	0.00
Chile	1990-2000	0.81	0.75	0.65	0.52	0.45	0.39	0.44	0.44	0.00
China	1940-1950	0.05			0.25			0.00		
China	1950-1960	0.06	0.05		0.26	0.25		0.00	0.00	
China	1960-1970	0.10	0.06	0.05	0.28	0.26	0.25	0.00	0.00	0.00
China	1970-1980	0.15	0.10	0.06	0.31	0.28	0.26	0.00	0.00	0.00
China	1980-1990	0.26	0.15	0.10	0.37	0.31	0.28	0.00	0.00	0.00
China	1990-2000	0.24	0.26	0.15	0.42	0.37	0.31	0.00	0.00	0.00
Colombia	1940-1950	0.15			0.24			0.00		
Colombia	1950-1960	0.29	0.15		0.27	0.24		0.11	0.00	
Colombia	1960-1970	0.36	0.29	0.15	0.30	0.27	0.24	0.22	0.11	0.00
Colombia	1970-1980	0.43	0.36	0.29	0.34	0.30	0.27	0.11	0.22	0.11
Colombia	1980-1990	0.62	0.43	0.36	0.38	0.34	0.30	0.11	0.11	0.22
Colombia	1990-2000	0.64	0.62	0.43	0.44	0.38	0.34	0.22	0.11	0.11
Croatia	1940-1950				0.26					
Croatia	1950-1960				0.34	0.26				
Croatia	1960-1970				0.38	0.34	0.26			
Croatia	1970-1980				0.43	0.38	0.34			

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Croatia	1980-1990				0.55	0.43	0.38	0.56		
Croatia	1990-2000	0.73			0.61	0.55	0.43	0.56	0.56	
Cyprus	1940-1950				0.25					
Cyprus	1950-1960				0.32	0.25				
Cyprus	1960-1970				0.33	0.32	0.25			
Cyprus	1970-1980				0.38	0.33	0.32	0.22		
Cyprus	1980-1990	0.59			0.43	0.38	0.33	0.56	0.22	
Cyprus	1990-2000	0.69	0.59		0.47	0.43	0.38	0.67	0.56	0.22
Czech R.	1940-1950	0.60			0.33					
Czech R.	1950-1960	0.60	0.60		0.37	0.33				
Czech R.	1960-1970	0.73	0.60	0.60	0.42	0.37	0.33			
Czech R.	1970-1980	0.84	0.73	0.60	0.45	0.42	0.37			
Czech R.	1980-1990	0.89	0.84	0.73	0.51	0.45	0.42			
Czech R.	1990-2000	0.88	0.89	0.84	0.53	0.51	0.45	0.78		
Denmark	1940-1950	0.70			0.48			0.56		
Denmark	1950-1960	0.74	0.70		0.53	0.48		0.67	0.56	
Denmark	1960-1970	0.81	0.74	0.70	0.57	0.53	0.48	0.89	0.67	0.56
Denmark	1970-1980	0.87	0.81	0.74	0.60	0.57	0.53	0.78	0.89	0.67
Denmark	1980-1990	0.92	0.87	0.81	0.62	0.60	0.57	0.78	0.78	0.89
Denmark	1990-2000	0.94	0.92	0.87	0.50	0.62	0.60	0.89	0.78	0.78
Domin. R.	1940-1950				0.30					
Domin. R.	1950-1960	0.14			0.31	0.30		0.11		
Domin. R.	1960-1970	0.21	0.14		0.35	0.31	0.30	0.11	0.11	
Domin. R.	1970-1980	0.25	0.21	0.14	0.37	0.35	0.31	0.33	0.11	0.11
Domin. R.	1980-1990	0.32	0.25	0.21	0.44	0.37	0.35	0.33	0.33	0.11
Domin. R.	1990-2000		0.32	0.25	0.46	0.44	0.37		0.33	0.33
Egypt	1940-1950	0.04			0.19			0.00		
Egypt	1950-1960	0.08	0.04		0.20	0.19		0.00	0.00	
Egypt	1960-1970	0.11	0.08	0.04	0.21	0.20	0.19	0.00	0.00	0.00
Egypt	1970-1980	0.14	0.11	0.08	0.23	0.21	0.20	0.00	0.00	0.00
Egypt	1980-1990	0.21	0.14	0.11	0.27	0.23	0.21	0.00	0.00	0.00
Egypt	1990-2000	0.28	0.21	0.14	0.29	0.27	0.23	0.00	0.00	0.00
El Salv.	1940-1950	0.11			0.32			0.00		
El Salv.	1950-1960	0.14	0.11		0.34	0.32		0.00	0.00	
El Salv.	1960-1970	0.19	0.14	0.11	0.38	0.34	0.32	0.11	0.00	0.00
El Salv.	1970-1980	0.25	0.19	0.14	0.37	0.38	0.34	0.00	0.11	0.00
El Salv.	1980-1990	0.34	0.25	0.19	0.43	0.37	0.38	0.22	0.00	0.11
El Salv.	1990-2000	0.46	0.34	0.25	0.46	0.43	0.37	0.11	0.22	0.00
Estonia	1940-1950				0.27					
Estonia	1950-1960				0.31	0.27				
Estonia	1960-1970				0.36	0.31	0.27			
Estonia	1970-1980				0.40	0.36	0.31			
Estonia	1980-1990				0.43	0.40	0.36	0.33		
Estonia	1990-2000	0.87			0.46	0.43	0.40	0.44	0.33	
Ethiopia	1940-1950				0.25					
Ethiopia	1950-1960				0.18	0.25				
Ethiopia	1960-1970	0.00			0.32	0.18	0.25	0.00		
Ethiopia	1970-1980	0.01	0.00		0.38	0.32	0.18	0.00	0.00	
Ethiopia	1980-1990	0.06	0.01	0.00	0.44	0.38	0.32	0.00	0.00	0.00
Ethiopia	1990-2000	0.13	0.06	0.01	0.49	0.44	0.38	0.00	0.00	0.00

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Finland	1940-1950	0.41			0.37			0.56		
Finland	1950-1960	0.53	0.41		0.43	0.37		0.56	0.56	
Finland	1960-1970	0.63	0.53	0.41	0.48	0.43	0.37	0.33	0.56	0.56
Finland	1970-1980	0.74	0.63	0.53	0.53	0.48	0.43	0.56	0.33	0.56
Finland	1980-1990	0.87	0.74	0.63	0.57	0.53	0.48	0.78	0.56	0.33
Finland	1990-2000	0.91	0.87	0.74	0.64	0.57	0.53	0.67	0.78	0.56
France	1940-1950	0.61			0.31			0.56		
France	1950-1960	0.66	0.61		0.41	0.31		0.33	0.56	
France	1960-1970	0.76	0.66	0.61	0.43	0.41	0.31	0.67	0.33	0.56
France	1970-1980	0.84	0.76	0.66	0.48	0.43	0.41	0.67	0.67	0.33
France	1980-1990	0.90	0.84	0.76	0.52	0.48	0.43	0.67	0.67	0.67
France	1990-2000	0.94	0.90	0.84	0.61	0.52	0.48	0.56	0.67	0.67
Germ. (E.)	1940-1950				0.33			0.00		
Germ. (E.)	1950-1960	0.73			0.40	0.33		0.00	0.00	
Germ. (E.)	1960-1970	0.81	0.73		0.46	0.40	0.33	0.00	0.00	0.00
Germ. (E.)	1970-1980	0.87	0.81	0.73	0.52	0.46	0.40	0.00	0.00	0.00
Germ. (E.)	1980-1990	0.89	0.87	0.81	0.59	0.52	0.46	0.78	0.00	0.00
Germ. (E.)	1990-2000	0.95	0.89	0.87	0.66	0.59	0.52	0.78	0.78	0.00
Germ. (W.)	1940-1950				0.33			0.67		
Germ. (W.)	1950-1960	0.76			0.41	0.33		0.67	0.67	
Germ. (W.)	1960-1970	0.85	0.76		0.50	0.41	0.33	0.67	0.67	0.67
Germ. (W.)	1970-1980	0.90	0.85	0.76	0.56	0.50	0.41	0.78	0.67	0.67
Germ. (W.)	1980-1990	0.95	0.90	0.85	0.62	0.56	0.50	0.78	0.78	0.67
Germ. (W.)	1990-2000	0.95	0.95	0.90	0.68	0.62	0.56	0.78	0.78	0.78
Ghana	1940-1950				0.19			0.11		
Ghana	1950-1960	0.07			0.21	0.19		0.00	0.11	
Ghana	1960-1970	0.11	0.07		0.21	0.21	0.19	0.00	0.00	0.11
Ghana	1970-1980	0.14	0.11	0.07	0.25	0.21	0.21	0.11	0.00	0.00
Ghana	1980-1990	0.22	0.14	0.11	0.26	0.25	0.21	0.00	0.11	0.00
Ghana	1990-2000	0.30	0.22	0.14	0.30	0.26	0.25	0.33	0.00	0.11
Greece	1940-1950	0.30			0.34			0.33		
Greece	1950-1960	0.37	0.30		0.40	0.34		0.22	0.33	
Greece	1960-1970	0.35	0.37	0.30	0.43	0.40	0.34	0.22	0.22	0.33
Greece	1970-1980	0.47	0.35	0.37	0.51	0.43	0.40	0.67	0.22	0.22
Greece	1980-1990	0.58	0.47	0.35	0.56	0.51	0.43	0.78	0.67	0.22
Greece	1990-2000	0.71	0.58	0.47	0.38	0.56	0.51	0.78	0.78	0.67
Guatem.	1940-1950				0.27					
Guatem.	1950-1960				0.28	0.27				
Guatem.	1960-1970	0.13			0.30	0.28	0.27	0.11		
Guatem.	1970-1980	0.17	0.13		0.35	0.30	0.28	0.11	0.11	
Guatem.	1980-1990	0.23	0.17	0.13	0.39	0.35	0.30	0.00	0.11	0.11
Guatem.	1990-2000	0.27	0.23	0.17	0.42	0.39	0.35	0.11	0.00	0.11
Hungary	1940-1950	0.44			0.28			0.00		
Hungary	1950-1960	0.46	0.44		0.35	0.28		0.00	0.00	
Hungary	1960-1970	0.59	0.46	0.44	0.38	0.35	0.28	0.00	0.00	0.00
Hungary	1970-1980	0.74	0.59	0.46	0.38	0.38	0.35	0.00	0.00	0.00
Hungary	1980-1990	0.83	0.74	0.59	0.43	0.38	0.38	0.56	0.00	0.00
Hungary	1990-2000	0.85	0.83	0.74	0.37	0.43	0.38	0.56	0.56	0.00
Iceland	1940-1950				0.39					

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Iceland	1950-1960				0.46	0.39				
Iceland	1960-1970				0.49	0.46	0.39			
Iceland	1970-1980				0.52	0.49	0.46	0.78		
Iceland	1980-1990	0.88			0.57	0.52	0.49	0.78	0.78	
Iceland	1990-2000	0.92	0.88		0.56	0.57	0.52	0.78	0.78	0.78
India	1940-1950	0.04			0.23			0.11		
India	1950-1960	0.05	0.04		0.22	0.23		0.22	0.11	
India	1960-1970	0.08	0.05	0.04	0.24	0.22	0.23	0.33	0.22	0.11
India	1970-1980	0.10	0.08	0.05	0.27	0.24	0.22	0.33	0.33	0.22
India	1980-1990	0.13	0.10	0.08	0.31	0.27	0.24	0.33	0.33	0.33
India	1990-2000	0.16	0.13	0.10	0.36	0.31	0.27	0.33	0.33	0.33
Indonesia	1940-1950				0.24			0.00		
Indonesia	1950-1960	0.04			0.23	0.24		0.00	0.00	
Indonesia	1960-1970	0.10	0.04		0.25	0.23	0.24	0.00	0.00	0.00
Indonesia	1970-1980	0.18	0.10	0.04	0.28	0.25	0.23	0.00	0.00	0.00
Indonesia	1980-1990	0.27	0.18	0.10	0.30	0.28	0.25	0.00	0.00	0.00
Indonesia	1990-2000	0.42	0.27	0.18	0.35	0.30	0.28	0.22	0.00	0.00
Iran	1940-1950	0.02			0.17			0.00		
Iran	1950-1960	0.04	0.02		0.22	0.17		0.00	0.00	
Iran	1960-1970	0.08	0.04	0.02	0.24	0.22	0.17	0.00	0.00	0.00
Iran	1970-1980	0.14	0.08	0.04	0.27	0.24	0.22	0.11	0.00	0.00
Iran	1980-1990	0.26	0.14	0.08	0.31	0.27	0.24	0.11	0.11	0.00
Iran	1990-2000	0.39	0.26	0.14	0.35	0.31	0.27	0.00	0.11	0.11
Iraq	1940-1950	0.01			0.15			0.00		
Iraq	1950-1960	0.02	0.01		0.17	0.15		0.00	0.00	
Iraq	1960-1970	0.08	0.02	0.01	0.18	0.17	0.15	0.00	0.00	0.00
Iraq	1970-1980	0.14	0.08	0.02	0.20	0.18	0.17	0.00	0.00	0.00
Iraq	1980-1990	0.28	0.14	0.08	0.21	0.20	0.18	0.00	0.00	0.00
Iraq	1990-2000	0.47	0.28	0.14	0.24	0.21	0.20	0.00	0.00	0.00
Ireland	1940-1950	0.51			0.25			0.44		
Ireland	1950-1960	0.58	0.51		0.29	0.25		0.44	0.44	
Ireland	1960-1970	0.63	0.58	0.51	0.36	0.29	0.25	0.44	0.44	0.44
Ireland	1970-1980	0.72	0.63	0.58	0.42	0.36	0.29	0.44	0.44	0.44
Ireland	1980-1990	0.77	0.72	0.63	0.46	0.42	0.36	0.67	0.44	0.44
Ireland	1990-2000	0.85	0.77	0.72	0.66	0.46	0.42	0.67	0.67	0.44
Israel	1940-1950	0.53			0.36			0.67		
Israel	1950-1960	0.65	0.53		0.40	0.36		0.67	0.67	
Israel	1960-1970	0.72	0.65	0.53	0.42	0.40	0.36	0.56	0.67	0.67
Israel	1970-1980	0.81	0.72	0.65	0.46	0.42	0.40	0.67	0.56	0.67
Israel	1980-1990	0.88	0.81	0.72	0.50	0.46	0.42	0.67	0.67	0.56
Israel	1990-2000	0.91	0.88	0.81	0.50	0.50	0.46	0.56	0.67	0.67
Italy	1940-1950	0.43			0.26			0.67		
Italy	1950-1960	0.50	0.43		0.33	0.26		0.78	0.67	
Italy	1960-1970	0.63	0.50	0.43	0.40	0.33	0.26	0.78	0.78	0.67
Italy	1970-1980	0.75	0.63	0.50	0.45	0.40	0.33	0.89	0.78	0.78
Italy	1980-1990	0.86	0.75	0.63	0.50	0.45	0.40	1.00	0.89	0.78
Italy	1990-2000	0.90	0.86	0.75	0.57	0.50	0.45	0.78	1.00	0.89
Japan	1940-1950	0.53			0.32			0.44		
Japan	1950-1960	0.51	0.53		0.36	0.32		0.44	0.44	

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Japan	1960-1970	0.66	0.51	0.53	0.42	0.36	0.32	0.56	0.44	0.44
Japan	1970-1980	0.80	0.66	0.51	0.49	0.42	0.36	0.56	0.56	0.44
Japan	1980-1990	0.88	0.80	0.66	0.54	0.49	0.42	0.56	0.56	0.56
Japan	1990-2000	0.93	0.88	0.80	0.59	0.54	0.49	0.44	0.56	0.56
Jordan	1940-1950	0.05			0.15			0.00		
Jordan	1950-1960	0.11	0.05		0.14	0.15		0.00	0.00	
Jordan	1960-1970	0.17	0.11	0.05	0.17	0.14	0.15	0.00	0.00	0.00
Jordan	1970-1980	0.24	0.17	0.11	0.20	0.17	0.14	0.00	0.00	0.00
Jordan	1980-1990	0.48	0.24	0.17	0.22	0.20	0.17	0.00	0.00	0.00
Jordan	1990-2000	0.75	0.48	0.24	0.23	0.22	0.20	0.00	0.00	0.00
S. Korea	1940-1950	0.06			0.14			0.11		
S. Korea	1950-1960	0.18	0.06		0.23	0.14		0.22	0.11	
S. Korea	1960-1970	0.24	0.18	0.06	0.29	0.23	0.14	0.00	0.22	0.11
S. Korea	1970-1980	0.37	0.24	0.18	0.36	0.29	0.23	0.00	0.00	0.22
S. Korea	1980-1990	0.57	0.37	0.24	0.46	0.36	0.29	0.67	0.00	0.00
S. Korea	1990-2000	0.72	0.57	0.37	0.53	0.46	0.36	0.56	0.67	0.00
Kyrgyztan	1940-1950				0.24					
Kyrgyztan	1950-1960				0.27	0.24				
Kyrgyztan	1960-1970				0.30	0.27	0.24			
Kyrgyztan	1970-1980				0.32	0.30	0.27			
Kyrgyztan	1980-1990				0.35	0.32	0.30	0.00		
Kyrgyztan	1990-2000	0.78			0.40	0.35	0.32	0.22	0.00	
Latvia	1940-1950				0.32					
Latvia	1950-1960				0.34	0.32				
Latvia	1960-1970				0.37	0.34	0.32			
Latvia	1970-1980				0.41	0.37	0.34			
Latvia	1980-1990				0.44	0.41	0.37	0.22		
Latvia	1990-2000	0.87			0.36	0.44	0.41	0.56	0.22	
Lith.	1940-1950				0.25					
Lith.	1950-1960				0.30	0.25				
Lith.	1960-1970				0.36	0.30	0.25			
Lith.	1970-1980				0.39	0.36	0.30			
Lith.	1980-1990				0.44	0.39	0.36	0.44		
Lith.	1990-2000	0.86			0.52	0.44	0.39		0.44	
Lux.	1940-1950				0.31					
Lux.	1950-1960				0.38	0.31				
Lux.	1960-1970				0.43	0.38	0.31			
Lux.	1970-1980				0.48	0.43	0.38	0.67		
Lux.	1980-1990	0.97			0.50	0.48	0.43	0.78	0.67	
Lux.	1990-2000	0.95	0.97		0.57	0.50	0.48	0.56	0.78	0.67
Maced.	1940-1950				0.27					
Maced.	1950-1960				0.28	0.27				
Maced.	1960-1970				0.32	0.28	0.27			
Maced.	1970-1980				0.35	0.32	0.28			
Maced.	1980-1990				0.39	0.35	0.32	0.22		
Maced.	1990-2000	0.63			0.45	0.39	0.35	0.44	0.22	
Malaysia	1940-1950				0.29					
Malaysia	1950-1960				0.24	0.29				
Malaysia	1960-1970	0.22			0.31	0.24	0.29	0.22		

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Malaysia	1970-1980	0.26	0.22		0.32	0.31	0.24	0.22	0.22	
Malaysia	1980-1990	0.35	0.26	0.22	0.35	0.32	0.31	0.22	0.22	0.22
Malaysia	1990-2000	0.53	0.35	0.26	0.39	0.35	0.32	0.22	0.22	0.22
Malta	1940-1950				0.19					
Malta	1950-1960				0.22	0.19				
Malta	1960-1970				0.27	0.22	0.19			
Malta	1970-1980				0.30	0.27	0.22	0.67		
Malta	1980-1990	0.80			0.36	0.30	0.27	0.67	0.67	
Malta	1990-2000	0.84	0.80		0.38	0.36	0.30	0.67	0.67	0.67
Mexico	1940-1950	0.16			0.25			0.00		
Mexico	1950-1960	0.24	0.16		0.26	0.25		0.00	0.00	
Mexico	1960-1970	0.28	0.24	0.16	0.32	0.26	0.25	0.00	0.00	0.00
Mexico	1970-1980	0.39	0.28	0.24	0.36	0.32	0.26	0.00	0.00	0.00
Mexico	1980-1990	0.53	0.39	0.28	0.41	0.36	0.32	0.22	0.00	0.00
Mexico	1990-2000	0.61	0.53	0.39	0.51	0.41	0.36	0.44	0.22	0.00
Moldova	1940-1950				0.22					
Moldova	1950-1960				0.25	0.22				
Moldova	1960-1970				0.29	0.25	0.22			
Moldova	1970-1980				0.31	0.29	0.25			
Moldova	1980-1990				0.37	0.31	0.29	0.11		
Moldova	1990-2000	0.75			0.44	0.37	0.31	0.22	0.11	
Morocco	1940-1950				0.13			0.00		
Morocco	1950-1960	0.04			0.15	0.13		0.00	0.00	
Morocco	1960-1970	0.05	0.04		0.20	0.15	0.13	0.00	0.00	0.00
Morocco	1970-1980	0.08	0.05	0.04	0.24	0.20	0.15	0.00	0.00	0.00
Morocco	1980-1990	0.14	0.08	0.05	0.29	0.24	0.20	0.00	0.00	0.00
Morocco	1990-2000	0.31	0.14	0.08	0.33	0.29	0.24	0.00	0.00	0.00
NL	1940-1950	0.78			0.40			0.78		
NL	1950-1960	0.81	0.78		0.47	0.40		0.78	0.78	
NL	1960-1970	0.88	0.81	0.78	0.51	0.47	0.40	0.78	0.78	0.78
NL	1970-1980	0.93	0.88	0.81	0.53	0.51	0.47	0.78	0.78	0.78
NL	1980-1990	0.94	0.93	0.88	0.56	0.53	0.51	0.78	0.78	0.78
NL	1990-2000	0.95	0.94	0.93	0.63	0.56	0.53	0.78	0.78	0.78
New Zealand	1940-1950	0.79			0.35			0.56		
New Zealand	1950-1960	0.82	0.79		0.43	0.35		0.56	0.56	
New Zealand	1960-1970	0.85	0.82	0.79	0.48	0.43	0.35	0.56	0.56	0.56
New Zealand	1970-1980	0.87	0.85	0.82	0.51	0.48	0.43	0.67	0.56	0.56
New Zealand	1980-1990	0.90	0.87	0.85	0.57	0.51	0.48	0.78	0.67	0.56
New Zealand	1990-2000	0.90	0.90	0.87	0.64	0.57	0.51	0.67	0.78	0.67
Nigeria	1940-1950				0.17					
Nigeria	1950-1960				0.20	0.17		0.00		
Nigeria	1960-1970	0.05			0.20	0.20	0.17	0.00	0.00	
Nigeria	1970-1980	0.08	0.05		0.23	0.20	0.20	0.22	0.00	0.00
Nigeria	1980-1990	0.16	0.08	0.05	0.24	0.23	0.20	0.00	0.22	0.00
Nigeria	1990-2000	0.18	0.16	0.08	0.25	0.24	0.23	0.22	0.00	0.22
Norway	1940-1950	0.67			0.43			0.56		
Norway	1950-1960	0.73	0.67		0.51	0.43		0.56	0.56	
Norway	1960-1970	0.79	0.73	0.67	0.56	0.51	0.43	0.67	0.56	0.56
Norway	1970-1980	0.85	0.79	0.73	0.61	0.56	0.51	0.67	0.67	0.56

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Norway	1980-1990	0.91	0.85	0.79	0.66	0.61	0.56	0.78	0.67	0.67
Norway	1990-2000	0.94	0.91	0.85	0.73	0.66	0.61	0.78	0.78	0.67
Pakistan	1940-1950	0.03			0.10			0.00		
Pakistan	1950-1960	0.04	0.03		0.13	0.10		0.00	0.00	
Pakistan	1960-1970	0.05	0.04	0.03	0.16	0.13	0.10	0.00	0.00	0.00
Pakistan	1970-1980	0.06	0.05	0.04	0.21	0.16	0.13	0.00	0.00	0.00
Pakistan	1980-1990	0.12	0.06	0.05	0.24	0.21	0.16	0.11	0.00	0.00
Pakistan	1990-2000	0.18	0.12	0.06	0.26	0.24	0.21	0.00	0.11	0.00
Peru	1940-1950	0.16			0.28			0.00		
Peru	1950-1960	0.20	0.16		0.29	0.28		0.11	0.00	
Peru	1960-1970	0.29	0.20	0.16	0.33	0.29	0.28	0.00	0.11	0.00
Peru	1970-1980	0.38	0.29	0.20	0.35	0.33	0.29	0.22	0.00	0.11
Peru	1980-1990	0.50	0.38	0.29	0.39	0.35	0.33	0.33	0.22	0.00
Peru	1990-2000	0.55	0.50	0.38	0.42	0.39	0.35	0.33	0.33	0.22
Philipp.	1940-1950	0.13			0.26			0.11		
Philipp.	1950-1960	0.18	0.13		0.24	0.26		0.22	0.11	
Philipp.	1960-1970	0.25	0.18	0.13	0.28	0.24	0.26	0.00	0.22	0.11
Philipp.	1970-1980	0.41	0.25	0.18	0.31	0.28	0.24	0.00	0.00	0.22
Philipp.	1980-1990	0.46	0.41	0.25	0.35	0.31	0.28	0.33	0.00	0.00
Philipp.	1990-2000	0.48	0.46	0.41	0.39	0.35	0.31	0.44	0.33	0.00
Poland	1940-1950	0.32			0.21			0.00		
Poland	1950-1960	0.40	0.32		0.28	0.21		0.00	0.00	
Poland	1960-1970	0.49	0.40	0.32	0.30	0.28	0.21	0.00	0.00	0.00
Poland	1970-1980	0.60	0.49	0.40	0.34	0.30	0.28	0.00	0.00	0.00
Poland	1980-1990	0.69	0.60	0.49	0.42	0.34	0.30	0.33	0.00	0.00
Poland	1990-2000	0.76	0.69	0.60	0.49	0.42	0.34	0.44	0.33	0.00
Portugal	1940-1950	0.24			0.23			0.00		
Portugal	1950-1960	0.29	0.24		0.28	0.23		0.00	0.00	
Portugal	1960-1970	0.35	0.29	0.24	0.32	0.28	0.23	0.00	0.00	0.00
Portugal	1970-1980	0.44	0.35	0.29	0.34	0.32	0.28	0.56	0.00	0.00
Portugal	1980-1990	0.62	0.44	0.35	0.45	0.34	0.32	0.44	0.56	0.00
Portugal	1990-2000	0.71	0.62	0.44	0.55	0.45	0.34	0.44	0.44	0.56
Romania	1940-1950	0.17			0.24			0.00		
Romania	1950-1960	0.23	0.17		0.27	0.24		0.00	0.00	
Romania	1960-1970	0.33	0.23	0.17	0.32	0.27	0.24	0.00	0.00	0.00
Romania	1970-1980	0.47	0.33	0.23	0.37	0.32	0.27	0.00	0.00	0.00
Romania	1980-1990	0.52	0.47	0.33	0.41	0.37	0.32	0.56	0.00	0.00
Romania	1990-2000	0.76	0.52	0.47	0.44	0.41	0.37	0.44	0.56	0.00
Russia	1940-1950	0.26			0.23			0.00		
Russia	1950-1960	0.40	0.26		0.27	0.23		0.00	0.00	
Russia	1960-1970	0.57	0.40	0.26	0.30	0.27	0.23	0.00	0.00	0.00
Russia	1970-1980	0.67	0.57	0.40	0.33	0.30	0.27	0.00	0.00	0.00
Russia	1980-1990	0.84	0.67	0.57	0.38	0.33	0.30	0.56	0.00	0.00
Russia	1990-2000	0.75	0.84	0.67	0.40	0.38	0.33	0.56	0.56	0.00
Rwanda	1940-1950				0.24					
Rwanda	1950-1960				0.25	0.24		0.00		
Rwanda	1960-1970	0.01			0.26	0.25	0.24	0.00	0.00	
Rwanda	1970-1980	0.01	0.01		0.26	0.26	0.25	0.00	0.00	0.00
Rwanda	1980-1990	0.05	0.01	0.01	0.30	0.26	0.26	0.00	0.00	0.00

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Rwanda	1990-2000	0.05	0.05	0.01	0.32	0.30	0.26	0.00	0.00	0.00
S. Arabia	1940-1950				0.30					
S. Arabia	1950-1960				0.34	0.30				
S. Arabia	1960-1970	0.02			0.25	0.34	0.30	0.00		
S. Arabia	1970-1980	0.06	0.02		0.28	0.25	0.34	0.00	0.00	
S. Arabia	1980-1990	0.10	0.06	0.02	0.30	0.28	0.25	0.00	0.00	0.00
S. Arabia	1990-2000	0.38	0.10	0.06	0.33	0.30	0.28	0.00	0.00	0.00
Singapore	1940-1950				0.19					
Singapore	1950-1960				0.24	0.19				
Singapore	1960-1970				0.27	0.24	0.19			
Singapore	1970-1980				0.32	0.27	0.24	0.11		
Singapore	1980-1990	0.81			0.40	0.32	0.27	0.22	0.11	
Singapore	1990-2000	0.87	0.81		0.44	0.40	0.32	0.00	0.22	0.11
S. Africa	1940-1950	0.22			0.23			0.00		
S. Africa	1950-1960	0.29	0.22		0.28	0.23		0.00	0.00	
S. Africa	1960-1970	0.39	0.29	0.22	0.31	0.28	0.23	0.00	0.00	0.00
S. Africa	1970-1980	0.46	0.39	0.29	0.33	0.31	0.28	0.00	0.00	0.00
S. Africa	1980-1990	0.36	0.46	0.39	0.39	0.33	0.31	0.00	0.00	0.00
S. Africa	1990-2000	0.69	0.36	0.46	0.43	0.39	0.33	0.22	0.00	0.00
Spain	1940-1950	0.37			0.27			0.00		
Spain	1950-1960	0.42	0.37		0.34	0.27		0.00	0.00	
Spain	1960-1970	0.50	0.42	0.37	0.42	0.34	0.27	0.00	0.00	0.00
Spain	1970-1980	0.60	0.50	0.42	0.48	0.42	0.34	0.67	0.00	0.00
Spain	1980-1990	0.78	0.60	0.50	0.55	0.48	0.42	0.78	0.67	0.00
Spain	1990-2000	0.86	0.78	0.60	0.61	0.55	0.48	0.67	0.78	0.67
Sweden	1940-1950	0.70			0.45			0.56		
Sweden	1950-1960	0.79	0.70		0.54	0.45		0.56	0.56	
Sweden	1960-1970	0.85	0.79	0.70	0.57	0.54	0.45	0.78	0.56	0.56
Sweden	1970-1980	0.90	0.85	0.79	0.62	0.57	0.54	0.78	0.78	0.56
Sweden	1980-1990	0.94	0.90	0.85	0.66	0.62	0.57	0.78	0.78	0.78
Sweden	1990-2000	0.95	0.94	0.90	0.76	0.66	0.62	0.78	0.78	0.78
Switzerld.	1940-1950	0.78			0.38			0.22		
Switzerld.	1950-1960	0.82	0.78		0.45	0.38		0.22	0.22	
Switzerld.	1960-1970	0.88	0.82	0.78	0.47	0.45	0.38	0.44	0.22	0.22
Switzerld.	1970-1980	0.92	0.88	0.82	0.54	0.47	0.45	0.44	0.44	0.22
Switzerld.	1980-1990	0.94	0.92	0.88	0.59	0.54	0.47	0.44	0.44	0.44
Switzerld.	1990-2000	0.95	0.94	0.92	0.69	0.59	0.54	0.89	0.44	0.44
Taiwan	1940-1950				0.15					
Taiwan	1950-1960				0.22	0.15				
Taiwan	1960-1970				0.26	0.22	0.15			
Taiwan	1970-1980				0.31	0.26	0.22			
Taiwan	1980-1990				0.40	0.31	0.26	0.00		
Taiwan	1990-2000	0.77			0.47	0.40	0.31	0.67	0.00	
Tanzania	1940-1950				0.22					
Tanzania	1950-1960				0.28	0.22		0.00		
Tanzania	1960-1970	0.01			0.30	0.28	0.22	0.00	0.00	
Tanzania	1970-1980	0.04	0.01		0.32	0.30	0.28	0.00	0.00	0.00
Tanzania	1980-1990	0.13	0.04	0.01	0.32	0.32	0.30	0.00	0.00	0.00
Tanzania	1990-2000	0.10	0.13	0.04	0.36	0.32	0.32	0.00	0.00	0.00

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Thailand	1940-1950	0.05			0.24			0.00		
Thailand	1950-1960	0.07	0.05		0.26	0.24		0.00	0.00	
Thailand	1960-1970	0.12	0.07	0.05	0.29	0.26	0.24	0.00	0.00	0.00
Thailand	1970-1980	0.18	0.12	0.07	0.30	0.29	0.26	0.00	0.00	0.00
Thailand	1980-1990	0.22	0.18	0.12	0.36	0.30	0.29	0.11	0.00	0.00
Thailand	1990-2000	0.33	0.22	0.18	0.39	0.36	0.30	0.22	0.11	0.00
Trinidad-T.	1940-1950				0.27					
Trinidad-T.	1950-1960				0.24	0.27		0.33		
Trinidad-T.	1960-1970	0.70			0.29	0.24	0.27	0.11	0.33	
Trinidad-T.	1970-1980	0.77	0.70		0.33	0.29	0.24	0.22	0.11	0.33
Trinidad-T.	1980-1990	0.81	0.77	0.70	0.38	0.33	0.29	0.44	0.22	0.11
Trinidad-T.	1990-2000	0.88	0.81	0.77	0.42	0.38	0.33	0.44	0.44	0.22
Turkey	1940-1950	0.05			0.19			0.33		
Turkey	1950-1960	0.07	0.05		0.22	0.19		0.22	0.33	
Turkey	1960-1970	0.10	0.07	0.05	0.25	0.22	0.19	0.33	0.22	0.33
Turkey	1970-1980	0.16	0.10	0.07	0.29	0.25	0.22	0.00	0.33	0.22
Turkey	1980-1990	0.32	0.16	0.10	0.34	0.29	0.25	0.22	0.00	0.33
Turkey	1990-2000	0.42	0.32	0.16	0.38	0.34	0.29	0.44	0.22	0.00
Uganda	1940-1950				0.14					
Uganda	1950-1960				0.16	0.14		0.00		
Uganda	1960-1970	0.03			0.24	0.16	0.14	0.00	0.00	
Uganda	1970-1980	0.04	0.03		0.25	0.24	0.16	0.33	0.00	0.00
Uganda	1980-1990	0.10	0.04	0.03	0.28	0.25	0.24	0.00	0.33	0.00
Uganda	1990-2000	0.09	0.10	0.04	0.32	0.28	0.25	0.22	0.00	0.33
Ukraine	1940-1950				0.22					
Ukraine	1950-1960				0.27	0.22				
Ukraine	1960-1970				0.30	0.27	0.22			
Ukraine	1970-1980				0.34	0.30	0.27			
Ukraine	1980-1990				0.37	0.34	0.30	0.44		
Ukraine	1990-2000	0.71			0.42	0.37	0.34	0.56	0.44	
U.K.	1940-1950	0.92			0.37			0.56		
U.K.	1950-1960	0.93	0.92		0.40	0.37		0.56	0.56	
U.K.	1960-1970	0.95	0.93	0.92	0.47	0.40	0.37	0.67	0.56	0.56
U.K.	1970-1980	0.96	0.95	0.93	0.52	0.47	0.40	0.67	0.67	0.56
U.K.	1980-1990	0.97	0.96	0.95	0.57	0.52	0.47	0.67	0.67	0.67
U.K.	1990-2000	0.97	0.97	0.96	0.61	0.57	0.52	0.67	0.67	0.67
U.S.A.	1940-1950	0.81			0.37			0.33		
U.S.A.	1950-1960	0.85	0.81		0.40	0.37		0.33	0.33	
U.S.A.	1960-1970	0.91	0.85	0.81	0.44	0.40	0.37	0.33	0.33	0.33
U.S.A.	1970-1980	0.95	0.91	0.85	0.47	0.44	0.40	0.33	0.33	0.33
U.S.A.	1980-1990	0.97	0.95	0.91	0.51	0.47	0.44	0.44	0.33	0.33
U.S.A.	1990-2000	0.97	0.97	0.95	0.54	0.51	0.47	0.67	0.44	0.33
Uruguay	1940-1950	0.49			0.33			0.33		
Uruguay	1950-1960	0.63	0.49		0.38	0.33		0.44	0.33	
Uruguay	1960-1970	0.71	0.63	0.49	0.43	0.38	0.33	0.00	0.44	0.33
Uruguay	1970-1980	0.77	0.71	0.63	0.46	0.43	0.38	0.00	0.00	0.44
Uruguay	1980-1990	0.83	0.77	0.71	0.52	0.46	0.43	0.78	0.00	0.00
Uruguay	1990-2000	0.83	0.83	0.77	0.56	0.52	0.46	0.67	0.78	0.00
Venez.	1940-1950	0.20			0.25			0.00		

COUNTRY	DECADE	TecPro T_0	TecPro T_{-1}	TecPro T_{-2}	EmaVal T_0	EmaVal T_{-1}	EmaVal T_{-2}	CivEnt T_0	CivEnt T_{-1}	CivEnt T_{-2}
Venez.	1950-1960	0.29	0.20		0.30	0.25		0.56	0.00	
Venez.	1960-1970	0.41	0.29	0.20	0.32	0.30	0.25	0.44	0.56	0.00
Venez.	1970-1980	0.53	0.41	0.29	0.34	0.32	0.30	0.44	0.44	0.56
Venez.	1980-1990	0.69	0.53	0.41	0.38	0.34	0.32	0.33	0.44	0.44
Venez.	1990-2000	0.78	0.69	0.53	0.44	0.38	0.34	0.22	0.33	0.44
Vietnam	1940-1950				0.25			0.00		
Vietnam	1950-1960				0.26	0.25		0.00	0.00	
Vietnam	1960-1970				0.27	0.26	0.25	0.00	0.00	0.00
Vietnam	1970-1980	0.17			0.29	0.27	0.26	0.00	0.00	0.00
Vietnam	1980-1990	0.24	0.17		0.32	0.29	0.27	0.00	0.00	0.00
Vietnam	1990-2000	0.34	0.24	0.17	0.38	0.32	0.29	0.00	0.00	0.00
Zambia	1940-1950				0.32					
Zambia	1950-1960				0.31	0.32		0.00		
Zambia	1960-1970	0.09			0.31	0.31	0.32	0.00	0.00	
Zambia	1970-1980	0.15	0.09		0.36	0.31	0.31	0.00	0.00	0.00
Zambia	1980-1990	0.22	0.15	0.09	0.37	0.36	0.31	0.00	0.00	0.00
Zambia	1990-2000	0.23	0.22	0.15	0.40	0.37	0.36	0.11	0.00	0.00
Zimbabwe	1940-1950				0.21					
Zimbabwe	1950-1960				0.22	0.21				
Zimbabwe	1960-1970				0.22	0.22	0.21			
Zimbabwe	1970-1980				0.27	0.22	0.22	0.22		
Zimbabwe	1980-1990	0.28			0.29	0.27	0.22	0.00	0.22	
Zimbabwe	1990-2000	0.21	0.28		0.31	0.29	0.27	0.00	0.00	0.22
MEAN		0.50	0.46	0.42	0.36	0.34	0.32	0.30	0.27	0.23
SD		0.32	0.31	0.30	0.12	0.11	0.10	0.30	0.29	0.28
MINIMUM		0.00	0.00	0.00	0.10	0.10	0.10	0.00	0.00	0.00
MAXIMUM		0.97	0.97	0.96	0.76	0.66	0.62	1.00	1.00	0.89

Arrangement of Countries into Culture Zones of Figure 3

Old Catholic West: Austria, Belgium, (Cyprus), France, (Greece), (Israel), Italy, Malta, Portugal, Spain.

Old Protestant West: Denmark, Finland, Germany (W.), Iceland, Netherlands, Norway, Sweden, Switzerland.

English West: Australia, Canada, Ireland, New Zealand, UK, USA.

Ex-communist West: Croatia, Czech R., Estonia, Germany (E.), Hungary, Latvia, Lithuania, Poland.

Ex-communist East: Albania, Belarus, Bulgaria, Kyrgyzstan, Macedonia, Moldova, Romania, Russia, Ukraine.

MENA-Region: Algeria, Egypt, Iran, Iraq, Jordan, Morocco, Saudi Arabia, Turkey.

South Asia: Bangladesh, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Thailand.

East Asia: China, Japan, South Korea, Taiwan, Vietnam.

Latin America: Argentina, Brazil, Chile, Colombia, Dominican R., El Salvador, Guatemala, Mexico, Peru, Trinidad-Tobago, Uruguay, Venezuela.

Sub-Saharan Africa: Burkina Faso, Ethiopia, Ghana, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Zambia, Zimbabwe.

Appendix 7: Results from Multiple Imputations and 'SUR'

Based on the data matrix displayed in the table above, I ran a standard, multiple imputation algorithm in SPSS to replace missing values with expected values. For each missing values five different estimates are produced based on confidence intervals, yielding five different data matrices. Each of these data matrices is complete, including (85 * 6 =) 510 country-per-decade observations. I reran with each of these five datasets the same three panel regressions as in Table 1, using panel-corrected standard errors. Also, with each of the five impute datasets I ran a 'seemingly unrelated regression' (SUR) in which the three panel regressions among technological progress, emancipative values, and civic entitlements are defined as parts one integrated system of equations. This procedure takes care of correlated error terms between the three regressions (Greene 2003). Appendix-Tables 9 and 10 display the results. They are practically identical to those in Table 1 of the article, confirming the same pattern of reciprocity and dominant flow of causality.

Appendix-Table 9. PCSE Regressions with Imputed Data

IMPUTATION 1		*Dependent Variables*:	
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	.99***	.90***	.41***
Technological Progress at T_{-1}		.08***	.35***
Emancipative Values at T_{-1}	.04		.58***
Civic Entitlements T_{-1}	- .02†	.01†	
Constant	.13***	.07***	- .13***
Adj. R^2	.93	.91	.70

IMPUTATION 2		*Dependent Variables*:	
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	.95***	.91***	.35***
Technological Progress at T_{-1}		.09***	.32***
Emancipative Values at T_{-1}	.13**		.68***
Civic Entitlements T_{-1}	- .01†	- .00†	
Constant	¤ .11***	.06***	- .14***
Adj. R^2	.93	¤ .91	.69

IMPUTATION 3		*Dependent Variables*:	
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	.93***	.91***	.39***
Technological Progress at T_{-1}		.08***	.32***
Emancipative Values at T_{-1}	.24***		.64***
Civic Entitlements T_{-1}	- .02†	.01†	
Constant	.08***	.06***	- .13***
Adj. R^2	.93	.91	.71

IMPUTATION 4	*Dependent Variables*:		
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	.95***	.90***	.39***
Technological Progress at T_{-1}		.08***	.28***
Emancipative Values at T_{-1}	.11*		.72***
Civic Entitlements T_{-1}	- .01†	.01†	
Constant	.12***	.07***	- .15***
Adj. R^2	.93	.90	.70
IMPUTATION 5	*Dependent Variables*:		
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	.95***	.91***	.35***
Technological Progress at T_{-1}		.08***	.35***
Emancipative Values at T_{-1}	.07†		.58***
Civic Entitlements T_{-1}	.00†	.01†	
Constant	.13***	.07***	- .11***
Adj. R^2	.93	.90	.68
N (observations)	510 country-per-decade units (85 countries over 6 decades)		

Appendix-Table 10. SUR-Regressions with Imputed Data

IMPUTATION 1	*Dependent Variables*:		
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	1.01***	.92***	.42***
Technological Progress at T_{-1}		.08***	.33***
Emancipative Values at T_{-1}	.00†		.55***
Civic Entitlements T_{-1}	- .03†	.00†	
Constant	.14***	.07***	- .12***
Adj. R^2	.93	.91	.70

IMPUTATION 2	*Dependent Variables*:		
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	.96***	.92***	.36***
Technological Progress at T_{-1}		.08***	.31***
Emancipative Values at T_{-1}	.09†		.67***
Civic Entitlements T_{-1}	- .01†	- .00†	
Constant	¤ .12***	.06***	- .13***
Adj. R^2	.93	.91	.69

IMPUTATION 3	*Dependent Variables*:		
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	.93***	.93***	.40***
Technological Progress at T_{-1}		.07***	.31***
Emancipative Values at T_{-1}	.21***		.64***
Civic Entitlements T_{-1}	- .03†	.01†	
Constant	.09***	.06***	- .13***
Adj. R^2	.93	.91	.71

IMPUTATION 4	*Dependent Variables*:		
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0

Dependent Variable at T_{-2}	.97***	.91***	.41***
Technological Progress at T_{-1}		.08***	.28***
Emancipative Values at T_{-1}	.09*		.70***
Civic Entitlements T_{-1}	- .02†	.01†	
Constant	.12***	.07***	- .14***
Adj. R^2	.93	.90	.70
IMPUTATION 5		*Dependent Variables*:	
Predictors:	Technol. Progress at T_0	Emancipative Values at T_0	Civic Entitlements at T_0
Dependent Variable at T_{-2}	.96***	.91***	.36***
Technological Progress at T_{-1}		.08***	.33***
Emancipative Values at T_{-1}	.07†		.58***
Civic Entitlements T_{-1}	- .01†	.00†	
Constant	.14***	.06***	- .11***
Adj. R^2	.93	.90	.68
N (observations)	510 country-per-decade units (85 countries over 6 decades)		

Appendix 8: Data for the Multi-level Models in Table 2

The multi-level models in Table 2 of the manuscript test if the action resources that technological progress plays into ordinary people's hand shape these people's emancipative values more strongly via the parts of these resources that people have in common with most others in their country or the part that is unique to them. To this, each of the three types action resources--including material, intellectual, and connective resources--is introduced at both the individual level and the country level. The individual-level measure are then centered on the country means because this separates the within-country variation in each type of resource from the between-country variation. Thus, there is no variance overlap between the individual-level and country-level resource measures.

The individual-level measure of material resources is a respondent's household income, measured on a 10-point scale. The relevant question in the 2005 WVS-questionnaire is V116. The individual-level measure of intellectual resources is a respondent's level of education, measured on 9-point scale from no formal education to a university degree. The respective question in the 2005 WVS-questionnaire is V238. The individual-level measure of connective resources is a 9-point index of informational connectedness, which measures the variety of sources a respondent uses to obtain information, in ascending order on an nine-point scale from no source to eight sources. The respective questions in the WVS 2005 questionnaire are V223 to V230.

At the country level, I measure material resources by the per capita Gross Domestic Product (GDP) in US-Dollars at power purchasing parities. Data are from the year of the survey and the source is the World Bank's (2012) Development Indicator Series. Intellectual resources at the country-level are a national adult population's mean years of schooling at the time of the survey. Data are taken from Barro and Lee's (2000) International Data on Educational Attainment Dataset. Connective resources at the country level are the number of internet hosts per 1,000 inhabitants in a country. To obtain a summary measure of all three types of action resources at the country level, I use two options. For one, I create a factor combined measure of material resources (GDP/pc.), intellectual resources (schooling years), and connective resources (internet hosts), since all three represent a single underlying dimension, with factor loadings of .90 for schooling years, .95 for GDP/p.c., and .95 for internet hosts and a shared variance of 88 percent among the three variables (N = 83). Next, I use the technological progress index introduced in Appendix 1 as a proxy for all three types of action resources because indeed technological progress correlates closely with all three of them as well as with their factor combination: the correlation is .92 with schooling years (N = 92), .76 with GDP/p.c. (N = 142), .79 with internet hosts (N = 137) and .93 with the factor summary of all three resources (N = 87).

All the variables at both levels of analyses are standardized into a scale range from minimum 0 to maximum 1.0. This makes the size of unstandardized regression coefficients comparable across variables originally measured in different units.

Appendix 9: The Cool-Water Index

Climate Zones (Köppen-Geiger)

To capture the developmentally relevant features of a society's natural environment, I use data based on the Köppen-Geiger climate zone classification published by Gallup, Mellinger and Sachs (2010) in the Harvard Geography Datasets. The same classification is applied in two ways: (1) fraction of the area of a society located in each climate zone; (2) fraction of a society's population located in each climate zone. Since the first version is a more purely natural measure, it is more certainly prior to developmental factors with a direct human cause.

Of course, there has been climate change in the past but on the time scale of human history, these changes have been much slower than the transformations of human societies. This justifies two important conclusions as concerns the climate data. First, for most of the time scope of our analyses, climate zone locations can be considered as rather invariant (especially as concerns the first, purely territorial, version of the climate zone measures). Second, climate zone characteristics are first causes in the sense that they are prior to any human cause. Hence, any correlation pattern we find between climatic characteristics and societal characteristics must be interpreted as an effect of nature on society rather than the other way round.

Based on the correlation pattern shown in Appendix-Table 11 below, I create impact-weighted summary indices for climate zones, as specified in Appendix-Table 12. This is done to summarize climatic features in ways that reflect their relative technological impact.

Appendix-Table11. Correlation of the Human Empowerment Components with Köppen-Geiger Climate Zones

	Technological Progress		Emancipative Values		Civic Entitlements	
CLIMATE ZONES:	A	B	A	B	A	B
Tropical: Rainforest[1)]	- .16*	- .18**	- .13	- .14	- .09	- .11
Tropical: Monsoon[2)]	- .04	- .08	- .10	- .03	- .00	- .00
Tropical: Savannah[3)]	- .45***	- .45***	- .26**	- .26**	- .26***	- .25***
Arid: Desert[4)]	- .13	- .12	- .37***	- .34***	- .37***	- .34***
Arid: Steppe[5)]	- .27***	- .28***	- .31***	- .41***	- .13	- .20**
Temperate: Dry Summer[6)]	.15*	.13	.01	.05	.16**	.08
Temperate: Dry Winter[7)]	- .27**	- .26***	- .16	- .19*	- .16*	- .17**
Temperate: No Dry Season[8)]	.58***	.61***	.61***	.63***	.62***	.64***
Cold: Dry Season[9)]	.09	.09	- .07	- .03	- .12	- .08
Cold: No Dry Season[10)]	.36***	.36***	.18*	.20*	.25***	.24***
Polar[11)]	.27***	.13	.36***	.18	.23**	.16
N (societies)	134		89		151	

Notes: A - Measure relates to fraction of a society's **territory** in respective climate zone.
B - Measure relates to fraction of a society's **population** in respective climate zone.

1) Zone '**Af**'
2) Zone '**Am**'
3) Zone '**Aw**'
4) Zone '**Bw**'
5) Zone '**Bs**'
6) Zone '**Cs**'
7) Zone '**Cw**'
8) Zone '**Cf**'
9) Zone '**Dw**'
10) Zone '**Df**'
11) Zone '**E**' in the Köppen-Geiger classification.

For the criteria of the Köppen-Geiger classification, see Peel, Finlayson and McMahon (2007: 1636).

Technological Progress, Emancipative Values, and Civic Entitlements are measured as described in Appendix 1 to 3.

Significance Levels (two-tailed): † $p \geq .100$, * $p < .100$, ** $p < .050$, *** $p < .005$.

Appendix-Table 12. Correlation of the Human Empowerment Components with Climate Zone Summaries

CLIMATE ZONES:	Technological Progress A	Technological Progress B	Emancipative Values A	Emancipative Values B	Civic Entitlements A	Civic Entitlements B
Rainy & Cool (RC)[1)]	.69***	.72***	.66***	.69***	.68***	.67***
Dry & Hot (DH)[2)]	- .60***	- .63***	- .39***	- .45***	- .35***	- .38***
Rainy & Cool vs. Dry & Hot[3)]	.75***	.77***	.64***	.68***	.62***	.64***
N (societies)	134		89		151	

Notes: A - Measure relates to fraction of a society's **territory** in respective climate zone.
B - Measure relates to fraction of a society's **population** in respective climate zone.

Letter-abbreviations for climate zones in the formula below refer to the notes 1) to 11) in the footer of Appendix-Table 11. Zones are combined in an impact-weighted manner: impact factors represent the partial effects of the combined zones (partial *r*) obtained from regressing technological progress on these zones. Sum is divided by the sum of impact weights to keep index scores (fractions) in a 0-to-1.0 range.

1) Index of *rainy/cool climates*: RC = (**cf**_zone * 0.53 + **df**_zone * 0.40) / 0.93.

2) Index of *dry/hot climates*: DH = (**aw**_zone * 0.35 + **bs**_zone * 0.26 + **cw**_zone * 0.28) / 0.89.

3) Index of *rainy/cool-vs.-dry/hot climates*: RC_DH = (RC + (1 – DH)) / 2.

For the criteria of the Köppen-Geiger classification, see Peel, Finlayson and McMahon (2007: 1636).

Technological Progress, Emancipative Values, and Civic Entitlements are measured as described in Appendix 1 to 3.

Significance Levels (two-tailed): † $p \geq 0.100$, * $p < 0.100$, ** $p < 0.050$, *** $p < 0.005$.

The 'cool-water' condition (CW-condition) is supposed to measure water autonomy: equal and easy access to fresh and clean water resources to the individuals on the territory of a given society. The index of rainy/cool-vs.-dry/hot climates introduced in Appendix-Table 12 already depicts a considerable proportion of this condition. Yet, variation on the rainy/cool-vs.-dry/hot index does by no means capture all variation in continuous rainfall and proximity of ice-free waterways. Taking from Parker (2000) the monthly minimum rainfall (average across a society's whole territory in a year's driest month), measured as a fraction of the maximum, and from Gallup, Mellinger and Sachs (2010), the fraction of a society's territory in less than a hundred kilometres distance from ice-free waterways, whether rivers or oceans, the rainy/cool-vs.-dry/hot index correlates with minimum rainfall at $r = .45$ ($N = 158$; $p < .001$, two-tailed) and at $r = .35$ ($N = 159$, $p < .001$, two-tailed) with waterway proximity. As expected, these correlations are positive and highly significant but from their strength we can calculate that about eighty per cent of the variation in minimum rainfall and eighty-eight per cent of the variation in waterway proximity are uncovered by the rainy/cool-vs.-dry/hot index. To measure water autonomy in the intended way, this uncovered variation should be incorporated.

To do so, I weight the rainy/cool-vs.-dry/hot territorial fraction measure ('rc-vs.-dh'), the minimum rainfall measure, and the waterway proximity measure for their partial impact on technological progress and recombine the impact-weighed measures additively. This is done after transforming each of the three variables into an index with minimum 0 and maximum 1.0:

CW-Index = (.69 * rc-vs.-dh + .40 * waterway proximity + .26 * minimum rainfall) / 1.35.

This procedure differentiates the three components for their relative importance and their separate contribution to technological progress. Impact factors are obtained by regressing technological progress simultaneously on the three components, using the partial regression coefficients. The resulting CW-Index is available for 172 countries.

Appendix-Table 13. Data for the CW-Condition and Its Components

COUNTRY	Fraction of inhabited territory with cool/rainy conditions in excess of fraction in hot/dry conditions	Fraction of territory in 100 km reach of ice-free waterways	Index of minimum rainfall in driest month	Cool-Water (CW) Index
Afghanistan	0.38	0.00	0.00	0.19
Albania	0.43	0.80	0.16	0.49
Algeria	0.37	0.68	0.00	0.39
Andorra	1.00	0.90	0.17	0.81
Angola	0.11	0.24	0.00	0.13
Argentina	0.73	0.32	0.28	0.52
Armenia	0.43	0.00	0.04	0.23
Australia	0.87	0.83	0.20	0.73
Austria	0.95	0.71	0.19	0.73
Azerbaijan	0.31	0.00	0.04	0.17
Bahrain	0.43	1.00	0.00	0.52
Bangladesh	0.06	0.98	0.01	0.32
Belarus	0.88	0.90	0.18	0.75
Belgium	1.02	0.99	0.26	0.87
Belize	0.27	1.00	0.28	0.49
Benin	0.06	0.51	0.06	0.19
Bhutan	0.15	0.45	0.01	0.22
Bolivia	0.33	0.02	0.04	0.18
Bosnia	0.57	0.82	0.16	0.57
Botswana	0.14	0.00	0.00	0.07
Brazil	0.29	0.37	0.20	0.30
Brunei	0.43	1.00	0.65	0.64
Bulgaria	0.98	0.60	0.14	0.70
Burkina Faso	0.13	0.00	0.00	0.07
Burma	0.24	0.33	0.01	0.22
Burundi	0.08	0.00	0.02	0.05
Cambodia	0.18	0.67	0.03	0.29
Cameroon	0.24	0.15	0.11	0.19
Canada	0.82	0.68	0.28	0.68
CAR	0.04	0.00	0.02	0.02
Cabo Verde	0.03	1.00	0.00	0.31
Chad	0.20	0.00	0.00	0.10
Chile	0.42	0.41	0.01	0.34
China	0.48	0.45	0.01	0.38
Colombia	0.26	0.25	0.25	0.26
Congo	0.08	0.18	0.00	0.09
Costa Rica	0.09	1.00	0.02	0.34
Cote Divoire	0.04	0.37	0.20	0.17
Croatia	0.84	1.00	0.23	0.77
Cuba	0.03	1.00	0.23	0.36
Cyprus	0.43	1.00	0.00	0.52
Czechia	1.02	0.75	0.09	0.76
Denmark	1.02	1.00	0.16	0.85
Djibouti	0.43	1.00	0.00	0.51

COUNTRY	Fraction of inhabited territory with cool/rainy conditions in excess of fraction in hot/dry conditions	Fraction of territory in 100 km reach of icefree waterways	Index of minimum rainfall in driest month	Cool-Water (CW) Index
Dominica	0.03	1.00	0.30	0.37
Dominican Rep.	0.03	1.00	0.18	0.35
Ecuador	0.33	0.51	0.10	0.34
Egypt	0.43	0.99	0.00	0.51
El Salvador	0.04	0.98	0.02	0.31
Eq. Guinea	0.43	0.61	0.02	0.40
Eritrea	0.34	0.77	0.00	0.40
Estonia	0.88	0.66	0.18	0.68
Ethiopia	0.38	0.02	0.02	0.20
Finland	0.87	0.64	0.18	0.67
France	0.97	0.90	0.17	0.79
Gabon	0.16	0.28	0.01	0.17
Gambia	0.03	1.00	0.00	0.31
Germany (E.)	1.00	0.95	0.19	0.83
Germany (W.)	1.00	0.95	0.19	0.83
Georgia	0.62	0.27	0.07	0.41
Ghana	0.05	0.45	0.07	0.17
Greece	0.48	0.97	0.03	0.54
Guatemala	0.18	0.70	0.01	0.30
Guinea	0.17	0.25	0.01	0.16
Guinea-Bissau	0.03	0.99	0.00	0.31
Guyana	0.41	0.43	0.37	0.41
Haiti	0.03	1.00	0.16	0.35
Honduras	0.37	0.69	0.00	0.40
Hungary	0.99	0.93	0.16	0.81
Iceland	0.88	0.90	0.21	0.76
India	0.12	0.38	0.01	0.18
Indonesia	0.38	0.95	0.21	0.52
Iran	0.31	0.06	0.01	0.18
Iraq	0.39	0.06	0.00	0.22
Ireland	1.02	0.94	0.22	0.84
Israel	0.40	0.96	0.00	0.49
Italy	0.64	0.91	0.07	0.61
Jamaica	0.03	1.00	0.07	0.33
Japan	0.99	0.97	0.24	0.84
Jordan	0.29	0.04	0.00	0.16
Kazakhstan	0.33	0.00	0.02	0.17
Kenya	0.17	0.08	0.07	0.13
North Korea	0.43	0.84	0.05	0.48
South Korea	0.48	0.94	0.10	0.54
Kuwait	0.43	1.00	0.00	0.51
Kyrgyzstan	0.39	0.00	0.11	0.22
Laos	0.07	0.08	0.01	0.06
Latvia	0.89	0.44	0.18	0.62
Lebanon	0.43	1.00	0.00	0.51
Lesotho	1.00	0.00	0.04	0.52

COUNTRY	Fraction of inhabited territory with cool/rainy conditions in excess of fraction in hot/dry conditions	Fraction of territory in 100 km reach of icefree waterways	Index of minimum rainfall in driest month	Cool-Water (CW) Index
Liberia	0.26	0.66	0.15	0.36
Libya	0.37	0.61	0.00	0.37
Liechtenstein	0.95	0.71	0.32	0.76
Lithuania	0.90	0.84	0.18	0.74
Luxembourg	1.02	1.00	0.21	0.86
Maced.	0.89	0.17	0.16	0.54
Madagascar	0.21	0.50	0.04	0.26
Malawi	0.11	0.00	0.00	0.06
Malaysia	0.43	0.89	0.49	0.58
Malta	0.43	1.00	0.00	0.52
Mauritania	0.33	0.16	0.00	0.22
Mexico	0.34	0.29	0.02	0.26
Moldova	0.43	1.00	0.15	0.54
Mongolia	0.35	0.00	0.00	0.18
Monaco	0.75	1.00	0.10	0.70
Morocco	0.39	0.60	0.00	0.38
Mozambique	0.06	0.50	0.06	0.19
Namibia	0.16	0.04	0.00	0.10
Nepal	0.13	0.06	0.01	0.09
The Netherlands	1.02	1.00	0.20	0.86
New Zealand	1.01	0.99	0.40	0.89
Nicaragua	0.20	0.71	0.00	0.31
Niger	0.17	0.00	0.00	0.09
Nigeria	0.15	0.32	0.12	0.19
Norway	0.91	0.85	0.13	0.74
Oman	0.43	0.52	0.00	0.37
Pakistan	0.31	0.09	0.06	0.20
Panama	0.30	1.00	0.05	0.46
Papua-New Guin.	0.39	0.67	0.09	0.42
Paraguay	0.17	0.51	0.19	0.27
Peru	0.40	0.49	0.00	0.35
Philippines	0.41	1.00	0.06	0.52
Poland	0.91	0.88	0.15	0.76
Portugal	0.43	0.87	0.01	0.48
Qatar	0.43	1.00	0.00	0.51
Romania	0.87	0.52	0.13	0.62
Russia	0.79	0.07	0.18	0.46
Rwanda	0.17	0.00	0.03	0.10
Saudi Arabia	0.43	0.23	0.00	0.29
Senegal	0.10	0.82	0.00	0.30
Sierra Leone	0.26	0.50	0.01	0.28
Singapore	0.40	1.00	0.49	0.60
Slovakia	0.86	0.76	0.13	0.69
Slovenia	1.01	0.98	0.23	0.85
Somalia	0.29	0.60	0.00	0.33
South Africa	0.45	0.38	0.04	0.35

COUNTRY	Fraction of inhabited territory with cool/rainy conditions in excess of fraction in hot/dry conditions	Fraction of territory in 100 km reach of icefree waterways	Index of minimum rainfall in driest month	Cool-Water (CW) Index
Spain	0.61	0.66	0.05	0.52
Sri Lanka	0.03	0.99	0.34	0.38
Sudan	0.27	0.02	0.00	0.14
Suriname	0.43	0.76	0.37	0.52
Swaziland	0.68	0.38	0.10	0.48
Sweden	0.94	0.70	0.12	0.71
Switzerland	0.59	0.39	0.32	0.48
Syria	0.36	0.24	0.00	0.26
Taiwan	0.47	1.00	0.33	0.60
Tajikistan	0.27	0.00	0.01	0.14
Tanzania	0.05	0.16	0.00	0.07
Thailand	0.10	0.40	0.02	0.17
Togo	0.06	0.42	0.07	0.17
Trinidad-T.	0.43	1.00	0.20	0.55
Tunisia	0.37	0.85	0.01	0.44
Turkey	0.40	0.53	0.05	0.37
Turkmenistan	0.38	0.00	0.02	0.20
Uganda	0.06	0.00	0.23	0.07
Ukraine	0.56	0.71	0.15	0.52
UAE	0.43	0.78	0.00	0.45
U.K.	1.02	1.00	0.18	0.85
U.S.A.	0.82	0.65	0.33	0.68
Uruguay	1.02	0.80	0.33	0.82
Uzbekistan	0.31	0.00	0.02	0.16
Venezuela	0.23	0.83	0.05	0.37
Vietnam	0.11	0.92	0.09	0.34
Yemen	0.43	0.39	0.00	0.33
Serbia	0.50	0.58	0.23	0.47
Montenegro	0.46	0.60	0.23	0.46
Zaire	0.17	0.03	0.01	0.10
Zambia	0.12	0.00	0.00	0.06
Zimbabwe	0.12	0.00	0.00	0.06
Palestine	0.29	0.40	0.00	0.27
MEAN	0.44	0.63	0.14	0.42
SD	0.31	0.37	0.17	0.23
MINIMUM	0.03	0.00	0.00	0.02 (CAR)
MAXIMUM	1.00	1.00	1.00	0.89 (New Zealand)

Appendix 10: Disease Security Index

To measure disease security, I use the historic pathogen incidence data published by Murray and Schaller (2011). I use their historic instead of their contemporary disease data because I intend to analyse these data on the condition that they have a causally prior status to later measures of development. Before using the data, I invert them so that higher scores indicate more disease security; as with all our variables, scale range is normalized from minimum 0 to maximum 1.0. Data are available for 187 countries. Appendix-Table 14 displays the data.

As these data correlate closely with rather invariant climatic features and more closely so than with a society's affluence, we can safely assume that these disease data indicate a society's *naturally induced* disease burden: they are *not endogenous* to development. For instance, the disease security index correlates at $r = .74$ with the countries' scores on the rainy/cool-vs.-dry/hot climate index ($N = 165$; significant at $p < .001$, two-tailed) before controlling the countries' per capita GDP in 1960 and at $r_{\text{partial}} = .50$ *after* controlling for per capita GDP ($N = 87$; significant at $p < .001$, two-tailed). The partial correlation of per capita GDP with disease security is much smaller: .39.[24]

[24] GDP data are from the World Bank's (2012) Development Indicators Series and measured at purchasing power parities in US-Dollars. I had to use the earliest available GDP measure because the disease security data are historic.

Appendix-Table 14. Data for Disease Security

COUNTRY	Murray % Schaller's Original Disease Data	Disease Data Inverted and Normalized
Afghanistan	0.15	0.45
Albania	0.00	0.50
Algeria	0.63	0.29
Andorra	-1.05	0.85
Angola	0.93	0.19
Antigua-B.	-0.27	0.59
Argentina	0.00	0.50
Armenia	0.15	0.45
Australia	-0.14	0.55
Austria	-0.65	0.72
Azerbaijan	0.29	0.40
Bahamas	-0.51	0.67
Bahrain	0.15	0.45
Bangladesh	0.66	0.28
Barbados	-0.15	0.55
Belarus	-0.78	0.76
Belgium	-0.78	0.76
Belize	0.28	0.41
Benin	1.07	0.14
Bhutan	0.27	0.41
Bolivia	0.30	0.40
Bosnia	0.03	0.49
Botswana	0.39	0.37
Brazil	1.06	0.15
Brunei	0.00	0.50
Bulgaria	-0.10	0.53
Burkina Faso	1.19	0.10
Burma	0.53	0.32
Burundi	1.07	0.14
Cambodia	0.28	0.41
Cameroon	1.20	0.10
Canada	-1.18	0.89
CAR	1.19	0.10
Cabo Verde	-0.26	0.59
Chad	1.04	0.15
Chile	-0.22	0.57
China	1.03	0.16
Colombia	0.53	0.32
Comoros	-0.25	0.58
Congo	1.19	0.10
Costa Rica	0.18	0.44
Cote Divoire	1.06	0.15
Croatia	-0.38	0.63
Cuba	0.00	0.50
Cyprus	-0.25	0.58
Czech R.	-0.78	0.76

COUNTRY	Murray % Schaller's Original Disease Data	Disease Data Inverted and Normalized
Denmark	-0.91	0.80
Djibouti	0.50	0.33
Dominica	-0.02	0.51
Dominican R.	-0.13	0.54
Ecuador	0.30	0.40
Egypt	0.76	0.25
El Salvador	0.42	0.36
Eq. Guinea	0.93	0.19
Eritrea	0.37	0.38
Estonia	-0.78	0.76
Ethiopia	0.77	0.24
Fiji	-0.39	0.63
Finland	-0.78	0.76
France	-0.40	0.63
Gabon	1.19	0.10
Gambia	0.92	0.19
Germany (E.)	-0.78	0.76
Germany (W.)	-0.78	0.76
Georgia	0.16	0.45
Ghana	1.19	0.10
Greece	0.29	0.40
Grenada	-0.53	0.68
Guatemala	0.56	0.31
Guinea	1.06	0.15
Guinea-B.	1.06	0.15
Guyana	0.64	0.29
Haiti	-0.01	0.50
Honduras	0.16	0.45
Hungary	-0.78	0.76
Iceland	-1.18	0.89
India	0.91	0.20
Indonesia	0.51	0.33
Iran	-0.16	0.55
Iraq	0.40	0.37
Ireland	-0.23	0.58
Israel	0.53	0.32
Italy	0.40	0.37
Jamaica	0.25	0.42
Japan	0.25	0.42
Jordan	0.39	0.37
Kazakhstan	-0.38	0.63
Kenya	0.92	0.19
Kiribati	-0.53	0.68
North Korea	-0.14	0.55
South Korea	-0.28	0.59
Kuwait	-0.25	0.58
Kyrgyzstan	-0.38	0.63
Laos	0.28	0.41

COUNTRY	Murray % Schaller's Original Disease Data	Disease Data Inverted and Normalized
Latvia	-0.78	0.76
Lebanon	0.65	0.28
Lesotho	-0.13	0.54
Liberia	0.80	0.23
Libya	0.24	0.42
Liechtenstein	-1.05	0.85
Lithuania	-0.78	0.76
Luxembourg	-0.91	0.80
Macedonia	0.03	0.49
Madagascar	0.51	0.33
Malawi	0.64	0.29
Malaysia	0.51	0.33
Maldives	-0.90	0.80
Malta	-0.50	0.67
Marshall	-0.25	0.58
Mauritania	0.26	0.41
Mauritius	0.11	0.46
Mexico	0.56	0.31
Micronesia	-0.11	0.54
Moldova	-0.37	0.62
Mongolia	-0.78	0.76
Monaco	-0.65	0.72
Morocco	0.62	0.29
Mozambique	0.93	0.19
Namibia	-0.25	0.58
Nauru	-0.80	0.77
Nepal	-0.12	0.54
The Netherlands	-0.78	0.76
New Zealand	-0.91	0.80
Nicaragua	0.16	0.45
Niger	0.52	0.33
Nigeria	1.19	0.10
Norway	-0.91	0.80
Oman	0.00	0.50
Pakistan	-0.12	0.54
Palau Isld.	-0.38	0.63
Panama	0.31	0.40
Papua-N.	0.15	0.45
Paraguay	0.17	0.44
Peru	0.16	0.45
Philippines	0.51	0.33
Poland	-0.78	0.76
Portugal	0.63	0.29
Qatar	-0.25	0.58
Reunion	-0.25	0.58
Romania	-0.37	0.62
Russia	-0.64	0.71
Rwanda	1.05	0.15

COUNTRY	Murray % Schaller's Original Disease Data	Disease Data Inverted and Normalized
Samoa	-0.41	0.64
Sao Tome	-0.19	0.56
Saudi Arabia	0.24	0.42
Senegal	0.78	0.24
Seychelles	-0.63	0.71
Sierra Leone	0.92	0.19
Singapore	0.26	0.41
Slovakia	-0.78	0.76
Slovenia	-0.78	0.76
Somalia	0.64	0.29
Solomon Isld.	-0.12	0.54
South Africa	0.00	0.50
Spain	0.13	0.46
Sri Lanka	0.52	0.33
Sudan	1.15	0.12
Suriname	0.67	0.28
Swaziland	0.13	0.46
Sweden	-0.91	0.80
Switzerland	-1.05	0.85
Syria	0.41	0.36
Taiwan	0.25	0.42
Tajikistan	0.02	0.49
Tanzania	0.66	0.28
Thailand	0.52	0.33
Togo	1.19	0.10
Tonga	-0.67	0.72
Trinidad-T.	-0.01	0.50
Tunisia	0.90	0.20
Turkey	0.40	0.37
Turkmenistan	0.02	0.49
Tuvalu	-0.93	0.81
Uganda	1.05	0.15
Ukraine	-0.64	0.71
UAE	-0.39	0.63
U.S.A.	-0.64	0.71
Uruguay	0.53	0.32
Uzbekistan	-0.37	0.62
Vanuatu	-0.13	0.54
Venezuela	0.80	0.23
Vietnam	0.64	0.29
Yemen	0.23	0.42
Zaire	0.95	0.18

COUNTRY	Murray % Schaller's Original Disease Data	Disease Data Inverted and Normalized
Zambia	0.52	0.33
Zimbabwe	0.53	0.32
Hong Kong	0.37	0.38
MEAN	0.10	0.47
SD	0.63	0.21
MINIMUM	-1.18	0.10 (Congo)
MAXIMUM	1.20	0.89 (Canada)

Appendix 11: Geographic Distance/Proximity Index

The origin of modern homo sapiens sapiens is supposedly in East Africa, most likely Ethiopia (Oppenheimer 2004). On their way out of Africa, the migratory distance from Ethiopia was one determinant of when modern humans began to populate an area. To measure each country's migratory distance from Africa, I calculate the country centroids combined longitudinal and latitudinal distance from the centroid of Ethiopia. Data for the country centroids' longitudinal and latitudinal positions are taken from Gallup, Mellinger and Sachs (2010). These data were first centered on the longitudinal and latitudinal position of Ethiopia, measuring deviations from it. Then the longitudinal and latitudinal deviations were standardized into the same scale range from minimum 0 to maximum 1.0. Finally, the two standardized distances were averaged. This is my migratory distance index. The inverse of this index is the migratory proximity index. The migratory proximity is a proxy and the migratory distance index an inverse proxy for how early modern humans began to populate an area. Data are displayed in Appendix-Table 15 below and are available for 196 countries.

Appendix-Table 15. Data Matrix underlying Path Analysis in Figure 4

COUNTRY	Distance from Human Origin (prehistoric)	Estimated Human Arrival	Cool-Water Index (historic)	Disease Security Index (historic)	Fertility Control Index 1980	Technological Progress Index 2005
Afghanistan	0.31	40,000	0.23	0.45	0.16	
Albania	0.35	50,000	0.46	0.50	0.66	0.39
Algeria	0.31	40,000	0.37	0.29	0.28	0.36
Andorra		35,000	0.80	0.85		1.01
Angola	0.12	90,000	0.13	0.19	0.23	0.21
Antigua-B.		12,000		0.59	0.86	
Argentina	0.32	10,000	0.56	0.50	0.72	0.65
Armenia	0.29	25,000	0.26	0.45	0.82	0.54
Australia	0.50	50,000	0.79	0.55	0.89	0.91
Austria	0.43	25,000	0.74	0.72	0.92	0.88
Azerbaijan	0.30	25,000	0.19	0.40	0.72	0.41
Bahamas		12,000		0.67	0.73	
Bahrain		90,000	0.54	0.45	0.52	0.58
Bangladesh	0.32	70,000	0.24	0.28	0.45	0.16
Barbados		12,000		0.55	0.87	0.76
Belarus	0.43	25,000	0.73	0.76	0.87	0.62
Belgium	0.49	20,000	0.85	0.76	0.92	0.88
Belize	0.26	12,000	0.43	0.41	0.41	
Benin	0.15	130,000	0.15	0.14	0.23	0.18
Bhutan	0.35	70,000	0.18	0.41	0.39	
Bolivia	0.16	10,000	0.21	0.40	0.44	0.36
Bosnia	0.38	50,000	0.53	0.49	0.86	0.47
Botswana	0.18	90,000	0.08	0.37	0.37	0.34
Brazil	0.07	10,000	0.30	0.15	0.62	0.61
Brunei	0.32	70,000	0.56	0.50	0.62	
Bulgaria	0.34	50,000	0.74	0.53	0.87	0.69
Burkina F.	0.18	130,000	0.08	0.10	0.16	0.11
Burma	0.32	70,000	0.23	0.32		0.17
Burundi	0.08	130,000	0.05	0.14	0.28	
Cambodia	0.28	70,000	0.26	0.41	0.40	0.15
Cameroon	0.13	130,000	0.20	0.10	0.33	0.19
Canada	0.67	15,000	0.74	0.89	0.91	0.91
CAR	0.09	130,000	0.03	0.10	0.40	
Cabo Verde		130,000	0.30	0.59	0.30	0.30
Chad	0.14	40,000	0.12	0.15	0.29	
Chile	0.35	10,000	0.38	0.57	0.78	0.65
China	0.48	60,000	0.41	0.16	0.81	0.47
Colombia	0.16	10,000	0.26	0.32	0.63	0.50
Congo	0.16	130,000	0.08	0.10	0.34	
Costa Rica	0.18	12,000	0.31	0.44	0.67	0.58
Cote D'Ivoire	0.14	130,000	0.13	0.15	0.20	0.18
Croatia	0.40	50,000	0.79	0.63	0.88	0.73
Cuba	0.26	12,000	0.33	0.50	0.88	0.54
Cyprus	0.25	50,000	0.54	0.58	0.82	0.75

COUNTRY	Distance from Human Origin (prehistoric)	Estimated Human Arrival	Cool-Water Index (historic)	Disease Security Index (historic)	Fertility Control Index 1980	Technological Progress Index 2005
Czech R.	0.44	25,000	0.77	0.76	0.87	0.79
Denmark	0.52		0.91	0.80	0.93	0.95
Djibouti	0.04	200,000	0.49	0.33	0.29	0.13
Dominica		12,000	0.33	0.51		0.55
Dominican R.	0.20	12,000	0.30	0.54	0.57	0.38
Ecuador	0.20	10,000	0.35	0.40	0.50	0.46
Egypt	0.19	40,000	0.49	0.25	0.45	0.42
El Salvador	0.23	12,000	0.25	0.36	0.51	0.37
Eq. Guinea	0.17	130,000	0.41	0.19	0.41	
Eritrea	0.06	200,000	0.40	0.38	0.31	0.13
Estonia	0.48		0.75	0.76	0.87	0.83
Ethiopia	0.00	200,000	0.23	0.24	0.30	0.09
Finland	0.52		0.70	0.76	0.92	0.94
France	0.46	20,000	0.82	0.63	0.88	0.86
Gabon	0.17	130,000	0.17	0.10	0.44	
Gambia	0.13	130,000	0.23	0.19	0.31	
Germany (E.)	0.47	25,000	0.82	0.76		0.89
Germany (W.)	0.47	20,000	0.82	0.76		0.89
Georgia	0.30	25,000	0.45	0.45	0.84	0.52
Ghana	0.15	130,000	0.14	0.10	0.31	0.20
Greece	0.32	50,000	0.56	0.40	0.85	0.76
Grenada		12,000		0.68		
Guatemala	0.25	12,000	0.26	0.31	0.36	0.27
Guinea	0.13	130,000	0.16	0.15	0.27	0.12
Guinea-B.	0.12	130,000	0.24	0.15	0.24	
Guyana	0.10	10,000	0.39	0.29	0.68	0.50
Haiti	0.21	12,000	0.31	0.50	0.36	
Honduras	0.23	12,000	0.39	0.45	0.35	0.31
Hungary	0.40	25,000	0.80	0.76	0.89	0.79
Iceland	0.56	15,000	0.81	0.89	0.82	0.88
India	0.27	70,000	0.18	0.20	0.51	0.30
Indonesia	0.35	70,000	0.52	0.33	0.58	0.32
Iran	0.26	90,000	0.22	0.55	0.30	0.47
Iraq	0.22	90,000	0.25	0.37	0.31	
Ireland	0.50	15,000	0.89	0.58	0.72	0.90
Israel	0.21	90,000	0.45	0.32	0.72	0.79
Italy	0.39	35,000	0.64	0.37	0.92	0.82
Jamaica	0.22	12,000	0.31	0.42	0.66	0.52
Japan	0.61	30,000	0.90	0.42	0.91	0.86
Jordan	0.20	90,000	0.19	0.37	0.25	0.54
Kazakhstan	0.44	40,000	0.20	0.63	0.76	0.52
Kenya	0.08	200,000	0.14	0.19	0.21	0.27
Kiribati		40,000		0.68	0.55	
North Korea	0.60	60,000	0.48	0.55		
South Korea	0.57	60,000	0.56	0.59		0.84
Kuwait	0.20	90,000	0.50	0.58	0.47	0.56

COUNTRY	Distance from Human Origin (pre-historic)	Estimated Human Arrival	Cool-Water Index (historic)	Disease Security Index (historic)	Fertility Control Index 1980	Technological Progress Index 2005
Kyrgyzstan	0.41	40,000	0.25	0.63	0.62	0.42
Laos	0.32	70,000	0.06	0.41	0.29	0.21
Latvia	0.46	25,000	0.67	0.76	0.89	0.75
Lebanon	0.23	90,000	0.48	0.28	0.62	0.49
Lesotho	0.22	90,000	0.61	0.54	0.42	0.19
Liberia	0.13	130,000	0.33	0.23	0.26	
Libya	0.24	40,000	0.36	0.42	0.22	
Lithuania	0.46		0.73	0.76	0.87	0.77
Luxembourg	0.48	20,000	0.84	0.80	0.94	0.84
Macedonia	0.35	50,000	0.59	0.49	0.81	0.57
Madagascar	0.12	200,000	0.31	0.33	0.32	0.15
Malawi	0.06	90,000	0.07	0.29	0.18	0.12
Malaysia	0.33	70,000	0.54	0.33	0.60	0.61
Malta		35,000	0.54	0.67	0.87	0.72
Mauritania	0.21	40,000	0.26	0.41	0.33	0.19
Mauritius		200,000		0.46	0.79	0.46
Mexico	0.37	12,000	0.32	0.31	0.55	0.54
Micronesia		30,000		0.54	0.36	
Moldova	0.37	25,000	0.47	0.62	0.83	0.53
Mongolia	0.56	60,000	0.21	0.76	0.46	0.47
Morocco	0.32	40,000	0.39	0.29	0.43	0.34
Mozambique	0.09	90,000	0.17	0.19	0.33	0.11
Namibia	0.20	90,000	0.13	0.58	0.32	0.34
Nauru		30,000		0.77		
Nepal	0.33	70,000	0.09	0.54	0.43	0.16
Netherlands	0.50	20,000	0.86	0.76	0.92	0.94
New Zealand	0.78	1,500	0.93	0.80	0.87	0.90
Nicaragua	0.21	12,000	0.29	0.45	0.36	0.26
Niger	0.19	40,000	0.10	0.33	0.10	
Nigeria	0.13	130,000	0.18	0.10	0.26	0.21
Norway	0.59		0.80	0.80	0.91	0.93
Oman	0.16	90,000	0.41	0.50	0.23	0.48
Pakistan	0.29	70,000	0.22	0.54	0.25	0.25
Panama	0.15	12,000	0.40	0.40	0.66	0.51
Papua-NG.	0.41	70,000	0.45	0.45	0.42	
Paraguay	0.19	10,000	0.22	0.44	0.47	0.42
Peru	0.13	10,000	0.36	0.45	0.51	0.49
Philippines	0.33	70,000	0.54	0.33	0.48	0.40
Poland	0.45	25,000	0.75	0.76	0.84	0.74
Portugal	0.38	35,000	0.48	0.29	0.85	0.73
Qatar	0.19	90,000	0.53	0.58	0.41	0.66
Romania	0.37	50,000	0.65	0.62	0.82	0.63
Russia	0.67	25,000	0.56	0.71		0.68
Rwanda	0.09	130,000	0.11	0.15	0.06	0.09
Saudi Arabia	0.15	90,000	0.33	0.42	0.23	0.51
Senegal	0.15	130,000	0.24	0.24	0.25	0.22

COUNTRY	Distance from Human Origin (prehistoric)	Estimated Human Arrival	Cool-Water Index (historic)	Disease Security Index (historic)	Fertility Control Index 1980	Technological Progress Index 2005
Sierra Leone	0.11	130,000	0.28	0.19	0.31	0.09
Singapore		70,000	0.58	0.41	0.91	0.80
Slovakia	0.42	25,000	0.69	0.76	0.84	0.74
Slovenia	0.41	25,000	0.83	0.76	0.87	0.82
Somalia	0.04	200,000	0.34	0.29	0.22	
South Africa	0.23	90,000	0.38	0.50	0.56	0.53
Spain	0.41	35,000	0.56	0.46	0.85	0.82
Sri Lanka	0.16	70,000	0.34	0.33	0.68	0.40
Sudan	0.08	40,000	0.17	0.12	0.33	0.22
Suriname	0.10	10,000	0.47	0.28	0.64	
Swaziland	0.18	90,000	0.49	0.46	0.35	0.29
Sweden	0.55		0.76	0.80	0.92	0.96
Switzerland	0.44	25,000	0.47	0.85	0.93	0.91
Syria	0.23	90,000	0.27	0.36	0.21	0.36
Taiwan	0.43	60,000	0.60	0.42		0.88
Tajikistan	0.37	40,000	0.17	0.49	0.41	0.33
Tanzania	0.04	200,000	0.09	0.28	0.30	0.15
Thailand	0.29	70,000	0.17	0.33	0.70	0.57
Togo	0.15	130,000	0.13	0.10	0.25	
Trinidad-T.	0.10	12,000	0.56	0.50	0.71	0.55
Tunisia	0.33	40,000	0.43	0.20	0.48	0.45
Turkey	0.28	90,000	0.41	0.37	0.59	0.51
Turkmenistan	0.33	40,000	0.23	0.49	0.50	
Uganda	0.09	130,000	0.06	0.15	0.24	0.18
Ukraine	0.37	25,000	0.52	0.71	0.88	0.66
UAE	0.18	90,000	0.46	0.63	0.45	0.67
U.K.	0.52	15,000	0.91		0.89	0.91
U.S.A.	0.59	15,000	0.71	0.71	0.90	0.90
Uruguay	0.27	10,000	0.84	0.32	0.79	0.65
Uzbekistan	0.37	40,000	0.19	0.62	0.52	0.40
Venezuela	0.11	10,000	0.34	0.23	0.60	0.54
Vietnam	0.32	70,000	0.29	0.29	0.50	0.37
Yemen	0.09	90,000	0.38	0.42	0.14	0.20
Yugoslavia	0.37	50,000	0.46		0.84	0.63
Zaire	0.11	130,000	0.11	0.18		
Zambia	0.09	90,000	0.07	0.33	0.25	0.19
Zimbabwe	0.13	90,000	0.07	0.32	0.25	0.30
MEAN	0.28	62,000	0.42	0.47	0.55	0.52
SD	0.16	50,500	0.24	0.21	0.25	0.26
MINIMUM	0.00	1,500	0.03	0.10	0.06	0.08
MAXIMUM	0.78	200,000	0.93	0.89	0.94	1.00

Appendix 12: Geographic and Migratory Distance and Human Arrival Estimates

Appendix-Table 16 shows regional estimates of the time past since modern humans began to populate an area. If we assign the same estimates to all countries belonging to the same region, these data correlate at r = -.56 with the distance data shown in Appendix-Table 15 (N = 153; p ‹ .001, two-tailed).[25] For Africa, Eurasia, and Australasia, the geographical distance is largely equivalent to the migratory distance: in order to get from Ethiopia to any other place in Africa, Eurasia, and Australasia, they had to bridge the combined the latitudinal and longitudinal distance to it. This is different for the Americas, however. Here the central part is geographically closer to Ethiopia than the North and South but the human migratory path was different. Modern humans entered the Americas some 20,000 years over the Bering Strait and then migrated from North to South. Thus, if one re-orders the latitudinal distance for the Americas in such a way that it increases from North to South, one obtains a migratory rather than geographic distance index. This index correlates at -.76 with the human arrival estimates in Appendix-Table 16.

Reporting findings from Oppenheimer (2004) and Cavalli-Sforza (2005), Galor (2011) reports that human genetic diversity diminished in the course of human migrations, such that genetic diversity is highest among African populations, modicum among Eurasian populations and lowest among native American populations. Indeed, Galor shows that an area's migratory distance from the human origin explains fully 85 per cent of its population's genetic diversity. In other words, migratory distance is a formidable indicator of genetic diversity. Geographic distance, by contrast, is a decent indicator of the presence of the cool-water condition as this condition tends to prevail in a large North-South and East-West distance from Ethiopia: indeed, a country's cool-water condition correlates at r = .70 (N = 158; p ‹ .001, two-tailed) with its geographic distance from Africa but only at r = .39 with its migratory distance from Africa (N = 158; p ‹ .001, two-tailed).

Now if the migratory distance represents a country population's genetic diversity while the cool-water-condition represents an environmental feature, we can ask which one is more important for development. Galor (2011) argues that genetic diversity affects development like an inverted U: low and high levels of diversity have an adverse effect on development; modicum levels have a conducive effect. Using the index of technological progress introduced in Appendix 1, I can replicate this pattern: diminishing genetic diversity first increases and then decreases technological progress. The quadratic function explains a significant 42 per cent of the cross-national variation in technological progress across 134 countries. A graphical inspection shows that diminishing genetic variation increases technological progress among African and Eurasian populations but further diminishing variation among American populations then decreases technological progress. However, if I run a regression in which I control the impact of genetic variation on technological progress for the presence of the cool-water-condition, the U-shaped effect of the genetic diversity vanishes and its explanatory power over technological progress drops to 9 per cent. By contrast, the explanatory power of the cool-water-condition over technological progress remains at 64 per cent (N =

[25] I have experimented with another estimation of geographic distance in which the latitudinal distance counts 1.5 times or 2 times as much as the longitudinal distance. This follows the idea of Diamond (1997) that bridging latitudinal distances is usually more challenging than bridging longitudinal ones because the former involve changing the climate zone, which requires changes in equipment, technology and the acquisition of additional knowledge. On the other hand, bridging much of the longitudinal distances on the southern hemisphere requires ocean crossing, which is a huge additional challenge. Overall, these different challenges seem to cancel each other out: the modified estimations of migratory distance did not produce much different results.

134). Hence, distance from the human origin influences development much more by variation in environmental conditions than by variation in genes.

Appendix-Table 16. Estimated Arrival of Modern Humans by World Region

WORLD REGION:	Estimated Number of Years since Arrival
East Africa	180,000
Central Africa	135,000
West Africa	135,000
South Africa	135,000
Middle East	90,000
India	75,000
Southeast Asia	75,000
China	65,000
East Asia	65,000
Southeast Europe	55,000
Australia	45,000
Southwest Europe	45,000
Central Asia	40,000
North Africa	40,000
Japan	25,000
Eastern Europe	25,000
Central Europe	25,000
Western Europe	25,000
North America	20,000
Central America	15,000
Northwest Europe	10,000
South America	10,000
New Zealand	1,500

Note: Estimates based on DNA-data from Oppenheimer (2004).

Appendix-Table 17 below shows which countries I assigned to which region shown in Appendix-Table 16.

Appendix-Table 17. Arrangement of Societies Analysed in Figure 4 into Regions

WORLD REGION:	COUNTRIES
East Africa	Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Tanzania
Central Africa	Cameroon, Rwanda, Uganda
Southern Africa	Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe
Northern Africa	Algeria, Egypt, Mauritania, Morocco, Sudan, Tunisia
West Africa	Benin, Burkina Faso, Cote D'Ivoire, Ghana, Guinea, Nigeria, Senegal, Sierra Leone
Middle East	Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, UAE, Yemen
India	India
Southeast Asia	Bangladesh, Burma, Cambodia, Indonesia, Laos, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam
China	China
East Asia	Mongolia, North Korea, South Korea, Taiwan
Central Asia	Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan
Japan	Japan
Southeast Europe	Albania, Bosnia, Bulgaria, Croatia, Cyprus, Greece, Macedonia, Romania
Southwest Europe	Italy, Portugal, Spain
Eastern Europe	Armenia, Azerbaijan, Belarus, Georgia, Moldova, Russia, Ukraine
Central Europe	Austria, Czech R., Germany, Hungary, Poland, Slovakia, Slovenia, Switzerland
Western Europe	Belgium, France, Luxemburg, Netherlands
Northern Europe	Denmark, Estonia, Finland, Latvia, Lithuania, Norway, Sweden
Northwest Europe	Iceland, Ireland, U.K.
Australasia	Australia, New Zealand
North America	Canada, U.S.A.
Central America	Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama
Caribbean	Cuba, Dominican R., Jamaica, Trinidad-Tobago
South America	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Uruguay, Venezuela

Appendix 13: Fertility Control Index

The fertility control index is the inverse of female fertility in 1980, taken from the World Bank's (2010) Development Indicators Series. Data are available for 170 countries and are displayed in Appendix-Table 15 above.

Appendix 14: Additional Data and their Sources for Tables 3 and 4

Data sources for the remainder of variables in Tables 3 and 4 of the article are as follows:

- *Neolithic Revolution Timing*: Time per society passed since majority of population transited to herding or farming as main subsistence method. Source: Putterman (2008), online at www.econ.brown.edu/fac/Louis_Putterman/agricultural%20data%20 page.htm.
- *'White' Settler Mortality*: Estimated historic mortality rate of Europeans in countries that once were European colonies. Source: Acemoglu, Johnson and Robinson (2002).
- *State Antiquity*: 'State antiquity index' measuring per society the amount of time reaching back into the past with continuous state organization. Source: Bockstette et al. (2002), variable v53.
- *Democratic Tradition*: 'Democracy stock index' measuring per society the historically accumulated experience with democracy until 1995, with a premium on more recent experience. Source: Gerring et al. (2005).
- *Continuous Peace*: Number of armed conflicts in which the government of a society has been involved since the end of World War II. Source: Gleditsch et al. (2002), UCDP/PRIO Armed Conflict Dataset-version 3 (online at www.pcr.uu.se /database/index.php).
- *Long-Allele 5-HTTLPR Gene*: Estimated fraction of a country's population carrying the long-allele version of the serotonin transporter gene 5-HTTLPR. Source: Chiao and Blizinsky (2010) who obtain their data from the 'allele frequency database' (ALFRED), online at www.alfred.med.yale.edu.
- *Val158Met COMT Gene*: Estimated fraction of a country's population with the 'Val$^{108/158}$Met' polymorphism of the COMT (catechol-o-methyltransferase) gene. Source: Inglehart et al. (forthcoming) who obtain their data from the 'allele frequency database' (ALFRED), online at www.alfred.med.yale.edu.
- *Neuroticism*, *Openness*, *Extraversion (Big-5)*: Average score of country samples on these three of the 'Big-5' personality traits. Source: Schmitt et al. (2012).
- *Collectivism/Individualism*: Index created in three steps from data published in the online supplement of Thornhill and Fincher et al. (2008) (see: http:// rspb. royalsocietypublishing.org/content/suppl/2009/03/20/275.1640.1279.DC1.html). First, I standardize individualism scores that Thornhill and Fincher et al. have taken from Hofstede (2001 [1980]) and Suh et al. (1998) into normalized scales from minimum 0 to maximum 1.0. Then I invert collectivism scores that Thornhill and Fincher et al. have taken from Gelfand et al. (2004) into an individualism scores with the same standard scale range as the other two. Whenever all three measures are available, I take their average; otherwise I take the average of the remaining two or the score of the only available one. This is done to avoid losing a whole country when only one index is available. This procedure suggests that the three indices are inter-changeable, which is justified on the basis of very high inter-index correlations: r = .91 between Suh's and

Hofstede's individualism scores ($N = 45$; $p < .001$, two-tailed); $r = .85$ between Suh's individualism scores and Gelfand's inverted collectivism scores ($N = 38$; $p < .001$, two-tailed); $r = .75$ between Hofstede's individualism scores and Gelfand's inverted collectivism scores ($N = 46$; $p < .001$, two-tailed).

- *Tightness/Looseness*: Gelfand et al.'s (2011) tightness/looseness scores inverted so that scores increase from tightness to looseness and normalized into a scale range from minimum 0 (tightness pole) to maximum 1.0 (looseness pole).
- *Consanguinity*: Consanguinity measures the average incidence of marriage within the wider family circle in a society; measures are logged to adjust a skewed distribution. Source: Woodley and Bell (2013).
- *Protestants, Catholics, Muslims*: Fractions of denominational Protestants, Catholics, and Muslims per country. Data are for varying time points in the 1990s. Source: Quality of Governance Institute (2010), online at www.qog.org.
- *State Integrity*: 'Control of corruption' index from the World Bank's 'governance quality project', measured in 2000. Normalized into a scale from minimum 0 to maximum 1.0, the index measures the impartiality of law and law enforcement. Source: Kaufmann, Kraay and Mastruzzi (2005).
- *Order and Stability*: Peace and stability index from the World Bank's 'governance quality project', measured in 2000. Normalized into a scale from minimum 0 to maximum 1.0, the index measures the absence of governmental and anti-governmental violence as well as political stability. Source: Kaufmann, Kraay and Mastruzzi (2005).

Appendix-Table 18. Data for Variables in Tables 3 and 4

Key: V1 – Time since Neolithic Revolution in years; V2 – ‘White’ settler mortality per 1,000 settlers; V3 – State history in years; V4 – Democratic tradition in historically accumulated ‘autocracy-democracy’ scores from Polity IV; V5 – Continuous peace as inverted and indexed conflict count since WWII; V6 – Percent population with longe-allele version of the HTTLPR gene; V7 - Percent population with ComtVal gene; V8 – Mean population score in neuroticism; V9 - Mean population score in neuroticism in openness; V10 – Mean population score in extraversion; V11 – Mean population score in individualism; V12 – Mean population score in tightness; V13 – Logged population score in consanguinity; V14 – Percent Catholics; V15 – Percent Muslims; V16 – Percent Protestants; V17 – State integrity (factor scores); V18 – Order and stability (factor scores)

COUNTRY	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
Afghanistan	9,000	0	1,197	-430	0.13								4.01	0	99	0	-1.91	-2.73
Albania	7,500	0	1,089	-387	0.00									0	21	0	-0.74	-0.96
Algeria	4,000	78	1,077	-504	0.13		17						3.12	1	99	0	-0.75	-1.90
Andorra		0		464							0.39			99	0	1	1.39	1.14
Angola	1,250	280	359	-106	0.25									69	0	20	-1.49	-2.39
Antigua-B.														10	0	42	0.92	0.67
Argentina	3,800	69	253	-63	0.00	51		0.55	0.51	0.49	0.28		-0.69	92	0	3	-0.38	0.05
Armenia	8,000	0	1,119	-378	0.00									0	0	0	-0.74	-1.24
Australia	400	9	138	615	0.00	46	52	0.51	0.50	0.49	0.13	4.40	-0.69	30	0	24	1.96	1.20
Austria		0	1,419	401	0.00	44	45	0.50	0.49	0.51		6.80		89	1	7	1.93	1.20
Azerbaijan	8,000	0	776	-422	0.00									0	93	0	-1.14	-0.91
Bahamas		85		161	0.00									26	0	47	1.39	1.10
Bahrain	7,500			-214	0.00								3.79	1	95	1	0.69	0.07
Bangladesh	5,500	71	750	-21	0.00			0.51	0.53	0.45			2.35	0	86	0	-0.93	-0.55
Barbados	1,700		162	216	0.00									6	0	33	1.39	0.99
Belarus	4,500	0	620	-381	0.00									14	0	0	-0.58	-0.14
Belgium	5,500	0	1,305	584	0.00	45	49	0.54	0.55	0.46		5.60	0.10	90	1	0	1.54	0.94
Belize	3,300			118	0.00									67	0	13	-0.14	0.29
Benin	3,100		196	-109	0.00									19	15	3	-0.58	0.67
Bhutan	5,500	0		-521	0.00									0	5	0	0.56	0.48
Bolivia	4,000	71	1,243	-7	0.00								0.53	93	0	2	-0.55	-0.25
Bosnia	7,000	0	1,113	-327	0.00									15	40	4	-0.57	-0.62
Botswana	1,000		434	189	0.00									9	0	27	0.77	0.94

COUNTRY	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
Brazil	3,500	71	276	-52	0.00	47	53	0.53	0.49	0.46	-0.20	3.50	1.46	88	0	4	0.09	0.11
Brunei	4,000			-155	0.00									3	64	1	0.35	1.23
Bulgaria	7,500	0	1,038	-330	0.00	43					-0.02			1	11	0	-0.24	0.49
Burkina F.	2,900	280	363	-158	0.00						0.00		4.19	9	43	2	-0.01	-0.09
Burma			1,553		0.25									1	4	3	-1.37	-1.58
Burundi	3,500		213	-167	0.13									78	1	5	-1.13	-2.22
Cambodia	4,500		1,643	-164	0.00									0	2	0	-0.91	-0.75
Cameroon	3,000	280	565	-213	0.00									35	22	18	-1.09	-0.54
Canada	1,500	16	189	610	0.00	42	59	0.51	0.49	0.48	0.22		0.41	47	1	30	2.02	1.05
CAR	3,000		25	-175	0.00									33	3	50	-1.35	-1.33
Cabo Verde	538		250	-80	0.00									96	0	3	0.20	1.08
Chad	2,700		340	-185	0.13									21	44	12	-0.87	-1.37
Chile	4,000	69	304	85	0.00	54		0.51	0.55	0.48	-0.02		-0.11	82	0	2	1.39	0.62
China	9,000	0	1,784	-405	0.00	75	27				-0.26	7.90	1.61	0	2	0	-0.36	-0.10
Colombia	3,400	71	284	212	0.13	58	61						1.25	97	0	1	-0.61	-1.91
Comoros				-49	0.00									0	100	0	-1.06	-0.19
Congo	3,000	240	288	-147	0.00									54	0	25	-1.02	-1.15
Costa Rica	2,500	78	265	619	0.00								1.22	91	0	6	0.85	0.89
Cote D'Iv.	3,500		325		0.00									19	24	5	-0.52	-0.86
Croatia	7,000		1,023	-326	0.00	37	49	0.46	0.48	0.52			-2.30	77	1	0	-0.01	0.32
Cuba	800		235	-170	0.00								-0.22	32	0	1	-0.23	-0.35
Cyprus	8,500		1,088	245	0.00			0.51	0.49	0.49	0.05			1	19	1	0.79	0.48
Czech R.	6,500	0	933	-111	0.00	43		0.51	0.51	0.50			-1.61	39	0	5	0.26	0.59
Denmark	5,500	0	1,108	577	0.00	41	61							1	0	95	2.18	1.19
Djibouti				-135	0.00									7	91	0	-0.89	-0.50
Dominica				129										90	0	8	0.44	0.43
Domin. R.	1,500	130	275	-134	0.00									97	0	1	-0.40	0.09
Ecuador	4,000	71	364	84	0.00								1.25	96	0	2	-0.92	-0.99
Egypt	7,200	68	1,287	-224	0.00		47				-0.94		3.43	0	82	0	-0.37	-0.35
El Salvador	3,000	78	274	-158	0.00								1.59	96	0	2	-0.41	0.23
Eq. Guinea				-159	0.00									71	1	5	-1.62	-0.03

COUNTRY	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
Eritrea				-18	0.13									0	33		0.66	-1.26
Estonia	3,700	0	344	-231	0.00	35	56	0.47	0.53	0.50		2.60		2	0	66	0.62	0.80
Ethiopia	4,000	26	1,913	-272	0.38			0.46	0.47	0.47	0.31			1	31	4	-0.48	-1.24
Fiji			38	159	0.00									9	8	39	0.15	-0.03
Finland	3,500	0	396	450	0.00	43	53	0.48	0.50	0.50	0.30			0	0	93	2.34	1.48
France	7,500	0	1,489	464	0.00	43	44	0.52	0.48	0.45	-0.10	6.30	-0.22	76	3	2	1.50	0.84
Gabon	3,000	280	50	-234	0.00									65	1	19	-0.60	0.29
Gambia	3,000	1,470	288	176	0.00									2	85	0	-0.40	0.47
Germ. (E.)	8,000	0		-260	0.00	43	56				-0.02	7.50						
Germ. (W.)	8,000	0	1,382	397	0.00	43	56	0.50	0.48	0.50	0.10	6.50		35	0	46	2.00	1.20
Georgia	6,000	0	1,040	-388	0.00									1	11	0	-0.90	-1.46
Ghana	3,500	668	484	-149	0.00		25				-0.03			19	16	26	-0.25	-0.22
Greece	8,500	0	1,050	295	0.00	48	45	0.53	0.52	0.49		3.90		0	2	0	0.72	0.69
Grenada	2,000		150	88										64	0	13	0.61	0.83
Guatem.	3,500	71	1,164	-162	0.00									94	0	5	-0.58	-0.69
Guinea	3,250	483	300	-249	0.13								3.25	1	69	0	-0.78	-1.80
Guinea-B.	3,000			-119	0.00									10	38	1	-0.89	-0.81
Guyana	3,800	32	175	-42	0.00									18	9	18	-0.38	-0.56
Haiti	1,000	130	300	-264	0.00									83	0	13	-1.43	-0.82
Honduras	3,000	78	526	101	0.00								1.22	96	0	3	-0.77	-0.23
Hungary	7,400	0	998	-211	0.00	42	55					2.90	-2.30	54	0	22	0.69	0.76
Iceland		0	538	543	0.00		59					6.40		1	0	97	2.21	1.42
India	8,500	49	1,397	320	1.00	59	43	0.50	0.48	0.47	0.43	11.0	3.28	1	12	1	-0.33	-0.66
Indonesia	4,000	170	922	-205	0.13			0.50	0.48	0.51	0.09		2.88	3	43	5	-1.01	-1.76
Iran	9,500	0	1,578	-373	0.13	47	49				-0.21		3.47	0	98	0	-0.51	-0.35
Iraq	10,000			-360	0.00								3.54	2	96	0	-1.45	-1.75
Ireland	5,000	0	983	501	0.00		51						-0.51	95	0	1	1.59	1.31
Israel	10,500	0	978	397	0.13	49	46	0.49	0.51	0.49		3.10	3.00	1	8	0	0.98	-0.74
Italy	8,000	0	1,419	294	0.00	49	47	0.52	0.50	0.50		6.80	-0.51	83	0	0	0.98	0.72
Jamaica	1,000	130	225	308	0.00									10	0	56	-0.25	-0.09
Japan	4,500	0	1,600	403	0.00	80	31	0.58	0.42	0.47	0.15	8.60	2.03	1	0	1	1.24	1.07

COUNTRY	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
Jordan	10,500		1,000	-418	0.00			0.50	0.47	0.48	-0.03		3.45	2	93	0	0.04	0.01
Kazakhstan	6,500	0	482	-424	0.00									3	47	2	-0.97	0.13
Kenya	3,500	145	25	-150	0.00									26	6	19	-0.97	-1.10
Kiribati				100										49	0	45	-0.22	
North Korea	4,500	0		-327	0.00									0	0	0	-1.93	-0.08
South Korea	4,500	0	1,716	-53	0.00	80	28	0.54	0.44	0.45	0.01	10.0		4	0	12	0.14	0.12
Kuwait	9,500			-544	0.00								3.95	2	95	0	1.04	0.61
Kyrgyzstan	6,500	0	364	-423	0.13								3.81	0	70	0	-0.89	-0.48
Laos	6,000		1,029	-246	0.00									1	1	0	-0.90	-0.73
Latvia	3,700	0	384	-269	0.00			0.51	0.50	0.49				18	0	14	0.13	0.61
Lebanon	10,500			-5	0.00								3.28	36	37	1	-0.31	-0.61
Lesotho	1,500		86	-94	0.00									44	0	30	-0.17	0.00
Liberia	3,250		69	-333	0.13									2	21	19	-1.65	-2.08
Libya	5,500		1,202	-255	0.00								3.63	0	98	0	-0.83	-0.69
Lithuania	3,700	0	567	-322	0.00			0.52	0.49	0.50				80	0		0.27	0.56
Luxembourg	5,500	0		594	0.00									93	0	1	2.05	1.54
Macedonia	7,500	0	922	-226	0.00									1	30	1	-0.56	-0.85
Madagascar	2,000	536	325	-64	0.00									26	2	22	-0.07	0.12
Malawi	1,800		370	-215	0.00									28	16	32	-0.45	-0.56
Malaysia	4,500	18	1,003	176	0.00	22	27	0.58	0.48	0.50	0.00	11.6	2.03	3	49	1	0.39	0.20
Maldives				-132	0.00									0	100	0	-0.14	1.11
Malta	7,600	16		230	0.00			0.52	0.51	0.50				97	0	1	0.83	1.40
Marshall				43										0	0		-0.68	
Mauritania	3,500		594	-203	0.00									0	99	0	-0.19	0.10
Mexico	4,100	71	1,061	-260	0.00	52	43	0.48	0.52	0.50	0.01	7.20	-0.22	95	0	1	-0.42	-0.08
Moldova	7,000	0	525	-326	0.00						0.01			0	0	0	-0.73	-0.22
Mongolia	5,000		661	-354	0.00									0	1	0	-0.31	0.79
Monaco				124										91	0	5		
Morocco	3,500	78	1,540	-407	0.00	34		0.51	0.49	0.49	-0.03		2.99	0	99	0	0.04	-0.21
Mozamb.	1,400		250	-114	0.00									31	13	7	-0.68	-0.01
Namibia	1,250			12	0.25									19	0	64	0.58	-0.31

COUNTRY	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
Nepal	6,000		1,470	-247	0.13									0	3	0	-0.43	-1.18
Netherlands	6,000	0	1,347	534	0.00	43	54	0.49	0.50	0.50	0.48	3.30	-1.61	43	1	42	2.18	1.39
New Zeald.	800	9	63	619	0.00	43	50	0.50	0.49	0.51		3.90		19	0	38	2.16	1.15
Nicaragua	3,000	163	244	-275	0.00									95	0	4	-0.94	-0.09
Niger	4,000	400	481	-146	0.00									0	88	0	-0.96	-0.16
Nigeria	2,700	2,004	803	-74	0.00	24	32						3.94	12	45	16	-1.14	-1.58
Norway	5,000	0	860	619	0.00	42	57				0.66	9.50	-0.69	0	0	98	2.14	1.26
Oman	7,500			-496	0.00								3.58	0	99	0	0.83	0.86
Pakistan	9,000	37	1,566	49	0.13		47					12.3	3.93	1	97	1	-0.76	-0.92
Panama	2,400	163	270	-96	0.00								0.53	85	5	5	-0.31	0.26
Papua-N.	4,000		19	190	0.00									33	0	58	-0.78	-0.45
Paraguay	4,000	78	275	-309	0.00									96	0	2	-1.19	-1.08
Peru	4,300	71	993	62	0.00		41	0.53	0.51	0.48	0.03		0.92	95	0	3	-0.33	-0.93
Philippines	5,000		253	75	0.25		17	0.51	0.49	0.48			-0.92	84	4	4	-0.50	-0.77
Poland	6,000	0	834	-175	0.00	40	54	0.52	0.49	0.49	-0.03	6.00		81	0	0	0.48	0.43
Portugal	6,500	0	1,437	-42	0.00			0.50	0.50	0.48		7.80	0.47	94	0	1	1.24	1.19
Qatar	7,500			-222	0.00								3.80	1	92	1	0.84	1.03
Reunion																		
Romania	7,500	0	797	-323	0.00	45	39	0.48	0.53	0.50	-0.25			5	1	6	-0.34	0.02
Russia	5,000	0	531	-385	0.13	44	55				0.00			1	11	0	-0.94	-0.72
Rwanda	2,500		375	-187	0.25	17	33				-0.24			56	9	12	-0.71	-1.81
S. Arabia	7,600	0		-580	0.00								3.65	0	99	0	0.50	0.05
Senegal	3,000	165	631	-102	0.13									6	91	0	-0.28	-0.52
Sierra Leone	3,250	483	45	-126	0.13									2	39	5	-0.98	-1.91
Singapore	4,500	18	419	-19	0.00	71	25					10.4	1.28	5	17	3	2.25	1.15
Slovakia	6,500	0	573	-120	0.00			0.52	0.53	0.49				74	0	8	0.16	0.35
Slovenia	7,000	0	978	-260	0.00	43	53	0.45	0.51	0.51	0.03		-0.51	71	2	0	0.73	0.92
Somalia	3,500		1,599	-86	0.00									0	100	0	-1.75	-2.47
South Africa	1,700	16	131	265	0.00	28		0.49	0.49	0.50	-0.04		1.03	10	1	39	0.57	-0.39
Spain	7,200	0	1,288	61	0.00	47	45	0.54	0.50	0.49	0.07	5.40	0.69	97	0	0	1.43	0.75
Sri Lanka	5,000	70	1,649	245	0.13								3.07	7	7	0	-0.18	-1.58

COUNTRY	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
Sudan	5,000	88	1,287	-98	0.13								3.92	4	73	0	-0.89	-2.39
Suriname	3,600			5	0.00									36	13	37	0.42	0.24
Swaziland	1,500		133	-203	0.00									11	0	34	-0.13	-0.09
Sweden	5,500	0	731	550	0.00	44	55				0.59		-0.36	1	0	68	2.23	1.25
Switzerland	5,500	0	1,396	619	0.00		50	0.49	0.53	0.50	0.52			53	0	43	2.13	1.46
Syria	10,500		1,092	-232	0.00								3.45	1	90	0	-0.61	-0.65
Taiwan	5,500	0	294	-199	0.00	71	24	0.53	0.46	0.48	-0.52			2	1	3	0.79	0.56
Tajikistan	7,000	0	1,010	-428	0.00								3.00	0	85	0	-1.20	-1.86
Tanzania	2,500	145		-199	0.00	21	30	0.48	0.48	0.49			3.63	28	33	11	-1.07	-0.46
Thailand	5,500	0	1,091	-206	0.00	69					0.25			0	4	0	-0.13	0.40
Togo	3,100	668	81	-187	0.00									29	17	6	-0.63	-0.18
Tonga				-136										18	0	62	-0.58	
Trinidad-T.	2,000	85	175	243	0.00	23					-0.16			36	7	13	0.14	0.06
Tunisia	4,500	63	1,346	-244	0.00								3.29	0	99	0	0.12	0.24
Turkey	10,000	0	1,618	131	0.13	54	50	0.50	0.53	0.52	0.00	9.20	3.00	0	99	0	-0.19	-1.00
Turkmen.	8,000	0	685	-226	0.00									0	87	0	-1.03	-0.01
Uganda	3,500	280	288	-92	0.25									50	7	2	-0.96	-1.54
Ukraine	6,500	0	554	-378	0.00			0.48	0.42	0.46	-0.23	1.60		0	0	0	-1.00	-0.36
UAE	7,500			-178	0.00								3.58	0	95	0	0.83	0.80
U.K.	5,500	0	1,400	600	0.13	44	57	0.51	0.46	0.50	0.00	6.90	-0.92	13	1	16	2.13	1.02
U.S.A.	3,500	15	208	619	0.00	45	53	0.50	0.50	0.50	0.16	5.10	-1.61	30	1	44	1.77	1.14
Uruguay	3,600	71	186	160	0.00						0.12		0.74	60	0	2	0.76	0.89
Uzbekistan	6,500	0	1,436	-447	0.13								3.15	0	88	0	-0.96	-1.31
Venezuela	3,800	78	278	100	0.00							3.70	0.34	95	0	1	-0.59	-0.54
Yemen	7,600		1,290	-327	0.00								3.55	0	100	0	-0.66	-1.35
Serbia	7,500	0	1,169	-283				0.50	0.52	0.52	0.06						-1.08	-1.70
Zaire		240	359	-210	0.13									48	1	29	-1.60	-2.65
Zambia	1,800		100	-113	0.00						0.26			26	0	32	-0.90	-0.38
Zimbabwe	1,400		75	7	0.13			0.48	0.49	0.49				14	1	21	-0.93	-1.44
Palestine																		
Hong Kong	5,000		1,740					0.52	0.42	0.47		6.30	0.59					

Appendix 15: Maddison's Income Estimates

Maddison (2007) provides income estimates for 32 countries around the world that are exemplary for a given global region. In times, these countries did not formally exist as countries, the estimates are for their contemporary territory at the respective time Estimates are given from the year One to 2000, measured in constant 1990 US-Dollars at international exchange rates. A basic assumption is that no society can survive at a material base of a lesser value than 400 US-Dollar per capita and year. Thus, the 400-US-Dollar subsistence level describes the wealth of pre-agrarian and primitive agrarian societies. Estimates are provided for benchmark time points in the years 1, 1000, 1500, 1600, 1700, 1800, 1850, 1900, 1950 and 2000.

Working over decades, Maddison gathered data from a plethora of historic sources. Of course, for the times before 1800, and even more so before 1500, Maddison has to make educated guesses. For instance, income estimates before 1500 largely rely on urbanization and population density estimates, assuming that a more dense and urban population requires a higher surplus per capita and, thus, higher average incomes. Hence, the data should not be considered as accurate measures but as estimates that are roughly in the right ballpark as concerns the magnitude of income differences. Support for this assessment is provided by Firebaugh (2010).

Around the year One, the wealthiest region was Mediterranean Europe under the Roman Empire with some 800 US-Dollar per capita in Italy; the poorest regions were those where people still lived as foragers: the Americas, Japan, and Australia/New Zealand with some 400 US-Dollars. Thus, the wealthiest regions were only by a factor of 2.0 above subsistence level and also only double as wealthy as the poorest ones. Around 1000 AD, the richest region was the Middle East under the Islamic Caliphates with some 650 US-Dollars in today's Iran and Iraq; this is just a factor of 1.5 above subsistence level, which still prevailed in the New World. Around 1500, during the Renaissance, the richest societies were again in Mediterranean Europe (especially Northern Italy) with some 1,100 US-Dollars; this is less than triple the subsistence level, which still prevailed in North America and Australia/New Zealand, the remaining foraging regions. This point marks a turn in history: humanity begins to break free from the confinements of subsistence-level economies—a condition that prevailed over the long Malthusian epoch during which income increases were largely eaten up by population growth. In 1800, the richest societies are in Western Europe with some 1,700 US-Dollars in the UK and the Netherlands; this is 4.3 times the income of the poorest region where, for instance, Ethiopia is just at subsistence level. It is noteworthy that, because of poor soil conditions, most of Sub-Saharan Africa was not suitable for high-surplus plough agriculture and large regions not even for low-surplus hoe agriculture, or horticulture (Weischet & Cavides 1993; Nolan & Lenski 1999; Gallup & Sachs 2000). In 1900, the USA is the richest region with some 5,300 US-Dollars, which is 13 times the income of the still poorest region at the time, Africa, and 13 times above subsistence level. Around 1950, the US leads by 9,600 over 450 US-Dollars in China: a factor of twenty-one and twenty-four times subsistence level. Around 2000, the US leads by 29,000 over 590 US-Dollars in Ethiopia: a factor of almost 50 (73 times subsistence level). It is noteworthy, however, that other regions of Africa are four times above subsistence level.

Appendix-Table 19. Maddison's Historic Income Estimates for Selected Exemplary Countries around the World

COUNTRY	1	1000	1500	1600	1700	1800[a)]	1850[b)]	1900[c)]	1950	2000[d)]
Australia	400	400	400	400	400	518	3,273	5,157	7,412	21,732
Austria	425	425	707	837	993	1,218	1,863	3,465	3,706	20,691
Belgium	450	425	875	976	1,144	1,319	2,692	4,220	5,462	20,656
Canada	400	400	400	400	430	904	1,695	4,447	7,291	22,488
China	450	466	600	600	600	600	530	552	448	3,421
Denmark	400	400	738	875	1,039	1,274	2,003	3,912	6,943	22,975
Egypt	600	500	475	475	475	475	649	902	910	2,936
Ethiopia	400	400	400	400	400	400	400	400	400	587
Finland	400	400	453	538	638	781	1,140	2,111	4,253	19,770
France	473	425	727	841	910	1,135	1,876	3,485	5,186	20,422
Germany	408	410	688	791	910	1,077	1,839	3,648	3,881	18,944
Greece	550	400	433	483	530	641	880	1,592	1,915	12,111
India	450	450	550	550	550	533	533	673	619	1,892
Iran	500	650	600	600	600	588	719	1,000	1,720	4,838
Iraq	500	650	550	550	550	588	719	1,000	1,364	1,221
Italy	809	450	1,100	1,100	1,100	1,117	1,499	2,564	3,502	18,774
Japan	400	425	500	520	570	669	737	1,387	1,921	20,738
Mexico	400	400	425	454	568	759	674	1,732	2,365	7,275
Morocco	450	430	430	430	430	430	563	710	1,455	2,652
Netherlands	425	425	761	1,381	2,130	1,838	2,757	4,049	5,996	22,161
Norway	400	400	610	665	722	801	1,360	2,447	5,430	25,102
Portugal	450	425	606	740	819	923	975	1,250	2,086	13,813
South America	400	400	416	438	527	691	676	1493	2503	5786
Spain	498	450	661	853	853	1,008	1,207	2,056	2,189	15,622
Sub-Sah. Africa	472	425	414	422	421	420	500	637	890	1,549
Sweden	400	400	651	700	750	819	1,359	3,073	6,769	20,710
Switzerland	425	410	632	750	890	1,090	2,102	4,266	9,064	22,475
Turkey	550	600	600	600	600	643	825	1,213	1,623	6,446
United Kingdom	400	400	714	974	1,250	1,706	3,190	4,921	6,939	20,353
United States	400	400	400	400	527	1,257	2,445	5,301	9,561	28,467
USSR	400	400	499	552	610	688	943	1,488	2,841	4,460

Note: In columns [a)] to [d)], Maddison indicates the years 1820[a)], 1870[b)], 1913[c)] and 2003[d)]. *Source*: Maddison (2007).

Interpolated Maddison Data and Estimated Human Arrivals

Maddison has provided per capita income estimates for 32 exemplary countries from around the world for ten benchmark points from the year One to 2000. If we interpolate these data for half-century points in between, assuming that--over the long Malthusian epoch--most regions fluctuated around or slightly above a previously achieved level, we obtain the correlations with the cool-water condition, disease security, and proximity to the human origin shown in Appendix-Table 20 below. According to Galor (2011) and other economic historians, this is a reasonable assumption.

Appendix-Table 20. Correlation Matrix for Figure 5 (correlations of Maddison's income estimates with water autonomy, disease security, and proximity to human origin of a country): Correlation Coefficients (*r*)

YEAR	Cool-Water-Condition	Disease Security	Proximity to Human Origin
1	-0.21	-0.40	0.32
50	-0.21	-0.40	0.32
150	-0.21	-0.40	0.32
200	-0.21	-0.40	0.32
250	-0.21	-0.40	0.32
300	-0.21	-0.40	0.32
350	-0.21	-0.40	0.32
400	-0.21	-0.40	0.32
450	-0.21	-0.40	0.32
500	-0.21	-0.40	0.32
550	-0.21	-0.40	0.32
600	-0.21	-0.40	0.32
650	-0.21	-0.40	0.32
700	-0.21	-0.40	0.32
750	-0.21	-0.40	0.32
800	-0.21	-0.40	0.32
850	-0.21	-0.40	0.32
900	-0.21	-0.40	0.32
950	-0.21	-0.40	0.32
1000	-0.47	-0.32	0.40
1050	-0.47	-0.32	0.40
1100	-0.47	-0.32	0.40
1150	-0.47	-0.32	0.40
1200	-0.47	-0.32	0.40
1250	-0.47	-0.32	0.40
1300	-0.47	-0.32	0.40
1350	-0.47	-0.32	0.40
1400	-0.47	-0.32	0.40
1450	-0.47	-0.32	0.40
1500	0.40	0.25	-0.22
1550	0.40	0.25	-0.22
1600	0.50	0.38	-0.28
1650	0.50	0.38	-0.28
1700	0.53	0.44	-0.31
1750	0.53	0.44	-0.31

YEAR	Cool-Water-Condition	Disease Security	Proximity to Human Origin
1800	0.68	0.63	-0.50
1850	0.74	0.69	-0.55
1900	0.76	0.79	-0.63
1950	0.68	0.83	-0.66
2000	0.86	0.77	-0.75
N	32 Exemplary Countries from around the World		

Note: See Appendix-Table 19 for the sample of countries. Grey-shaded years have real estimates; data gaps in between are interpolated by filling in the previous measure. Significance levels (two-tailed): † $p \geq .100$, * $p < .100$, ** $p < .050$, *** $p < .005$.

The switch in the signs of the correlations in around 1500 coincides with the late achievement of urban maturity in the two cool-water-area civilizations: Western Europe and Japan. Since then, the CW-area civilizations have accrued a developmental advantage and pulled other, un-urbanized CW-areas outside Eurasia into development—hence the increase in the magnitude of the correlations until recently.

If we display the recent times in a more fine-grained way (as shown Figure 8 of the article), we see that over the recent decades correlation magnitudes have fallen. I interpret this as the impact of globalization which diffuses knowledge and technologies in ways that tend to even out natural disadvantages.

Another noteworthy change in the correlation pattern occurs around 1000 CE: it's a change towards a more negative correlation in case of the cool water condition. This change is driven by the drop of per capita incomes in Italy and Mediterranean Europe after the downfall of the Roman Empire. Europe's rise began with the adaptation of intensive surplus agriculture after the introduction of field crop rotation and the oxen-charted iron plough. On this basis cities could grow. But it still lasted until the recovery from the devastating Black Death in 1348 that Europe really got on an upward slope.

Appendix 16: World Bank GDP/p.c. Time Series

Data for per capita Gross Domestic Products are measured in thousands of US-Dollars in international exchange rates and at constant prices of the year 2000. Data are taken from the World Bank's (2012) Development Indicators Series and available for 94 countries (1960) and 176 countries (2010). The time series starts in 1960 and ends in 2010 with annual measures.

Appendix 17: Dreher's Globalization Indices

Data on Dreher's combined economic, social, and political globalization indices are taken from the Quality of Governance Institute's (2012) Quality of Governance Dataset, online at www.qog.se. Data are available annually from 1970 to 2000 for 141 countries (1970) and 154 countries (2000). The indices measure a country's involvement in global economic, social, and political exchange. Scores are standardized into a range from minimum 0 to maximum 1.0. I paste below the description in Dreher et al.'s (2008) own words:

> "The Index of Globalization was introduced in 2002 (Dreher, 2006) and is updated and described in detail in Dreher, Gaston and Martens (2008). The overall index covers the economic, social and political dimensions of globalization. Following Clark (2000), Norris (2000) and Keohane and Nye (2000), it defines globalization to be the process of creating networks of connections among actors at multi-continental distances, mediated through a variety of flows including people, information and ideas, capital and goods. Globalization is conceptualized as a process that erodes national boundaries, integrates national economies, cultures, technologies and governance and produces complex relations of mutual interdependence.
> More specifically, the three dimensions of the KOF index are defined as:
>
> *economic globalization*, characterized as long distance flows of goods, capital and services as well as information and perceptions that accompany market exchanges;
> *political globalization*, characterized by a diffusion of government policies; and
> *social globalization*, expressed as the spread of ideas, information, images and people.
>
> The 2010 index introduces an updated version of the original index, employing more recent data than has been available previously.
>
> *Economic Globalization*
>
> Broadly speaking, economic globalization has two dimensions. First, actual economic flows are usually taken to be measures of globalization. Second, the previous literature employs proxies for restrictions to trade and capital. Consequently, two indices are constructed that include individual components suggested as proxies for globalization in the previous literature.
>
> *Actual Flows:* The sub-index on actual economic flows includes data on trade, FDI and portfolio investment. Data on trade and FDI flows is provided by the World Bank (2009), stocks of FDI are provided by the UNCTAD's World Investment Report. Portfolio investment is derived from the IMF's International Financial Statistics. More specifically, trade is the sum of a country's exports and imports and portfolio investment is the sum of a country's stock of assets and liabilities (all normalized by GDP). We include the sum of net inflows and outflows of FDI and the stocks of FDI (again all normalized by GDP).
>
> While these variables are straightforward, income payments to foreign nationals and capital are included to proxy for the extent that a country employs foreign people and capital in its production processes.
>
> *Restrictions:* The second index refers to restrictions on trade and capital using hidden import barriers, mean tariff rates, taxes on international trade (as a share of current revenue) and an index of capital controls. Given a certain level of trade, a country with higher revenues from tariffs is less globalized. To proxy restrictions of the capital account, an index constructed by Gwartney and Lawson (2009) is employed. This index is based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions and includes 13 different types of capital controls. The index is constructed by subtracting the number of restrictions from 13 and multiplying the result by 10. The indices on mean tariff rates and hidden import barriers are also derived from Gwartney and Lawson (2009). Mean tariff rates originate from various sources. Gwartney and Lawson allocated a rating of 10 to countries that do not impose any tariffs. As the mean tariff rate increases, countries are assigned lower ratings. The rating will decline toward zero as the mean tariff rate approaches 50 percent (which is usually not exceeded by most countries among their sample). The original source for hidden import barriers, finally, is the World Economic Forum's Global Competitiveness Report (various issues).
>
> *Social Globalization*
>
> The index classifies social globalization in three categories. The first covers personal contacts, the second includes data on information flows and the third measures cultural proximity.
>
> *Personal Contacts:* This index is meant to capture direct interaction among people living in different countries. It includes international telecom traffic (traffic in minutes per person) and

the degree of tourism (incoming and outgoing) a country's population is exposed to. Government and workers' transfers received and paid (in percent of GDP) measure whether and to what extent countries interact, while the stock of foreign population is included to capture existing interactions with people from other countries. The number of international letters sent and received also measure direct interaction among people living in different countries. While the first four variables derive from the World Bank (2009), the latter is taken from the Universal Postal Union's Postal Statistics Database.

Information flows: While personal contact data are meant to capture measurable interactions among people from different countries, the sub-index on information flows is meant to measure the potential flow of ideas and images. It includes the number of internet users, (per 100 people), the share of households with a television set, and international newspapers traded (in percent of GDP). All these variables to some extent proxy people's potential for receiving news from other countries – they thus contribute to the global spread of ideas. The variables in this sub-index derive from the World Bank (2009) and the UNESCO (various years).

Cultural Proximity: Cultural proximity is arguably the dimension of globalization most difficult to grasp. Dreher (2006) suggests the number of English songs in national hit lists or movies shown in national cinemas that originated in Hollywood. However, these data lack for the majority of countries in our sample. Instead, we thus use imported and exported books (relative to GDP), as suggested in Kluver and Fu (2004). Traded books proxy the extent to which beliefs and values move across national borders.

According to Saich (2000, p.209) moreover, cultural globalization mostly refers to the domination of U.S. cultural products. Arguably, the United States is the trend-setter in much of the global socio-cultural realm (see Rosendorf, 2000, p.111). As an additional proxy for cultural proximity we thus include the number of McDonald's restaurants located in a country. For many people, the global spread of McDonald's became a synonym for globalization itself. In a similar vein, we also use the number of Ikea per country.

Political Globalization

To proxy the degree of political globalization we employ the number of embassies and high commissions in a country and, the number of international organizations to which the country is a member and the number of UN peace missions a country participated in. In addition, we include the number of treaties signed between two or more states since 1945 (as provided in the United Nations Treaties Collection).

Method of Calculation

In constructing the indices of globalization, each of the variables introduced above is transformed to an index on a scale of one to hundred, where hundred is the maximum value for a specific variable over the period 1970 to 2007 and one is the minimum value. Higher values denote greater globalization. The data is transformed according to the percentiles of the original distribution. The weights for calculating the sub-indices are determined using principal components analysis for the entire sample of countries and years. The analysis partitions the variance of the variables used in each sub-group. The weights are then determined in a way that maximizes the variation of the resulting principal component, so that the indices capture the variation as fully as possible. The same procedure is applied to the sub-indices in order to derive the overall index of globalization.

Data are calculated on a yearly basis. However, not all data are available for all countries and all years. In calculating the indices, all variables are linearly interpolated before applying the weighting procedure. Instead of linear extrapolation, missing values at the border of the sample are substituted by the latest data available. When data are missing over the entire sample period, the weights are readjusted to correct for this. When observations with value zero do not represent missing data, they enter the index with weight zero. Data for sub-indices and the overall index of globalization are not calculated, if they rely on a small range of variables in a specific year and country. Observations for the index are reported as missing if more than 40 percent of the underlying data are missing or at least two out of the three sub-indices cannot be calculated. The indices on economic, social and political globalization as well as the overall index are calculated employing the weighted individual data series instead of using the aggregated lower-level globalization indices. This has the advantage that data enter the higher levels of the index even if the value of a sub-index is not reported due to missing data."