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World Development Vol. 64, pp. 33–51, 2014

http://dx.doi.org/10.1016/j.worlddev.2014.05.016

Evolution, Empowerment, and Emancipation: How Societies Climb the Freedom Ladder

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Summary. — 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. Historically, 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 breaking human empowerment free from its confinement to the initially favorable conditions (*contagion thesis*). Together, these and several other theses integrate into *Evolutionary Emancipation Theory* (EET). After unfolding EET, the article presents evidence in support of its major propositions.

Key words — civic entitlements, emancipative values, human empowerment, technological progress, utility ladder of freedoms

1. INTRODUCTION

Why have some regions of the world grown so much richer than others? This question has lost none of its relevance, given that per capita income continues to differ enormously across global regions. For instance, the average resident of Western Europe today is forty times more prosperous than her counterpart in Sub-Saharan Africa. [1] And even though cross-regional income inequality is slowly diminishing since the last twenty years, these differences still account for some 70% of the world's *total* income inequality (Firebaugh, 2012). Regional income disparities of this size are recent on the time scale of history: estimates suggest that, before 1600 CE, such disparities never exceeded a factor of 3.5; in 1800, they just reached a factor of 4.6—compared to a factor of forty today. [2]

Researchers stress different factors as the sources of prosperity and the differences therein. Many authors emphasize accumulated stocks of technological knowledge (Becker & Barro, 1988; Galor, 2011; Nolan & Lenski, 1999; Romer, 1990). Others champion cultural factors, especially the emancipation of individual initiative from rigid norms (Florida, 2002; Lal, 2001; Landes, 1998). Still others highlight institutional factors, most notably legal protection of freedoms (Acemoglu & Robinson, 2012; North, 1990; North, Wallis & Weingast 2009).

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 insight raises an important question: what is the root principle that integrates development into a syndrome? I suggest this principle is *human empowerment*: the emancipation of 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 as the emancipatory trend shows signs of spreading around the globe (Welzel, 2013, p. 4).

As this article tries to demonstrate, looking at development through the lens of emancipation offers new insights that help us to better understand the nature of the process. The article proceeds in five sections. Section 1 reviews the literature on development, culture, and institutions, and outlines how the human empowerment concept unifies separately gained insights in a single framework. Section 2 derives from this framework six hypotheses. Section three describes the data and methods to test them. Section four presents the evidence. I close with a discussion of my findings' main implications. The article is accompanied by an extensive Online Appendix (OA) at http://dx.doi.org/10.1016/j.worlddev.2014.05.016. The last two sections of this appendix (OA 18 and 19, pp. 73–114) discuss a number of points raised by reviewers and provide complementary analyses, with additional support for the theses suggested below.

2. THEORY

(a) *Converging insights into development, culture, and institutions*

Without mutual notice, scientists from different 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, juxtaposes "collectivistic" cultures which force people into closely-knit kinship bonds, and "individualistic" cultures in which people associate freely across lineage ties. Triandis argues that collectivism is the psychological response to existential hardship because hardship makes people dependent on kinship solidarity. This condition requires conformity to group norms, which favors authoritarian institutions as a tool of enforcement. Conversely, individualism emerges under receding existential pressures because then conformity is no longer needed. This opens room for individual creativity and shifts utility to liberal institutions that protect it.

* I thank Ronald Inglehart for his invaluable comments on earlier drafts of this paper. Research informing this article has been funded by grant number WE 2266/9-1 from the German Science Foundation. Final revision accepted: May 7, 2014.

Gelfand *et al.* (2011) present cross-national data in support of similar propositions. 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 more choice is tolerated. Again, the nexus to institutions is obvious: tight cultures breed authoritarian institutions to enforce taboos; loose cultures favor liberal institutions to protect choices.

A 70-nation study by Fincher, Thornhill, Murray, and Schaller (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, Fincher, & Aran, 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 nonrelatives. 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-style pattern of group formation is linked with authoritarian institutions and patriarchy (Hudson *et al.,* 2012). By the same token, the contractual pattern of group formation is more gender-egalitarian and lends itself to liberal institutions (Hartman, 2004). These institutions guarantee contractual freedom, including women's reproductive freedom.

Evidence from group experiments complements these findings. 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 innovation. This pattern suggests 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, the prevalence of opportunities over threats makes the promotion focus chronic. This should favor liberal institutions because they guarantee the room of maneuvre for which "promotionists" seek.

Countless studies confirm that people's socioeconomic status influences whether they perceive life as a source of threats or a source of opportunities: people in lower status positions are more vulnerable and, thus, more likely to feel threatened. People in higher status positions, by contrast, possess more options and tend to perceive life that way (Brint, 1984; Lamont, 1987; Loftus, 2001; Sullivan & Transue, 1999). Accordingly, cross-national survey data show that support for the authoritarian ideologies of right-wing parties is most widespread among the "residual underclass": low-skilled workers in insecure jobs (Coenders, Lubbers, & Scheepers, 2008; Norris, 2005).

The logic that separates population segments within a country also distinguishes entire countries. Thus, Inglehart and Welzel (2005) find that, in countries in which existential hardship prevails, more people cling to protective orientations and support authoritarian institutions. By contrast, in countries with thriving existential conditions more people embrace emancipatory orientations that support liberal institutions.

Summarizing these insights, 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, versus a "virtuous" cycle of existential thrive, emancipatory orientations, and liberal institutions—with transitory stages in between. I suggest that the organizing principle of this polarity is human empowerment: when existential hardship, protective orientations, and authoritarian institutions dominate, ordinary people have little control over their lives and politics—they are disempowered. When existential thrive, emancipatory orientations and liberal institutions prevail, ordinary people have significant control over both—they are empowered.

(b) *Evolutionary Emancipation Theory*

To unfold a comprehensive understanding of human empowerment, I propose a theory called Evolutionary Emancipation Theory (EET). This theory centers on the human desire for a life free from domination (for a book-length treatment see Welzel, 2013). 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 because of its power to shape reality (Geary, 2007). Agency embodies the desire to be unrestricted in the usage of one's potential for intentional action—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 utility-value link, human lives would be out of touch with reality and our species had probably gone extinct since long.

How pressing or permissive given existential conditions are, manifests itself in ordinary people's control over resources of action. The extent to which common people control action resources is a result of consumer-oriented technological progress (Bell, 1973; Drucker, 1993; Florida, 2002; Mokyr, 1990; Toffler, 1990). 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 (2010) shows, longer lives with less time wasted for unpleasant things lead to an 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, technological progress feeds itself from mobilizing intellectual creativity on a mass scale, which involves widespread education and information. Finally, technological progress interlinks people in wide-ranging webs of exchange. All in all, consumer-oriented technological progress enhances ordinary people's material, intellectual and connective resources. These are resources of action because each of them expands the options of what people can do at will. Action resources unlock the gift of agency.

As this happens, life turns from a source of threats into a source of opportunities. This means that societies ascend the utility ladder of freedoms: universal freedoms become increasingly important to take advantage of what a more promising life offers. Recognizing this, people begin to value freedoms accordingly: they adopt emancipative values. Again, this utility-value link is vital to keep human lives in touch with reality. Once the utility

and value of freedoms rise, denying their guarantee 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 unleash pressures for civic entitlements.

The utility ladder of freedoms addresses an inherently *social* utility function: it is about shared utilities that generate solidarity. Shared utilities relate to the fact that *universal* freedoms represent a *reciprocal good*: they not only include one's *own* freedoms but always also those of *others*. Supporting the freedoms of others is a more easily adopted orientation when the others reciprocate the favor. Such mutual recognition in turn is more likely when action resources are widespread because then people share utilities from universal freedoms. Solidarity emerging from jointly valued freedoms provides a source of collective pressures to guarantee these freedoms.

No iron law prescribes human empowerment to progress. At any point, external shocks can reverse the process. Yet, the latency of the desire for emancipation guides human efforts toward this end—as much as external circumstances allow. In this sense, humans are evolutionary "programed" to work *upward* the utility ladder of freedoms.

Still, human empowerment is historically speaking a recent process. Before the breakthrough into the "industrial age,"[3] no society could have been described as advanced in terms of human empowerment. Even today, human empowerment shows a highly discriminant geographical pattern, as we will see: the most empowered populations of the world concentrate in environments characterized by what I call the "cool-water" (CW-) condition. This condition combines (1) fairly low average annual temperatures with (2) continuous rainfall over all seasons and (3) access to permanently navigable waterways.

Ironically, development in areas with a strong CW-condition lagged behind over most of history. But once some of these areas reached the technology level of the long-time leading civilizations in China, India, the Middle East, and the Mediterranean, it was these catching-up CW-areas that launched the Industrial Revolution and initiated an "emancipatory dynamic"[4] toward increasingly inclusive freedoms. This puzzling pattern raises two questions: (1) Why did the CW-areas lag behind so long in the civilization process? (2) Why did the CW-areas, once they caught up, take off and redirect civilization toward emancipatory outcomes?[5] The chapter-length treatment by Welzel (2013, pp. 335–375) discusses these questions in detail. The following paragraphs can only provide a rough sketch. Inevitably, such a sketch glosses over many details, some of which are addressed in the review response sections of the Online Appendix (OA 18: 73–94; OA 19: 95–114).

The first question may be answered by location. On the continent where humanity adopted advanced agriculture first—Eurasia—the CW-condition is most pronounced at the Northwestern and Northeastern flanks, culminating in Northwestern Europe and Japan. As we will see, on a CW-index with a theoretical maximum of 1.0, these two areas have a score of almost .90. No other civilization reached more than half of that score.[6] Importantly, their Eurasian fringe location placed Northwestern Europe and Japan at a distance from the early centers of agriculture in the axial belt from the Mediterranean to China. The diffusion of advanced agriculture and urban civilization reached Northwestern Europe and Japan late for this reason.[7] Indeed, Putterman's (2008) data show that the flank civilizations adopted agriculture millennia after the older civilizations of the Middle East, India, China, and the Mediterranean. Likewise, Maddison's (2007, p. 40) estimates suggest that levels of urbanization known from the older civilizations since long have not been reached in Northwestern Europe before the 16th century CE and in Japan before 17th century CE.

The CW-areas outside Eurasia were even more isolated: no advanced agrarian societies emerged in the direct vicinity of the Atlantic and Pacific shores of today's Northern US and Southern Canada, at the Southern cones of America and Africa and the Southeast of Australia and New Zealand. Accordingly, urban civilization did not emerge in the thinly populated CW-areas outside Eurasia until settlers from the European CW-areas imported it.

By contrast, Eurasia's CW-areas in Northwestern Europe and Japan were exposed to multiple stimuli from highly

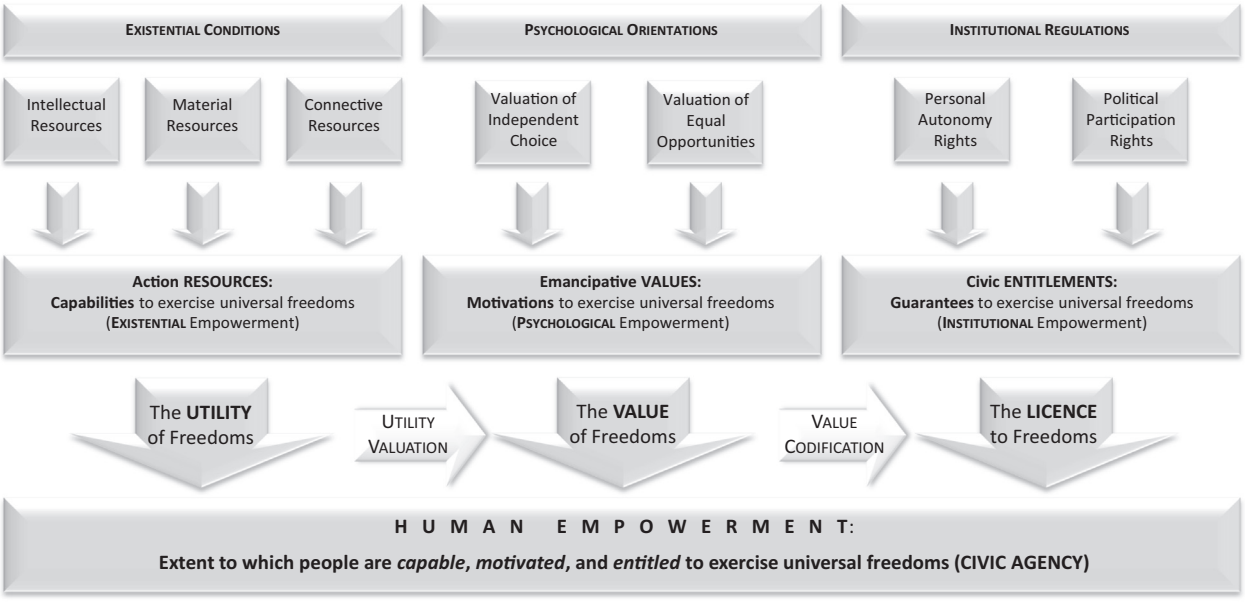


Figure 1. *The human empowerment framework. Source: Welzel (2013, p. 44).*

advanced civilizations along Eurasia's axial belt. [8] At the same time, their geographic fringe location shielded Northwestern Europe and Japan from foreign conquest. [9] Exposure allowed Northwestern Europe and Japan to adopt civilization; shieldedness allowed them to develop it in their own ways. This happened late but when it did the process of civilization changed in two fundamental ways: (1) technological progress accelerated to an unprecedented pace and began to benefit increasingly wide circles of the population; (2) struggles for emancipatory goals such as suffrage, representation, and rights also expanded into increasingly wide population circles.

I suggest that the key feature responsible for this Great Redirection is an opportunity endowment that the CW-condition naturally embodies: "water autonomy." The regular precipitation in CW-environments makes fresh water permanently accessible to everyone. And the cold temperatures of CW-environments make fresh water a safer resource by lowering its infestation (Welzel, 2013, pp. 335–375). Water access is an existential root autonomy whose presence closes a historic route to despotism: centralized control over riverine water supply (Bentzen, Kaarsen, & Wingender, 2012; Midlarsky & Midlarsky, 1997; Wittfogel, 1957). [10] Existential autonomy orients groups toward the assertion and defense of derivative autonomies, including control over their produce (Braudel, 1987, pp. 315–319). [11] Deep-rooted autonomy orientations provide a continuous source of resistance against unchecked rule and, hence, feed a pluralistic power structure. With such a structure in place, competing local, regional, and national rulers can raise taxes only in return for entitlements. These entitlements established power-sharing institutions: assemblies in which the taxed social groups are represented to check executive authority (Finer, 1999, pp. 868–895; Powelson, 1997; Tilly, 1997).

Representation was socially exclusive in the beginning but with the extension of income taxation into wider population segments, excluded groups formed social movements to campaign for their enfranchisement (Markoff, 1996). Sometimes enforced through revolutionary upheavals (Grayling, 2007), social movements triggered various waves of expanding civic entitlements, until in 1893 New Zealand became the first country to introduce full male and female suffrage (Held, 2006). Emancipatory struggles of this sort have spread since then to other areas and can be observed today all around the world (Carter, 2012; Clark, 2009). Nevertheless, such emancipatory outcomes as democracy have been achieved first in nations emerging under strong CW-conditions.

The autonomies rooted in the CW-condition include reproductive autonomies over fertility decisions. The reason is that the colder temperatures of CW-environments are inhospitable to the numerous communicable diseases known from (sub)tropical areas (Fincher *et al.*, 2008). As a consequence, child mortalities are *naturally* lower in CW-environments. Lower child mortalities allow for lower fertilities to sustain the workforce and this means more elasticity in fertility decisions: households can opt for fewer children once newly arising opportunities incentivize this preference. This is precisely what emerging urban markets do: the profit opportunities they offer make it rewarding to divert time investments from the maximization of offspring toward the formation of profitable skills and the development of selling ideas (Becker & Barro, 1988; Galor, 2011). The resulting demographic transition upgrades the value of labor, which becomes the costly production factor that producers seek to replace with technologies to save labor. Supported by initiative-promoting policies of competing local, regional, and national governments, the then ubiquitous search for innovations feeds the science and technology explosion needed for an industrial take-off (Galor, 2011; Goldstone, 2009).

The complementary analyses in OA 18 (Points 7 and 8) document that both Northwestern Europe and Japan had indeed lower child mortalities, lower female fertilities, and later female ages of marriage than areas with weak CW-conditions *already before* the medical breakthroughs of the industrial age. These breakthroughs pushed things more dramatically toward the demographic transition but its origins are visible already earlier. [12]

In summary, Northwestern Europe and its settler colonies, followed by Japan, pioneered the take-off into the age of industrialization because their societies reached the stage of urban civilization on the basis of a multi-polar power structure and plural autonomies. This was a decisive advantage because plural autonomies are necessary (1) to unleash the inquisitive energies that feed the technology explosion of an industrial take-off and (2) to bestow bargaining power on social groups so that they can enforce their representation in elected assemblies in return for the expansion of fiscal state capacities ("no taxation without representation"). Yet, the original cause of this trajectory is environmental: the CW-condition harbors an existential root autonomy—water access—from which derivative autonomies at more advanced stages of market development evolve bottom-up.

Through European settlement, all CW-areas outside Eurasia have been incorporated into the advancement of industrialization and democratization. This process established a situation in which all CW-areas on the globe today score high in technological progress, emancipative values, and civic entitlements—the three ingredients of human empowerment.

During the colonial period, Western nations monopolized emancipatory achievements. [13] 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: consumer-oriented technological progress and its emancipatory consequences diffuse beyond societies with pronounced CW-conditions. This happens because accelerating global exchange eases the diffusion of technologies—like air conditioning, water procurement, and vaccination—that offset the disadvantages of hot, dry, and disease-loaded environments. This does not mean the Westernization of the world but, on the contrary, its de-Westernization: the West's monopoly over emancipatory gains fades.

3. HYPOTHESES

The propositions of the above outlined theory 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*: 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*: Since the first civilization worldwide with pronounced CW-features, Northwestern Europe, reached the pre-industrial stage of development in the

16th century CE, a previously negative correlation between regional CW-scores and technological progress turns into an increasingly positive correlation until the beginning of the era of accelerated globalization.
5. *Fertility thesis*: The CW-condition's technological impact originates in this condition's tendency to favor lower fertilities.
6. *Contagion thesis*: Worldwide, the correlation between the societies' CW-scores and technological progress is declining since the era of accelerated globalization, beginning with the end of the Cold War.

(a) *Alternative explanations*

How does the CW-condition relate to the multitude of other factors that have been proposed as causes of technological progress and its emancipatory consequences? To answer this question it is helpful to order the various causes from remote to proximate as concerns their temporal closeness to technological progress today. In the sequence from remote to proximate causes, the CW-condition is a remote cause because it addresses geography-based differences that have changed less over the past than any human-made factors. Thus, if the technological impact of the CW-condition is real, it can only exist because the CW-condition operates as a selective force over some of the more proximate causes of technological progress. If so, these causes' technological impact must drop once we control it for the CW-condition.

Under this premise, the CW-condition's supposed technological impact gains credibility if it outmatches that of all equally remote causes. It should also outmatch the impact of the more proximate causes—except fertility control, of which emancipation theory says that it mediates the CW-condition's impact. What follows is a brief review of supposed causes, ordered from remote to proximate. [14]

Other geographic features to which scholars attribute a technological impact include Diamond's (1997) "geocondition" and "biocondition." "Geocondition" measures a country's territorial size, east–west-axis orientation, and latitude. "Biocondition" measures a country's number of domesticable plants and animals. Although these features explain an early timing of the Neolithic Revolution (Olsson & Hibbs, 2005), I doubt that they explain the pioneering of the Industrial Revolution—precisely because they do not capture the CW-condition. The findings section will show that this assumption is accurate.

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 emission of neurotransmitters: 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 innovation—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 innovation: "openness" and "extraversion" (Schmitt *et al.*, 2012; Stein *et al.*, 2005; Wichers *et al.*, 2008). [15] 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 innovation (Chiao & Blizinsky, 2010).

If the CW-condition indeed embodies existential autonomies, innovation is more rewarding under the CW-condition because autonomies are needed to reap the benefits of better ideas. Possibly, then, the CW-condition establishes a selective advantage for genes favoring the traits that encourage innovation. 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 favored 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 innovation. Consanguinity denotes a marriage pattern that keeps social circles narrow in preferring distant relatives over non-relatives. According to Woodley and Bell (2013), the effect on technological progress is negative. In the wake of Max Weber, many authors consider a Protestant legacy as a positive ideological influence on technological progress (e.g., Lal, 2001). A similarly large literature assigns Islamic traditions a negative effect (e.g., Kuran, 2004). Possibly, then, the technological impact of the CW-condition exists because this condition operated as a selective force in favor of Protestantism and cultural looseness and against consanguinity and Islam. [16]

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 state organization (Bockstette, Chanda, & Putterman, 2002). The proponents of these measures argue that the longer the Neolithic Revolution and state organization date back, the more time a society had to expand its stock of knowledge, which should be visible in technological progress today (Olsson & Hibbs, 2005). [17] Thus, it is possible that these factors mediate the technological effect of the CW-condition.

Acemoglu, Johnson, and Robinson (2001) attribute a lasting influence to colonial patterns. 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 claim by an institutional argument: development depends on power-sharing 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 rent-seekers came to extract natural resources. Finding physical work insufferable, these colonizers forced indigenous people and slaves from Africa to work on plantations and in mines. Tropical areas were, thus, left with a legacy of "labor-exploiting" institutions—a manifest hindrance to technological progress (Engerman & Sokoloff, 1997). [18]

The thesis that development favors democracy is one of the most researched topics in political economy, usually with confirmatory results (cf. Benhabib, Corvalán, & Spiegel, 2011; Teorell, 2010). The opposite thesis that democracy also favors development has produced conflicting evidence (Krieckhaus, 2004). Yet, as Gerring, Bond, Barndt, and Moreno (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, Kraay, & Mastruzzi, 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 (North *et al.*, 2009).

4. DATA AND METHODS

To save space, details of a technical nature—including measurement issues and descriptive statistics—are documented in the Online Appendix (OA). The following paragraphs, hence, provide only short descriptions of the key variables.

To test the syndrome thesis, I employ a 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 1995–2005, as described in OA 1. Data are available for 146 countries and shown in OA-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 Alexander and Welzel (2010), Deutsch and Welzel (2011) and Welzel (2012; 2013). OA 2 provides a description of items, index construction as well as reliability, and validity statistics. Data are available for 96 countries and shown in OA-Table 5. These countries are from all over the world and include the countries with the largest economy and biggest population in each world region. There is no sampling bias.

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 OA 3. A validation of the civic entitlements index is available in Welzel (2013, pp. 249–277). Data are available for 186 countries and shown in OA-Table 5.

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. However, 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. Specifically, I use resource and democracy measures from Vanhanen (2003) as proxies for technological progress and civic entitlements, as described in detail in OA 4 and 5, with descriptive statistics shown in OA-Table 7 (p. 19) and data displayed on a country-per-decade basis in OA-Table 8 (p. 20 ff.). The temporal intervals of these data are decades. 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 decennial time intervals.

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, confirming the previous literature on this issue (Abramson, 2014; Inglehart, 1990; Inglehart, 1997; Inglehart, 2008; Inglehart & Abramson 1999; Inglehart & Norris, 2003; Inglehart & Welzel, 2005; Welzel, 2007). [19] OA 19 (Point 15, pp. 110–112) discusses additional evidence in support of this assessment. In light of this evidence, it seems 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. Doing so, we obtain backward estimates of emancipative values for 96 societies for six decades back in time, covering the decennial sequence from 1940–50 to 1990–2000. OA 6 documents the details of the estimation procedure. OA-Table 7 (p. 19) shows descriptive statistics and OA-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 dominant flow of impact among the three elements of human empowerment. To handle the problem of serial dependence, estimations are based on panel-corrected standard errors. OA-Table 9 (p. 32) and OA-Table 10 (p. 33) show that robustness checks with multiple imputations and "seemingly unrelated regressions" confirm the results reported below in the findings section.

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 measures of the same type of resource. Hence, we can separate the individually unique from the commonly typical level of 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 10-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 from the World Values Surveys. 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. [20]

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 Gallup, Mellinger and Sachs (2010; see also

Mellinger, Sachs, and Gallup (2000); Peel, Finlayson, & MacMahon 2007). However, these area proportions still show considerable variation in (a) the amount of continuous rainfall as well as (b) the abundance of permanently navigable waterways—two important factors for 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-km reach of permanently ice-free waterways. 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 a root existential autonomy: water access. The exact steps of the index construction are detailed in OA 9 (p. 35 ff.). The index is available for 173 countries and index scores are shown in OA-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). 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. 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 OA 10. The index is available for 187 countries and scores are shown in OA-Table 14 (p. 43). Again I consider country differences on this index as constant over the study period.

Welzel (2013) argues that an area's migratory distance from the human origin in East Africa is a reasonable proxy for how late the area has been populated by modern humans and how remote it is from other populations. Since remoteness is linked with delayed development, it explains the CW-areas' belatedness: these areas are in large distance from the human origin. To measure the migratory distance, I calculate the longitudinal and latitudinal distance of a country's centroid from Ethiopia's centroid, as documented in OA 11. To indicate *earliness* of human arrival I inverse the migratory distance, indicating proximity to the human origin. Data are available for 159 countries and displayed in OA-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 OA 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). Data on fertility control are available for 170 countries; scores are shown in OA-Table 15 (p. 49 ff.).

All other variables described in the theory section are taken from the sources listed in OA 14 and scores for all variables are shown in OA-Table 18 (p. 58 ff.). 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 show that fertility control is not endogenous to economic development. After that, I specify a temporally ordered path model to demonstrate the causal flow from human 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 territories 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. [21] I interpolate data for large sections of time between Maddison's estimates for the years 1, 1000, and 1500. In the absence of demonstrably better assumptions, the interpolation assumes steady change between any two temporally adjacent measures. OA 15 documents Maddison's income estimates and OA-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 OA 16. Using longitudinal cross-country regressions, I explain decennially ordered change in per capita GDP by the CW-condition and measures of globalization from Dreher *et al.* (2008). These are available in time series from 1970 to 2000 on an annual basis. OA 17 documents the globalization measurement.

5. FINDINGS

(a) *The syndrome thesis*

Past and contemporary measures of technological progress, emancipative values, and civic entitlements correlate strongly, positively, and significantly across countries. Measured over the period 1995–2005, 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 and .92 for both civic entitlements and technological progress. The shared variation among the three variables is 86%. The three-dimensional scatter plot in Figure 2 visualizes the *technology–culture–institution nexus* that merges these variables into a single continuum of human empowerment. It is clear then that development is consistent across the technological, cultural, and institutional domains of human existence. The syndrome thesis is confirmed beyond reasonable doubt.

(b) *The sequence thesis*

The three ingredients of human empowerment are highly correlated but correlation is not causation. To examine causality, one needs longitudinal data to examine in temporal order models 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 far-reaching. [22] But let's first inspect the visual evidence. For better visibility, Figure 3 arranges the 84 societies covered by this analysis into ten global culture zones, as classified by Welzel (2013). Note that these culture zones account for 79% of the cross-national variation in civic entitlements, 78% in technological progress, and 72% in emancipative values. Hence, summarizing countries into culture zones means 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

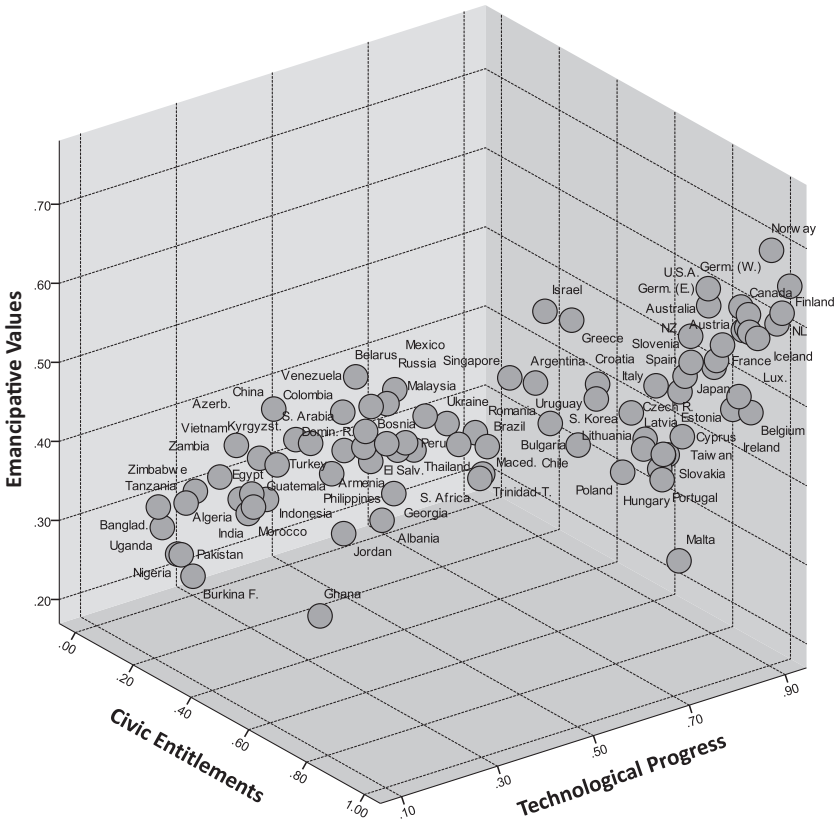


Figure 2. *The threefold syndrome of human empowerment. Note: variables are described in OA 1–3 and data are shown in OA-Table 5 (p. 13 ff.).*

Table 1. *Time-pooled cross-sectional model of a reciprocal system of temporally ordered effects*

	Dependent Variables at time T_0:		
Lagged predictors:	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: Variables are described in OA 4–6. Data are displayed in OA-Table 8 (p. 20 ff). 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): $^{\dagger}p \geqslant .100$, $^{*}p < .100$, $^{**}p < .050$, $^{***}p < .005$. 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 OA 4–6.
[c] Proxy measure for a society's civic entitlements in a decade is Vanhanen's index of democratization for that decade (see Vanhanen, 2003).

long-term global trend toward human empowerment on each of its three components.[23]

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

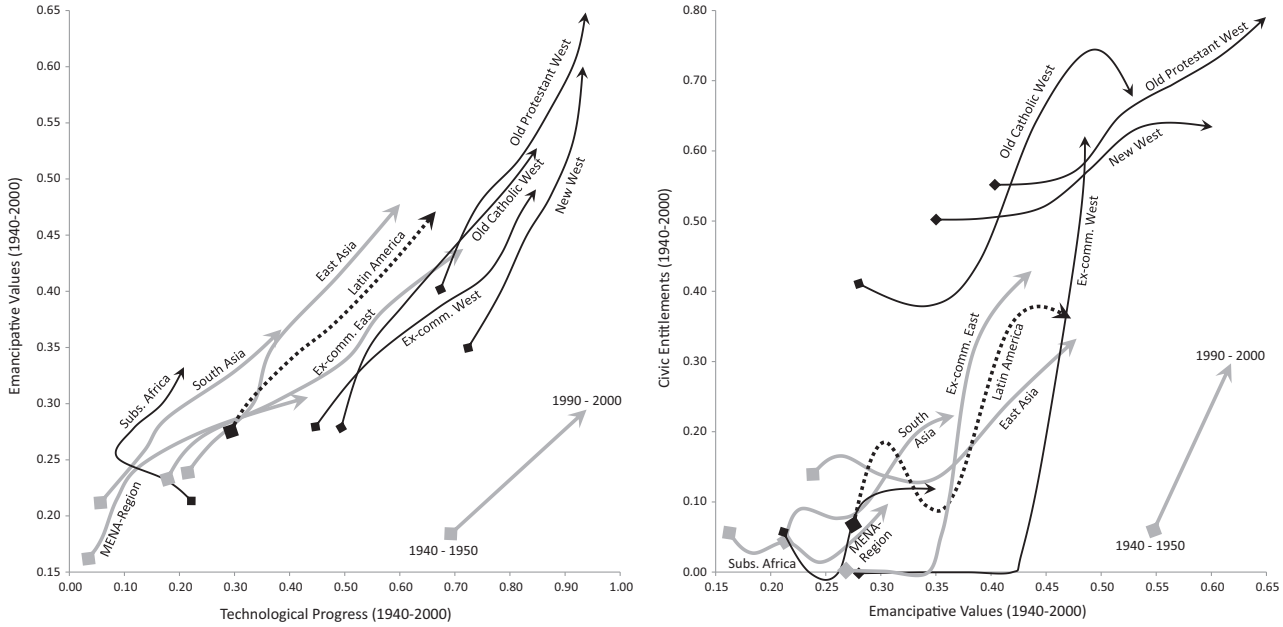


Figure 3. *The co-evolution of the three elements of human empowerment in global culture zones from 1940 to 2000. Note: variables are described in OA 4–6. Grouping of countries into culture zones documented at the bottom of OA 6 (p. 30). Data are displayed in OA-Table 8 (p. 20 ff.).*

which rising emancipative values pressure for wider civic entitlements.

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 most 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 to where rising emancipative values should have pulled them already earlier, were it not for the overriding veto of the Soviet Union.

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, the gains among Western societies occur earlier and on a higher plateau. Most likely, the West's higher plateau reflects its historic imprint from emancipatory movements 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 global 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 neocolonialism, emancipative values in non-Western societies had to surpass a higher threshold to gain similar civic entitlements as Western societies.

Incorporating this historic pattern, the panel regressions in Table 1 examine the causal relationship between the three elements of human empowerment, as anticipated 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}. 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.

(c) *The solidarity thesis*

The multi-level models in Table 2 examine how the action resources that technological progress plays into the hands of ordinary people affect their emancipative values. For each of the three 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[24] 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. This finding confirms the solidarity thesis: action resources strengthen emancipative values via the matching part that most people in a country have in common. The value of universal freedoms originates in socially *shared* utilities.

(d) *The initiation thesis*

As the left-hand diagram in Figure 4 illustrates, the countries' CW-condition explains 73% 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% of the inter-regional variance in technological progress ($N = 25$). The explained variance is higher at the regional level because the average CW-condition

Table 2. *Multi-level models of the impact of action resources on emancipative values*

Predictors:	Dependent variable: emancipative values				
	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)
Societal-level Effects					
x GDP/p.c.	.51*** (5.9)				
x Schooling years		.46*** (9.7)			
x Internet access			.61*** (9.2)		
x Technological progress[b]				.52*** (9.1)	.41*** (9.9)
Individ.-level effects					
Female sex	.02*** (10.5)	.02*** (11.5)	.03*** (11.2)	.03*** (11.5)	.03*** (11.5)
Cross-level interact.					
Birth year (index)	.14*** (19.9)	.11*** (12.3)	.09*** (10.1)	.07***(6.8)	.07*** (7.2)
x GDP/p.c.	.28*** (5.0)				
x Schooling years		.28*** (6.6)			
x Internet access			.14*** (2.6)		
x Techn. Progress[b]				.28*** (4.4)	.17*** (4.8)
Household income	.09*** (16.6)			.02*** (3.6)	.02*** (3.7)
x GDP/p.c.	N.S.				
x Schooling years					
x Internet access					
x Techn. progress[b]				N.S.	N.S.
Formal education		.12*** (19.0)		.10*** (12.0)	.10*** (12.6)
x GDP/p.c.					
x Schooling years		.11*** (4.2)			
x Internet access					
x Techn. progress[b]				.21*** (4.5)	.12*** (5.1)
Connectivity			.08*** (15.7)	.04*** (11.0)	.04*** (11.0)
x GDP/p.c.					
x Schooling years					
x Internet access			N.S.		
x Techn. progress[b]				N.S.	N.S.
Error Red. (of total)					
Within-soc. Var. DV	08% (05%)	13% (09%)	08% (05%)	12% (08%)	12% (08%)
Betw.-soc. Var. DV	57% (20%)	60% (21%)	71% (25%)	79% (28%)	77% (27%)
Var. in Age Effect	36%	41%	13%	31%	40%
Var. in Inc. Effect	ZERO			ZERO	ZERO
Var. in Educ. Effect		13%		28%	35%
Var. in Conn. Effect			ZERO	ZERO	ZERO
Total Explain. Var.	25%	30%	30%	36%	35%
N (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

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 ($p > .050$).

[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 (about 2000–05) and weighting each national sample to equal size. The other models only cover data from WVS round five (about 2005) because the questions used to measure informational connectedness were only fielded then.

[b] In the first combined model, instead of technological progress 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.

in a country's surrounding region has an additional effect on its technological progress: Swaziland has a similar CW-score as Switzerland but is surrounded by countries with low CW-scores, which reduces its technological progress below the level that its own CW-score suggests.

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 conditions these are, we probe into a mediation analysis to see which conditions absorb the technological impact of the CW-condition.

(e) *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 absorb the technological impact of the CW-condition. The table shows the variables' *partial* effects on technological progress, controlling

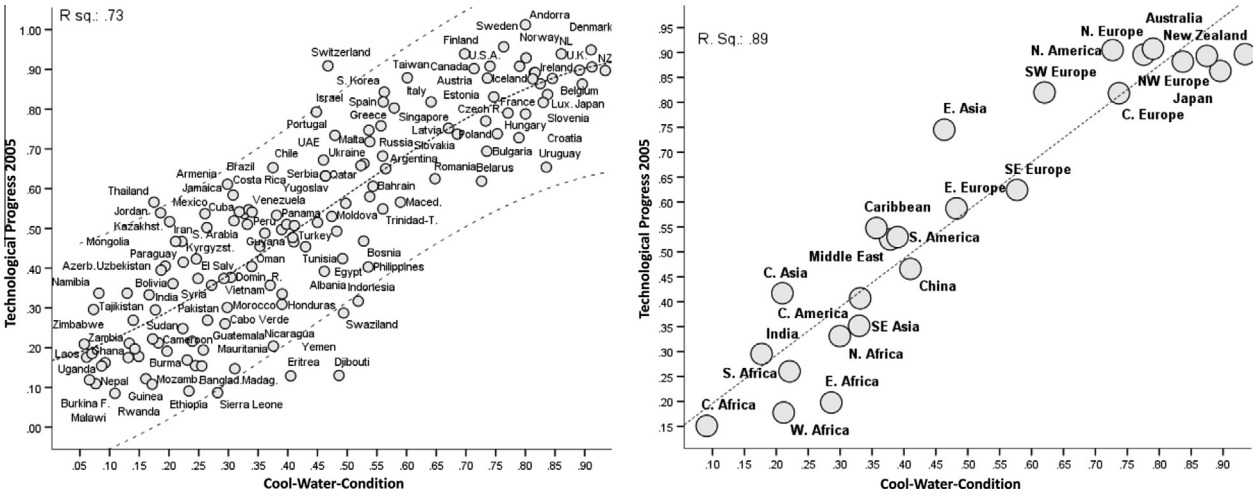


Figure 4. *The Cross-national and cross-regional technological impact of the CW-condition. Note: Variables are described in OA 9. Data are displayed in OA-Table 13 (p. 38 ff.).*

Table 3. *Correlations of technological progress with the CW-condition and its suspected mediators*

Predictors of technological progress	Correlation with Technological Progress 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, 990s	.70***	84
Consanguinity (logged)	−.70***	66
"Geocondition"	.65***	98
"Biocondition"	.60***	98
"Val^{158}Met" 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): †$p \geqslant .100$, *$p < .100$, **$p < .050$, ***$p < .005$.
For documentation of data and variables, see OA 14 and OA-Table 18 (p. 58 ff.).

for the CW-condition and disease security. The partial effects of the CW-condition and disease security are shown 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. Arguably, the mediator that absorbs most of the technological impact of the CW-condition explains why that impact exists.

In Table 3, all variables—except the HTTLPR 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 $r_{\text{partial}} = .47$; likewise, the effects of civic entitlements and the democratic tradition drop, 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 than each of these factors, except the "geocondition" and the "biocondition." The latter two, however, have a much weaker effect on technology than the CW-condition (partial *r*'s of .25 and .30 compared to .66 for the CW-condition).

Two of the most prominent variables in the development literature, Protestantism and "white" settlement—also show a much weaker partial effect on technology than the CW -condition (partial *r*'s of .02 and .21 compared to .70 for the CW-condition). In fact, these variables' technological effects are largely explained by the CW-condition. Protestantism became prevalent almost exclusively in societies where the CW-condition is pronounced and mass scale "white" settlement has been mostly directed into colonies with a strong CW-condition.[25] Thus, once we control for the CW-condition, the seeming technological impacts of Protestantism and "white" settlement largely vanish.

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.

Table 4. *Simultaneous effects of the CW-Condition and its suspected mediators on contemporary technological progress (partial Rs)*

Alternate predictors	Simultaneous EFFECTS on technological progress 2005			*N*
	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	
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
"Geocondition"	.66***	.28**	.30***	95
"Biocondition"	.66***	.31	.25**	95
Neuroticism (Big 5)	.51***	.36**	.25†	48
Openness (Big 5)			.03†	
Extraversion (Big 5)			.00†	
"White" settler mortality	.70***	.32***	−.21**	105
Time since neolithic revolution	.70***	.35***	.22**	132
% Muslims	.67***	.36***	−.12†	136
% Protestants			.02†	
% Catholics			.05†	
Continuous peace	.67***	.36***	.09†	137
"Val^{158}Met" COMT gene	.72***	.17†	.17†	49

Note: Entries are partial correlation coefficients to indicate each predictor's partial explanatory power over technological progress. Each line represents a separate regression of technological progress simultaneously on the cool water condition, disease security, and one of the alternate predictors shown in the left-hand column.
Reading example: in the first line, the coefficient .41 indicates the partial effect of the cool water condition on technological progress, controlling for disease security (whose partial effect on technological progress is .28) and fertility control (whose partial effect on technological progress is .61).
Tests for heteroskedasticity (White-test), influential cases (DFFITs), and multicollinearity (variance inflation factors) reveal no violation of OLS-assumptions in any regression series.
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.).
Significance levels (two-tailed): $^{\dagger}p \geqslant .100$, $^{*}p < .100$, $^{**}p < .050$, $^{***}p < .005$.

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

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	.21 (5.42)***	.15 (4.94)***	−.12 (−3.28)***	−.11 (−2.99)***
CW-condition, historic	.62 (6.10)***	.68 (9.26)***		
Disease security, historic	.12 (1.17)†	.28 (4.03)***		
GDP/p.c. (indexed), 1980	.22 (2.56)**			
Predicted fertility control			1.11 (18.72)***	1.10 (18.51)***
Adjusted R^2	.69	.63	.81	.76
N (societies)	96	96	84	84

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, the CW-condition 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): $^{\dagger}p \geqslant .100$, $^{*}p < .100$, $^{**}p < .050$, $^{***}p < .005$.
Data documented in OA 9–13.

show that fertility control is much more strongly determined by the remote CW-condition than by per capita GDP. The three instruments explain 69% of the cross-national variance in fertility control. Of these 69%, only 5% are accounted for by per capita GDP. [26] Because disease security is insignificant, the CW-condition accounts for most of the remaining 64% 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%. 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 does 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. [27] Indeed, the complementary analyses in OA 18 (Points 7 and 8) demonstrate that more pronounced CW-features produced lower fertilities already in pre-industrial times. Further supporting this point, Welzel (2013: 365) uses anthropological data from 34 pre-industrial populations around the world, showing that the presence of the CW-condition contributes significantly to "female reproductive autonomy'—a precondition of fertility control (Hudson *et al.*, 2012). All this suggests that the CW-condition indeed encourages lower fertilities.

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 began to reach the mature stage of urbanity. For it needs vibrant markets to make investments in technological progress profitable. The only two Eurasian civilizations in areas with high CW-scores were Northwestern Europe and Japan. Of these two, Northwestern Europe did not reach urbanization levels known from India, the Middle East, China, or Southern Europe before about 1500 CE and Japan did not reach them before the beginning of the Tokugawa period in about 1600 CE (Allen, 2000; Maddison, 2007, p. 40). [28] Beginning with the period leading to this catch-up, the technology impact of the CW-condition should surface. And it should have turned stronger since then because European settlement transplanted technological progress into each CW-area outside Eurasia (all of which were so thinly populated and susceptible to European diseases that resistance to settlement proved futile).

Figure 5 confirms this expectation with striking clarity. The diagram uses Maddison's (2007) historic estimates of the per capita incomes of exemplary territories 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 during 1300–1600 CE: the previously negative relationship between the CW-condition and technological progress, which goes all the way back to the year one, now turns positive and continues to increase steeply. [29]

Figure 5 suggests an answer why the CW-areas lagged behind before this turn. This is obvious from the correlation

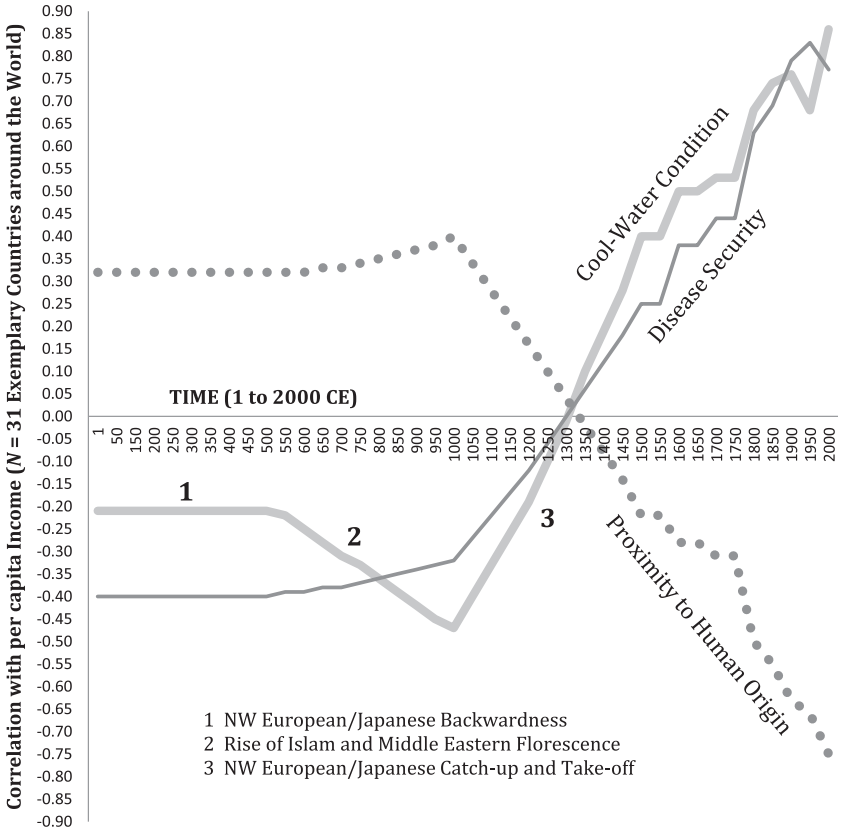


Figure 5. *Inter-regional correlation of the CW-condition, disease security, and early human arrival with income/p.c. over the last 2,000 years. Note: Data documented in OA 15, see in particular OA-Table 19 (p. 65) and OA-Table 20 (p. 67 f.).*

of the territories' per capita incomes with their geographic proximity to the human origin. Proximity shows a strongly positive correlation with cross-regional income differences until the beginning of the turn. This reflects the fact that the old civilizations in the axial belt from the Mediterranean to India were closer to the human origin. Accordingly, they have been populated earlier by modern humans and also developed advanced agriculture and urban civilization earlier than the remote and belated CW-areas. Hence, until about 1300 CE, people in the old and proximate civilizations had slightly but consistently higher incomes than people elsewhere. But since the rise of the remote and belated CW-areas, the early civilizations fell behind and the positive proximity-income correlation turns sharply negative.

Now, the pieces seem to fall in place. Located at the remote Northern coastal flanks, Eurasia's CW-areas were located at a distance from the early centers of civilization.[30] For this reason, they adopted advanced agriculture and urban civilization late. But once urban markets began to reach out in these areas, the existential autonomies inherent in the CW-environment bestowed higher utilities on freedoms. These utilities encouraged a low fertility preference and households began to sacrifice fertility for productivity. This shortened the supply of cheap mass labor. Rising labor demands of growing cities had to be met by labor-saving technology when the factor cost of labor is high. This nurtured technological progress. The path diagram in Figure 6 fully supports this narrative with temporally ordered data from some 127 countries around the world.[31]

(f) *The contagion thesis*

Fortunately, the human empowerment process is not doomed to remain limited to societies with Western-like CW-conditions. Quite the contrary, the process of globalization can greatly enhance the diffusion of technologies that overcome the disadvantages of dry, hot, and disease-loaded environments. These technologies include such basic things as water procurement, air conditioning, and vaccination. Accordingly, the demographic transition to lower fertility and higher education should have begun to expand into areas with a weaker CW-condition. This is exactly what we observe (Welzel 2013, p. 4). As a consequence, the countries' per capita incomes should increasingly dissociate from geographical conditions like the CW-features as globalization progresses. If this is correct, the CW-condition should show a diminishing impact on per capita income growth. And progressing globalization should explain this shrinkage in impact.

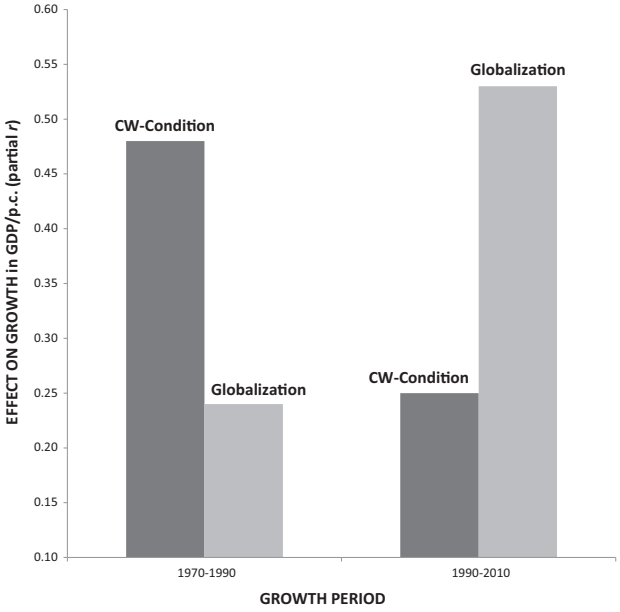
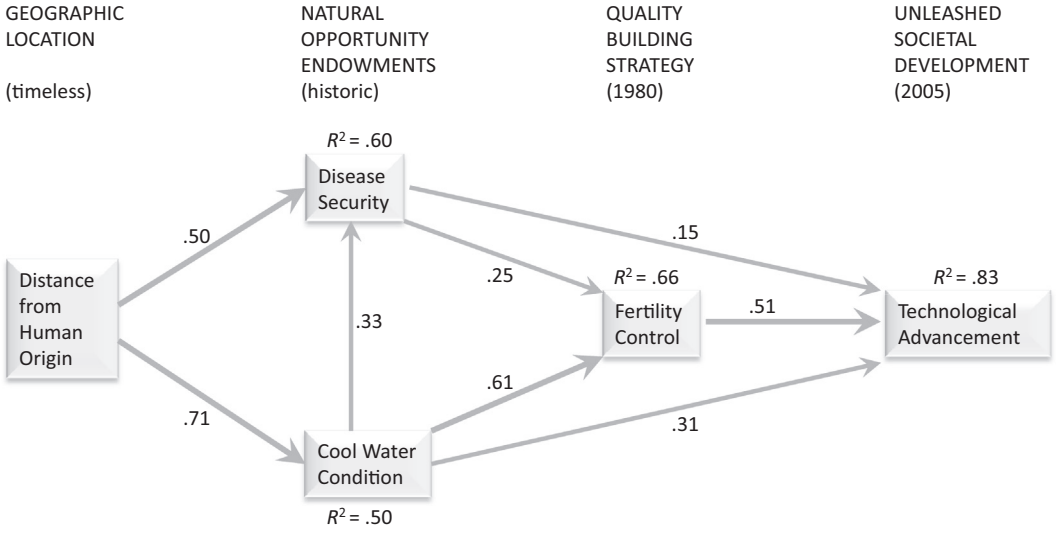


Figure 7. *The partial growth effects of the CW-condition and globalization over two phases. Note: Data documented in OA 15 and 16.*



Note: Entries are partial correlation coefficients, calculated with AMOS 19. Units of observation are national societies: *N* is 127, including all societies with available data on each variable. Fertility control in this model is *exogenous* to prosperity: it is the residuals in fertility control not predicted by per capita GDP in the same year. Goodness of fit indices: GFI .94, NFI .97, IFI .98, CFI .98. All effects are significant at the .001-level.

Figure 6. *Path diagram illustrating the causal flow suggested by the initiation thesis and the fertility thesis. Note: variables are described in OA 1 and 9–13. Data matrix is displayed in OA-Table 15 (p. 49 ff.).*

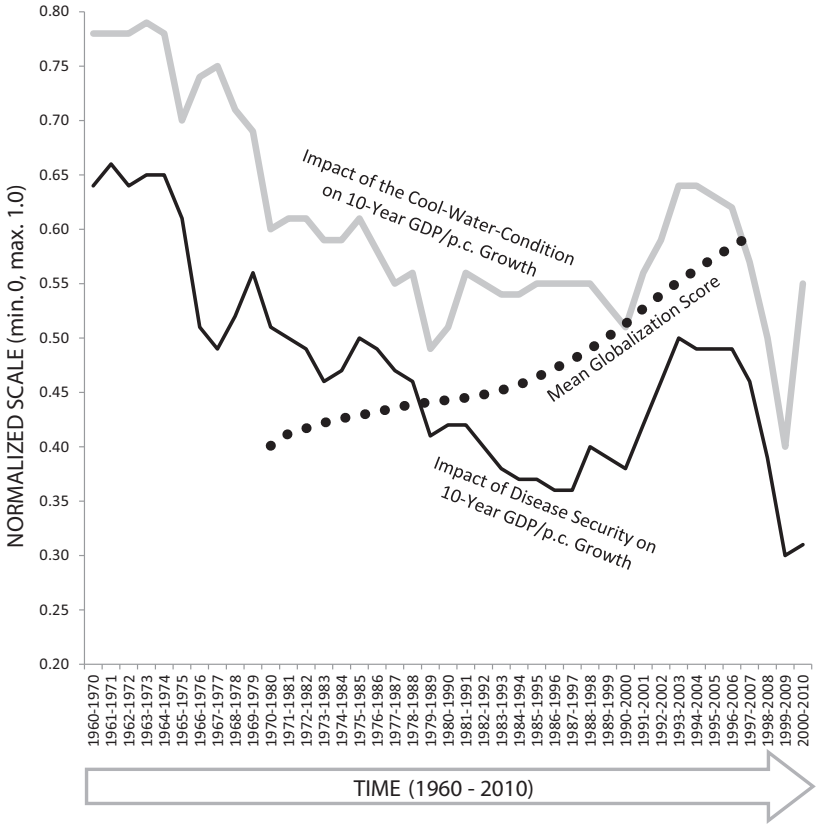


Figure 8. *The shrinking growth effect of natural conditions and the world's increasing globalization score. Note: Variables are described in OA 16 and 17.*

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 1970–90 and 1990–2010. 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 1970–90 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 ($N = 127$). [32]

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% of the declining impact of the CW-condition.

6. CONCLUSION

This article tried to show that disparate insights into development fall in place when considered in the framework of Evolutionary Emancipation Theory (for a summary, see Table 6). The available evidence confirms this theory's propositions, although two caveats are due. To obtain evidence that allows one to test the sequence thesis, I had to estimate emancipative values back in time. 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 the CW-condition within nations explain differences in technological progress? In an article-length treatment this question could not be addressed adequately but it is worth mentioning that a recent study by Dell, Jones and Olken (2012) confirms the hypothesis for US-regions.

Other elements of EET stand on firm ground, however. Indeed, a key regularity shows striking robustness—the value-utility link that ties emancipative values to action resources. Thus, in each single country surveyed, people in control of more action resources emphasize emancipative values more than do people with fewer resources. More importantly still, this tendency rises steeply as the proportion of people in control of action resources increases. Hence, if life improves on a mass level, a drive toward 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

Table 6. *Summary of Evolutionary Emancipation Theory (EET)*

One root idea: The utility ladder of freedoms		
Three premises		
Variability in freedoms' utility	The utility-value-link	Upward direction
Guarantees of universal freedoms have varying utility for people in how to master their lives: the utility of guarantees grows when people's existential conditions embody more options for intentional action. Then, guarantees are needed more to protect the safe use of the multiple options.	Human life strategies are shaped by a utility-value link: people value what is useful for mastering life under given circumstances. This utility-value link is vital to keep human existence in touch with reality. Hence, if rising opportunities enhance the utility of freedoms in an *objective* sense, *subjective* values adjust in the same direction, toward supporting freedoms.	Evolution favors reality-controlling features, and mastering freedoms is a reality-controlling feature because it means agency. Thus, humans are evolutionary programed to work upward the utility ladder. This orientation ties people's life satisfaction to how free they feel.

Six theses					
Syndrome thesis	Sequence thesis	Solidarity thesis	Initiation thesis	Fertility thesis	Contagion thesis
Expanding action resources, emancipative values, and civic entitlements constitute a syndrome of human empowerment—a process giving people control over their lives and their societies' agenda.	If it progresses, human empowerment advances in sequential growth cycles, starting from new action resources, continuing to new emanci-pative values, finishing with new civic entitlements. After completion of an empowerment cycle, a new one can begin.	The action resources that people have in common with most others in their society strengthen their emancipative values much more than what they have on top of others. Likewise, it is the emancipative values that people share which encourage joint actions in pursuit of freedoms.	Once Northwestern Europe reached the pre-industrial stage of civilization (15–17th centuries), an entirely new dynamic in history set in: societies with pronoun-ced "cool water features" developed increasingly toward emancipatory gains and became increasingly distinct that way.	The "cool water" features' emancipatory impetus roots in these features' tendency to diminish fertilities. This eases a turn in life strategies from quantity-breeding to quality-building: people divert energies from growing the size of the population to growing its skill.	Worldwide, the turn of development toward emancipatory gains shows clear signs of diffusion beyond areas with pronounced "cool water features" since the era of globalization.

a society's position on the utility ladder. Liberal institutions, thus, evolve from value-utility links at the grassroots of society.

Over the past thirty years, the world has seen falling fertility, rising education, and various waves of democratization. And despite the revival of autocracy in some countries, there has been no reverse wave away from democracy, as a recent study by Moeller and Skaaning (2013) shows. Nevertheless, the big question is whether China and other autocratic countries can embark on technological progress while denying its emancipatory consequences. EET predicts that such attempts will fail because it requires intellectual freedoms as well as their derivative freedoms to unleash the creative energies needed for technological leadership. It is up for future research to show whether this view is accurate.

NOTES

1. In 2012 the average per capita income (in power purchasing parities) of citizens in Germany, France, the UK, the Benelux countries and the Scandinavian countries amounts to some 45,000 international Dollars—which compares to about 1,200 Dollars for Sub-Saharan Africa. Data are from the World Development Indicator series (Word Bank, 2013).

2. I rely on Maddison's (2007) historic income estimates (see OA-Table 19 in the Online Appendix, p. 65).

3. The "industrial age" started in the middle of the 18th century when England headed into the transition from a rural society, with most of the labor force working in agriculture, toward an urban society, with most of the workforce occupied in industries (Goldstone, 2009; Landes, 1998). Industrial production happens in factories in which workers operate machines powered by inanimate energy (see Point 2 in Review Response Section II of the Online Appendix, OA 19, p. 96).

4. "Emancipatory dynamic" refers to a trajectory toward entitlements that extend incrementally to an ever wider circle of population. Emancipation in this sense involves a continuous sequence of struggles by extant discriminated groups for inclusion into the emancipatory gains that other groups have made before them (see Point 12 in Review Response Section II of the Online Appendix, OA 19, p. 107).

5. These questions address the "Needham Puzzle" from an inverse perspective. China belonged to the early centers of agriculture and, like the other mature civilizations of Eurasia, developed "proto industries" long before Northwestern Europe and Japan. Nevertheless, the mature civilizations did not lead the take-off into the industrial age. A commonality of these early maturing but subsequently not off-taking civilizations is a weak CW-condition (see Point 1 of Review Response Section II of the Online Appendix, OA 19, pp. 95–96).

6. In Europe, CW-scores culminate in the Northwest: the highest scores exist in the British Islands, the Netherlands, Belgium, Northern France, Northwestern Germany, and Southern Scandinavia. From there, scores drop as one moves eastward and southward. In Asia, CW-scores culminate in the Northeast: the highest scores exist in Japan from where scores drop as one moves westward and southward. By comparison, Russia as a total has a CW-score of .56 and China a CW-score of .41. In its most Northwestern region, Russia's CW-score gets as good as .73—still considerably below Northwestern Europe's overall score of .89. And China's CW-score in its most Northeastern region gets as good as .56—still below Japan's overall score of .90.

7. The flank position of these two civilizations saved them from conquest by Eurasia's recurrent land empires. Thus, the potential that resides in the

CW-condition unfolded undisturbedly in Northwestern Europe and Japan. This was different for the more inwardly located CW-areas in Eurasia, like Russia's Northwest or China's Northeast: they were absorbed into larger territorial empires whose primary power bases were areas with low CW-scores, like the Yangzi-delta in China. Also, Eurasia's "axial" belt civilizations were exposed to nomadic invasions from the Central Asian steppes—invasions that destroyed but also recreated empires with despotic structures (see Point 8 of Review Response Section II of the Online Appendix, OA 19, pp. 103–104).

8. Japan was heavily influenced by the more advanced Chinese civilization. Northwestern Europe was influenced by the more advanced Mediterranean region, which in turn received multiple influences from the Middle East (Fernandez-Armesto, 2002).

9. Northwestern Europe was safe from Mongol conquest but Russia was not. Northwestern Europe was also safe from Islamic conquest while Southeastern Europe was not. In East Asia, Japan was safe from Mongol conquest but China was not (see Point 6 in Review Response Section I of the Online Appendix, OA 18, pp. 77–78).

10. There have been despotic empires without centralized water control. Nevertheless, centralized management of riverine water supply eased the erection of despotic structures (see Point 11 in Review Response Section II of the Online Appendix, OA 19, p. 107).

11. Autonomies also existed in agrarian empires with a weak CW-condition but were inherently more limited in the presence of a central imperial administration. In agrarian societies with a strong CW-condition, state bureaucracies only emerged in parallel to power-sharing institutions that represented the interests of autonomous groups and checked executive authority (see Points 3 and 8 in Review Response Section II of the Online Appendix, OA 19, pp. 96–101, 103–104).

12. The analyses under Points 7 and 8 of Review Response Section I of the Online Appendix (OA 18, pp. 78–80; OA-Figure 4, p. 89) demonstrate that in 1800 CE child mortality at birth for 1,000 babies has been estimated at 417 for China, compared to 324 in the Netherlands.

13. See Point 10 (especially footnote 20) of Review Response Section II of the Online Appendix (OA 19, p. 106) for a more detailed discussion.

14. To show that the technological impact of the CW-condition is not spurious, I cannot afford to be more limited in the selection of alternative causes against which I test this impact. On the contrary, I need to be rather exhaustive in coverage to avoid omitted variable bias (see Point 14 in Review Response section II of the Online Appendix, OA 19, pp. 108–110).

15. The other two traits are "agreeableness" and "conscienceousness." For the definition and measurement of the "Big Five" personality traits see Matthews, Deary, and Whiteman (2003).

16. Note that the juxtaposition of Protestantism to Islam presented in Tables 3 and 4 of this article mostly relates to Sunni Islam because this is the dominant version of Islam in most Muslim majority countries, except Iran. As an additional control, these tables also examine the impact of Catholicism. I admit that a more differentiated sub-division of religious groups would be desirable but reliable and comparable data on the strength of smaller and perhaps more relevant religious groupings are unavailable on a broadly cross-national basis.

17. Olsson and Paik (2012) show that the relationship turns negative, if one excludes areas of rice-based agriculture in Asia. But the authors do not demonstrate why a later adoption of agriculture outside Asia turned out to be advantageous. The fact that these areas harbored a stronger CW-condition provides an answer.

18. Points 9 and 14 in Review Response Section II of the Online Appendix (OA 19, pp. 104–106, 110) discuss these arguments.

19. See Point 15 in Review Response Section II of the Online Appendix (OA 19, pp. 110–111) for a further validation.

20. Technological progress correlates with years of schooling 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 and more strongly so than the Human Development Index, which shows weaker correlations with these variables than does technological progress. In a factor analysis, schooling years, internet access, and GDP/capita represent a single-dimension: action resources. This dimension captures 90% of the variance in its three components. Technological progress correlates with this dimension at $r = .95$ ($N = 88$).

21. Point 9 in Review Response Section II of the Online Appendix (OA 19, pp. 104–106) discusses under what qualifications per capita income is a decent proxy for technological progress and why these qualifications apply here.

22. 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.

23. Point 13 of Review Response Section II in the Online Appendix (OA 19, pp. 107–108) discusses why the 50-year time span from 1940–50 to 1990–2000 is sufficient to evidence the sequence thesis.

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

25. Point 10 of Review Response Section II in the Online Appendix (OA 19, p. 106) discusses exceptions from this pattern.

26. The partial correlation coefficient of GDP/p.c. is .23, so the partial r squared is .05.

27. 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.

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

29. When exactly Northwestern Europe and Japan began to catch up with China is a matter of debate (see Point 5 of Review Response Section II in the Online Appendix, OA 19, pp. 101–103). Anyways, Maddison's (2007) estimates suggest a completion of the catch up in about 1500 CE.

30. Since China was itself an early center of agriculture it had no distance to these.

31. Because technological progress is the founding component of human empowerment as a whole, we explain human empowerment writ large when we explain technological progress.

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

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APPENDIX A. SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.worlddev.2014.05.016.