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Global human development: accounting for its regional disparities

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Abstract This study's multilevel statistical models quantify the effects of civilization zones and instrumental factors on the capacities for human agency that a country provides its citizens. These capacities are measured by the UN's human development index, which synthesizes measures of literacy, longevity, and income. Indicators of political democracy, slavery, national debt, corruption, and internal conflict gauge the instrumental factors. Political freedom and emancipative employment coupled with civil order account for the regional differences in human development scores; civilization zones, heavily indebted poor countries, and corruption influence the variability among countries within the regions.

Keywords Human development index · Substantive and instrumental freedoms · Democracy · Slavery · Corruption · Civil disorder · National debt · Clashes of civilizations · Multilevel statistical models · Causality

1 Introduction

Strategies for ameliorating the problems of poor countries have polarized. Some strategists emphasize rapid economic development, arguing that without it all that can be redistributed is poverty. Other strategists advocate the equitable distribution of economic benefits, arguing that rapid economic growth diminishes the quality of life: it changes traditional cultures, creates inequalities of wealth, and pollutes the environment.

Haq (1995, pp. 13–28) and Sen (1999, pp. 13–24, 2001, pp. 506–513) have synthesized these ideas by interpreting the aim of development as human development, which they define as the enrichment of the choices people will have for leading a decent, secure life. Human development implies more than economic growth; it has social components as well. Guided by this multidimensional perspective, the United Nations Development Program (UNDP) in 1990 created its human development index (HDI) that combines in one score a measure of a

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country's level of economic development, indicated by its income per capita, and its level of social development, indicated by measures of its literacy and longevity (Mehrotra 1997a,b).[1] Although the UN data are plentiful, and their relevance is profound, few academic studies have statistically analyzed the determinants of the positions of countries on the HDI and on its components.[2]

What factors explain why the regions of the world exhibit different levels of human development? This study offers answers to this question by analyzing a multilevel database of variables on countries and the global regions to which the countries belong. It conceptualizes the HDI as measuring the substantive freedoms a country provides its citizens (Sen 1999). Substantive freedoms are capacities for health, education, and economic well-being that people can claim simply because they are human beings. It explores the effects of the following instrumental factors that can facilitate or inhibit these substantive freedoms (Sen 1999, p. 10): *Social opportunity*, assessed by the country's level of contemporary slavery—debt bondage, forced labor, prostitution, chattel slavery, and perhaps bride price—all of which imply the absence of emancipative employment. *Political freedom*, indicated by the country's level of democracy. *Economic facilities*, indicated by whether or not the country is highly indebted and poor. *Protective security*, indicated here by its level of internal conflict and social unrest. *Transparency guarantees*, measured by perceptions of corruption. Because *civilization zones* as defined by Huntington (1997) are based on religious beliefs and cultures, and these may affect development, this study explores how the different zones bear on the HDI.

Following UN definitions this study groups countries (the level-1 units) into regions (the level-2 units) and assesses the fixed factors that predict a country's position on the HDI and that reduce the country-to-country variance within these regions. Then, consistent with George and Bennett's advocacy of "middle range" theory (2005, pp. 235–239), it introduces qualitative typologies that may account for the region-to-region variance. It distinguishes associational (i.e., non-causal) from causal effects as follows: it classifies the regional random effects by the typologies creating homogeneous subgroups in which the estimates of the level-2 random effects may become statistically insignificant and thus accounted for. It applies Bonferroni adjustments (hereafter, Bon.) to tighten the significance levels of any a-theoretical comparisons. It assesses the effects of the key variables on the ranking of the countries and replicates these findings using HDI scores, calculating effect sizes when the latter are analyzed.

[1] Welzel et al. (2003, pp. 345–346) define the concept of human development as comprising socioeconomic development, emancipative cultural values, and effective democracy whereas this study conceptualizes health, education, and economic welfare as the key components of human development and relates political freedom to different levels of the HDI.

[2] The extensive use of the HDI and parallel indexes that assess gender-related development, women's empowerment, and poverty could advance the social sciences: Sociologist may find the HDI useful because its three combined components provide an overall measure of system performance. Neoinstitutionalists could use this index to assess how different institutional arrangements influence development. Socio-economists may find the HDI compatible because its broad definition works against the narrow use of satisfaction of material wants as the generic measure of development (Basu 2001, pp. 71–72; Etzioni 1988). For communitarians and operational philosophers this index provides minimal apolitical standards—literacy, a long and healthy life, and lack of poverty—that the United Nations certifies for making cross-cultural judgments. Political scientists, economists, and dependency theorists may find this index of interest because it provides an overall measure of development, but one that allows the separate analysis of its components (Adelman 2001, p. 117; Kentor and Boswell 2003, Inglehart 2003). Moreover, economic historians have used the HDI in their investigations of human welfare in the past (Crafts 2001, pp. 323–326) and have proposed and tested improvements in it (Leandro Prados del la Escosura, personal communication).

2 Literature review and sensitizing hypotheses

This exposition draws primarily on Huntington's *Clash of Civilizations* and Sen's *Development as Freedom*. These studies exemplify different modes of explanation: intrinsic cultures versus manipulable extrinsic factors.

2.1 Civilizations

Huntington's ([1996] 1997, pp. 26–27) map of the world depicts his definitions of the dominant civilization of each country as Western, Latin American, African (i.e., non-Muslim and sub-Saharan), Islamic, Sinic (Chinese), Hindu, Orthodox, Buddhist, or Japanese. This study refers to these distinctions as *civilization zones* because not everyone in a country necessarily shares the same civilization, religion, and culture.[3]

These zones are distinct geographically but, depending on the measure used, all civilizations share some concern for human rights (Sen 1999, pp. 227–248). The data of this present study suggest the following: On an index of observed human rights abuses the West has the lowest score and the Sinic the highest score. Index scores for total trafficking—the involuntary smuggling of people between countries—which are based on Bales's measures (2002, pp. 84–85), suggest that the Hindu category has the highest unfavorable score, followed by the Orthodox and Japan. Moreover, certain affluent zones (Japan, the West) are net importers of people for inappropriate purposes whereas the poorer zones (African, Buddhist, Hindu, Islamic, Latin, Orthodox, and Sinic) are net exporters. The Freedom House measure of civil liberties implies that the Hindu zone has the third most favorable score after the West and Japan. The ratio of males to females favors males in only Islamic, Hindu, and Sinic zones.

Each zone thus exhibits strengths and weaknesses regarding human rights. Because human rights and human development are mutually reinforcing, their measures are correlated.[4] Consequently, civilization zones, which are largely defined by religion, influences the social aspects of development. Given the linkages between religion and economic development (Barro and McCleary 2003), they may also influence the economic aspect of development:

Hypothesis 1 A country's civilization zone influences its level on the HDI, a key indicator of its substantive freedoms. Japan and the West will exhibit higher levels; the other zones, lower levels.

2.2 Instrumental factors and substantive freedoms

Sen (1999) postulates an individual actor who wants to express her agency by making informed decisions and actions. She thus desires freedom, which is her intrinsic right.

[3] Sen (2002, pp. 30–33) has critiqued Huntington's classification: Many countries do not have unitary cultures—India is classified as Hindu, but 150–160 million Muslims live there. The religious traditions of Japan's 124 million people are Shintoist (124 million) and Buddhist (93 million); some people are both Shintoist and Buddhist. African countries have different forms of past colonization, tribal organizations, languages, and indigenous religions. People have complex group affiliations and not just one salient civilization identity—Protestants and Catholics in Northern Ireland share a common Western zone but conflict mars their relationships. Partitioning people on the basis of their civilization or culture may contribute to conflicts in the world—not all Muslims dislike the United States. The concept of civilization zone (rather than civilization) mitigates some of Sen's critique, as does Galtung's (1992, pp. 32–33) classification of countries based on geopolitics and power that is similar to Huntington's.

[4] The HDI and the indicators of human rights exhibit these significant correlations ($p < .0001$): for human rights abuse, $r_s = .53$; for total trafficking in humans, $r_s = .35$; for restricted civil liberties, $r_s = .59$; and for trafficking from, $r_s = .49$.

Development is the enhancement of a person's substantive freedoms, which are basic capacities to live the life that one has reason to value. Because the desire for freedom is intrinsic to all humans, all people have the right to at least enabling capacities for social and economic development indicated by literacy, health care, and economic resources beyond poverty. Each of these aspects of human development can be assumed to vary on a scale from 0 to 1; their average is the total substantive freedom capacity that a society provides its citizens.

The individual with her level of resources wants to exercise her agency but is constrained by certain societal blockages that limit her pursuit of freedom and, in the aggregate, her country's human development score. Development involves the removal of these blockages so that the agency of its citizens is enhanced. Thus,

Hypothesis 2 The following instrumental factors can enhance a country's levels of substantive freedoms:

2a. social opportunities (access to education, health facilities, and the free labor market, which imply the absence of contemporary slavery);
2b. political freedoms (protected consultation—political and civil rights);
2c. economic facilities (a society unencumbered with debt that provides opportunities for participation in employment, trade, and production);
2d. protective security (an effective safety net and the absence of civil conflict and unrest); and
2e. transparency guarantees (elite honesty and lack of corruption).

Conceptually, these instrumental factors can be assumed to vary on a scale from 0 (restricts freedom) to 1 (enhances freedom); their average score gauges the level of instrumental factors supportive of freedom that the society provides its citizens. The cross-tabulation of these measures locates a country according to its average substantive freedom score and its average score on the instrumental factors. Some societies (Norway, Iceland, Sweden, Australia, and the Netherlands) are developed, that is, free, having scores near 1 on the instrumental factors and on substantive freedom capacity. Some societies (Burundi, Mali, Burkina Faso, Niger, and Sierra Leone) are underdeveloped and unfree, having scores near zero on both measures.

Developing societies may take different paths toward the zone of free, developed societies (Sen 1999, pp. 41–46). Some societies follow a process of development based on social supports, providing their citizens initially with higher levels of substantive freedoms (health care, education, and an economic safety net) and lower levels of instrumental factors (primarily due to weak market-based economies). Sri Lanka, pre-reform China, Costa Rica, and Kerala exemplify this path—they experienced rapid increases in social development without much economic growth. Some other societies follow a process of development based primarily on the enhancement of economic growth and less on political freedom (and also less on enhanced substantive freedoms). South Korea and Taiwan exemplify this path—they experienced high economic growth, which drove their growth in social development.

Figure 1 depicts these hypothetical relationships—the x-axis plots a country's average score for instrumental factors supportive of freedom; the y-axis, its average score for substantive freedoms. Near the intersection of high scores on both dimensions is the zone of developed countries whose citizens enjoy freedom and agency. Near the intersection of low scores (0/0) is the zone of the underdeveloped and unfree countries. The graph depicts two idealized paths toward the zone of free, developed countries. The support-led process of development begins by increasing literacy, health, and economic supports that alleviate poverty. Based on these resources the process of enhancing instrumental factors begins, eventually reaching the development zone of free societies. Japan exemplifies this road to development.

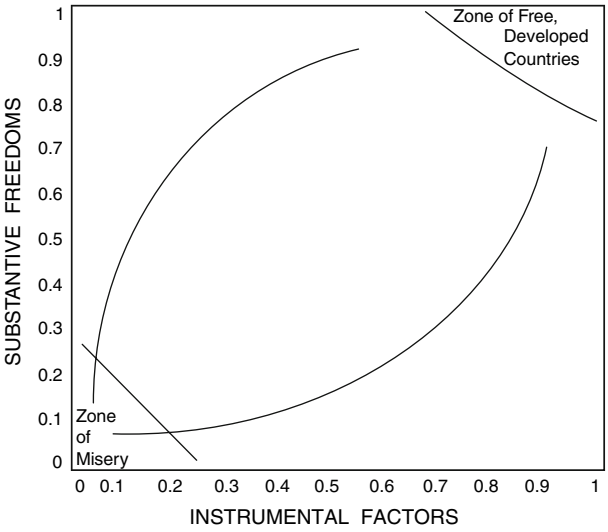


Fig. 1 Paths toward human development

The process led by economic growth begins with a minimal level of substantive freedom capabilities, but market mechanisms or a planned economy stimulate economic growth. However, the lack of political freedoms may constrain the upward surge in substantive freedoms; the average of the instrumental factors must be near 1 in order for a country to reach the zone of freedom. Brazil, post-reform China, and Russia follow this path but have not yet reached the zone of free, developed countries. Although this process may unfold over a period of years, a cross-sectional analysis of HDI scores later in this exposition confirms the correlations between instrumental factors supportive of freedom and substantive freedoms.

3 Research methods

3.1 The multilevel study design

The two levels of the data are countries and their properties (level 1), which are grouped within the regions of the world (level 2).[5] Because neighboring countries often have more similar HDI levels than countries that are distant, observations on these countries are clustered and not independent of each other. This study thus applies multilevel linear models (MLMs) to provide appropriate estimates of the effects of the covariates and their standard errors, and of the two variance components: σ_R^2, which is the variance in human development that is between the regions, and σ_c^2, which is the variance in human development of countries within the regions. These parameters can be viewed as response variables whose values are influenced by the fixed effects of the covariates and by the nesting of the regions by typologies, some of which account for the regional random effects.

[5] The variables and their effects are thus at the macro levels of region, civilization zone, and country and do not necessarily characterize the relationships and attitudes of individual citizens. For example, Huntington classifies the United States as a Western civilization (1997, pp. 20–29) but this global property (Lazarsfeld and Menzel [1961] 1972, pp. 228–229) does not imply that all people in the United States are Western and that this identity is most salient.

3.2 Measures

The UNDP derives a country's HDI value from aggregated observations on individual citizens thus forming an analytical property of the countries (Lazarsfeld and Menzel [1962] 1972, pp. 227–228). The countries' scores on the empirical indicators of their civilization zone and instrumental factors—slavery, democracy, debt, conflict, and corruption—are based on ratings that form nominal and ordinal typologies.

3.2.1 Substantive freedoms

The basic capacities for substantive freedoms that a country provides its citizens are assessed by its rank on the 1999 HDI, which is the main empirical response variable; future studies will assess longitudinal change. This index has three equally weighted dimensions (Haq 1995, pp. 46–72): A *long and healthy life* as indicated by life expectancy at birth; *knowledge* as assessed by a combination of adult literacy (weighted 2/3 by the UNDP) and the combined gross primary, secondary, and tertiary enrollment ratio (weighted 1/3 by the UNDP); and a *decent standard of living* as indicated by real gross domestic product (GDP) per capita (PPP US$)—purchasing power parity per capita in dollars. Income serves as a proxy for all the other aspects of human development not covered by a long and healthy life and knowledge.

This formula can express a country's performance on each of these dimensions as a value between 0 and 1:

$$\text{Index Dimension} = \frac{(\text{Actual Value} - \text{Minimum Value})}{(\text{Maximum Value} - \text{Minimum Value})}$$

The UNDP posits these maximum and minimum values, respectively: Life expectancy at birth in years (85, 25); Adult literacy rate (100%, 0%); Combined gross enrollment ratio (100%, 0%); and GDP per capita, PPP US$ ($40,000, $100)—since 1999 the UNDP takes the natural logarithm of this economic component. The use of the logarithm of income implies that a decent level of human development does not require unlimited income.

Human development is indicated by the simple average of the scores for each dimension and thus ranges from 0 to 1. Countries with high human development in 1999 had an average score of about .91, those with medium human development had an average score of about .68, and those with low human development had an average score of about .44. On the basis of these scores the UNDP ranks the countries by assigning equal-interval ordinal numbers: the country with the highest score is assigned the number 1 and the country with the lowest score is assigned 162, there are no ties. SAS treats the HDI ranking as if it is a normally distributed, continuous variable.[6]

3.2.2 The regions

The UN has created economic and social commissions that provide technical assistance, training, and capacity building to their constituent regions and to their member states. These commissions are coordinated to the following geographical areas, their constituent

[6] Counter to intuition, which expects a uniform distribution, the Kolmogorov–Smirnov test does not reject the null hypothesis that the unweighted HDI scores are distributed normally (the $\hat{D} = .06$ and $p = .20$). Moreover, the ratio of the skewness of the distribution to its standard error is small ($-.0113/.191 = -.06$); both of these statistics support the assumption of normality. However, the ratio of the kurtosis to its standard error is more extreme than the critical value of -1.96 ($-1.191/.380 = -3.13$), which indicates that the tails of the distribution are shorter than those of a normal distribution.

regions are in parentheses: Africa (Eastern Africa, Middle Africa, Northern Africa, Southern Africa, and Western Africa); Asia and the Pacific (Eastern Asia, South–Central Asia, South–Eastern Asia, and Oceania); Europe (Eastern Europe, Northern Europe, Southern Europe, and Western Europe); Latin America and the Caribbean (Central America, Caribbean, and South America); and Western Asia (Western Asia). Bundled within these regions, and also within North America, are the countries this study analyzes. Table 1 lists the 18 regions, the 138 countries that have complete data, the regions into which these countries are grouped, the reliability of the sample mean for each region, and each country's attributed civilization zone.[7]

3.2.3 Civilization zones

By carefully inspecting Huntington's world map ([1996] 1997, pp. 26–27) and also distributions of religious affiliations, a nominal variable was created that classifies each country according to its dominant civilization zone á la Huntington, but without some of the nuances of his thoughts about Haiti (pp. 136–137), torn countries (pp. 139–154), the eastern boundary of Western civilization (pp. 157–163), and cleft countries (pp. 163–168)—these simplifications facilitate the statistical modeling. The reliability of this classification was checked by ascertaining its congruence with Beckfield's reading of Huntington's map; 87 of the 90 countries that were jointly and independently classified exhibited agreement.[8] A society's civilization influences its world polity ties (Beckfield 2003, p. 417). Latin American, African, Islamic, Sinic, Hindu, and Buddhist societies have significantly fewer ties to international nongovernmental organizations and these differences have grown since 1960.

These civilization zones also exhibit lower levels on the HDI than the West and Japan. In the unconditional (i.e., no control variables) model there are significant differences in rank between civilization zones ($\hat{\sigma}^2_{HC} = 1{,}610.8, z = 1.9, p < .029$), as well as country-to-country differences within a zone ($\hat{\sigma}^2_c = 2{,}556.8, z = 8.71, p < .0001$). Japanese ($p < .002$) and Western zones ($p < .0005$) have significantly enhanced levels on the HDI (i.e., lower rank scores) whereas African ($p < .0001$), Hindu ($p < .019$), and Islamic ($t = 1.92, p = .057$) zones have significantly poorer levels (that is, higher rank scores)—that the HDI varies with civilization zone in this manner supports hypothesis 1.

3.2.4 Slavery: restricted social opportunities

Patterson (1982, p. 13) defines slavery as "the permanent, violent domination of natally alienated and generally dishonored persons." Similarly, Bales (1999, p. 6) suggests that slavery is the total control of one person by another for the purpose of economic exploitation; most often the slaveholder uses violence or its threat to obtain compliance. More formally

[7] This study analyzes the variance of the 18 regions and not the variance of the five commission areas because the latter are not exhaustive, the regions are more homogeneous than the areas, and the statistical model would be rather complicated—three levels with a fourth classificatory typology. For further information about the activities of these commissions and the definitions of regions see the *Yearbook of the United Nations* 2000 (2002, pp. 923–958) and the *Statistical Yearbook* (2001).

[8] Beckfield classified Jamaica (Protestant, 61.3%; Roman Catholic, 4%) and Haiti (Protestant, 16%; Roman Catholic, 80%) as Latin. On the basis of an anthropologist's insights, this study classifies these countries as Western. Huntington's map indicates that the various islands of the Philippines (Roman Catholic, 83%; Protestant, 9%; Moslem, 4%; Buddhist, 3%) may be Sinic, Buddhist, or Western. Beckfield chose to classify this hybrid country as Sinic, whereas due to its Catholic, Spanish, and American heritages this study classifies it as Western. Paupua New Guinea (Christian, 66%; Indigenous beliefs, 34%) is classified as Western. The use of these distinctions does not imply agreement or disagreement with Huntington's depictions.

Table 1 138 countries in 18 regions, reliabilities ($\hat{\lambda}$) and civilization zones in parentheses[a]

Eastern Africa ($\hat{\lambda}$ = .92): Burundi (A), Djibouti (I), Eritrea (I), Ethiopia (A), Kenya (A), Madagascar (A), Malawi (A), Mauritius (A), Mozambique (A), Rwanda (A), Tanzania (A), Uganda (A), Zambia (A), Zimbabwe (A).

Middle Africa ($\hat{\lambda}$ = .87): Angola (A), Cameroon (A), Central African Republic (A), Chad (I), Congo (A), Democratic Republic of Congo (A), Equatorial Guinea (A), Gabon (A).

Northern Africa ($\hat{\lambda}$ = .81): Algeria (I), Egypt (I), Morocco (I), Sudan (I), Tunisia (I).

Southern Africa ($\hat{\lambda}$ = .81): Botswana (A), Lesotho (A), Namibia (A), South Africa (A), Swaziland (A).

Western Africa ($\hat{\lambda}$ = .93): Benin (A), Burkina Faso (A), Cape Verde (W), Cote d'Ivoire (A), Gambia (I), Ghana (A), Guinea (I), Guinea-Bissau (I), Mali (I), Mauritania (I), Niger (I), Nigeria (A), Senegal (I), Sierra Leone (A), Togo (A).

North America ($\hat{\lambda}$ = .63): Canada (W), United States (W).

Central America ($\hat{\lambda}$ = .81): Costa Rica (L), El Salvador (L), Guatemala (L), Mexico (M), Panama (L).

Caribbean ($\hat{\lambda}$ = .81): Barbados (L), Dominican Republic (L), Haiti (W), Jamaica (W), Trinidad and Tobago (L).

South America ($\hat{\lambda}$ = .91): Argentina (L), Bolivia (L), Brazil (L), Chile (L), Colombia (L), Ecuador (L), Guyana (H), Paraguay (L), Peru (L), Suriname (W), Uruguay (L), Venezuela (L).

Eastern Asia ($\hat{\lambda}$ = .77): China (S), Japan (J), Republic of Korea (S), Mongolia (B).

South-Central Asia ($\hat{\lambda}$ = .90): Bangladesh (I), Bhutan (B), India (H), Iran (I), Kazakhstan (I), Kyrgyzstan (I), Nepal (H), Pakistan (I), Sri Lanka (B), Tajikistan (I), Uzbekistan (I).

South-Eastern Asia ($\hat{\lambda}$ = .88): Brunei Darussalam (I), Cambodia (B), Indonesia (I), Lao People's Democratic Republic (B), Malaysia (I), Philippines (W), Singapore (S), Thailand (B), Viet Nam (S).

Western Asia ($\hat{\lambda}$ = .92): Armenia (O), Azerbaijan (I), Bahrain (I), Georgia (O), Israel (W), Jordan (I), Kuwait (I), Lebanon (I), Oman (I), Qatar (I), Saudi Arabia (I), Syrian Arab Republic (I), Turkey (I), Yemen (I).

Eastern Europe ($\hat{\lambda}$ = .88): Belarus (O), Bulgaria (O), Czech Republic (W), Hungary (W), Poland (W), Romania (O), Russian Federation (O), Slovakia (W), Ukraine (O).

Northern Europe ($\hat{\lambda}$ = .77): Denmark (W), Estonia (W), Sweden (W), United Kingdom (W).

Southern Europe ($\hat{\lambda}$ = .86): Albania (I), Croatia (W), Greece (O), Italy (W), Portugal (W), Slovenia (W), Spain (W).

Western Europe ($\hat{\lambda}$ = .86): Austria (W), Belgium (W), France (W), Germany (W), Luxembourg (W), Netherlands (W), Switzerland (W).

Oceania ($\hat{\lambda}$ = .63): Australia (W), Papua New Guinea (W).

[a] Civilization zones based on Huntington (1996, 26–27): A = African, B = Buddhist, H = Hindu, I = Islamic, J = Japan, L = Latin, O = Orthodox, S = Sinic, W = Western (Haiti = W). The simple average of the regional reliabilities is $\bar{\lambda}$ = .83. For Africa, $\bar{\lambda}$ = .87; the Americas, $\bar{\lambda}$ = .79; Asia, $\bar{\lambda}$ = .87; Europe, $\bar{\lambda}$ = .84, and Oceania, $\bar{\lambda}$ = .63. If Mexico is classified as North American then the $\bar{\lambda}$ = .72. If data for New Zealand were available then the reliability for Oceania would also be $\bar{\lambda}$ = .72, sufficiently high

(Bales 2004, p. 4): "[Slavery is] a social and economic relationship marked by the loss of free will where a person is forced through violence or the threat of violence to give up the ability to sell his or her labor power." Contemporary slavery as Bales conceptualizes and measures it (2002) includes debt bondage, in which a person becomes collateral for a loan (Shastri 1990), chattel slavery in which masters assert ownership over slaves, and the trafficking of people from one place to another for purposes of physical or sexual exploitation: unfree marriages, forced labor, slavery, and prostitution (Bales 2000, pp. 73–134; Clark 2003). Slavery violates the 1948 Universal Declaration of Human Rights; the Supplementary Convention of 1956

that aims to abolish servile status (debt bondage, serfdom, unfree marriage, and exploitation of children for their labor); the Economic, Social, and Cultural Covenant of 1966 on the freedom to choose work; and the Rome Final Act of 1998 that aims to abolish the trafficking of people. Slaves have very restricted social opportunities and countries with many slaves have weak emancipative values.

Bales developed his ordinal scales of slavery by collating documentary evidence and his own observations about trafficking and the number of slaves in a country. From these data he created—and this study uses—a four-category ordinal classification of a country's level of contemporary slavery; its correlations with validating variables are consistent with expectations.[9] Countries Bales characterized as having higher levels of slavery have these correlates: unfavorable ratios of female to male primary education; human rights violations (higher levels of life integrity violations, abuse of human rights, and trafficking of humans); restricted political freedoms (lower levels of gender empowerment, civil rights, and political rights); and poverty (lower levels of literacy, enrollment in schools, life expectancy, and GDP per capita). All of these bivariate Spearman rank correlations (hereafter, r_s) are statistically significant ($p < .0002$). Bales (1999, p. 9) tallies at least 27 million slaves in the world, and "perhaps 15–20 million, is represented by bonded labor in India, Pakistan, Bangladesh, and Nepal."

Slavery obviously reduces human development because it prevents children and adults from being educated, reduces the per capita income of the poor, and shortens the life span; but the relative sizes of its impacts compared with those of the other covariates are not obvious. Consistent with hypothesis 2a, countries with higher levels of contemporary slavery have lower levels of human development ($F = 23.9$; $p < .0001$). The unconditional least squares means are: none or very little slavery = 1, then HDI rank is 43.6; some slavery = 2, then, 89.1; high slavery = 3, then, 111.7; and highest slavery = 4, then 110. Countries with slavery = 1 have significantly better HDI values than countries with any of the other categories ($p < .0001$, Bon.); countries with slavery = 2 have slightly better values than those with scores of 3 or 4 (unadjusted $p = .018$; $p = .11$, Bon.); and there is no significant difference in human development between countries with slavery = 3 and those with slavery = 4 ($p = 1$, Bon.). These categories thus can be dichotomized as indicating emancipative employment (1 = categories 1 or 2) versus slavery (0 = categories 3 or 4).

3.2.5 Democracy: political freedoms

Democratic regimes, as defined conceptually by Tilly (2007; [1995] 1997, p. 205; 2000, pp. 4–5), have high levels of protected consultation: such regimes sustain broad and equal citizenship, provide binding consultation with their citizens concerning governmental activities and personnel, and protect their citizens from arbitrary governmental agents and actions. Increased protective consultation defines increased democratization. Political rights tap breadth of participation, equality of participation, and consultation; civil liberties tap protection from arbitrary governmental actions and agents (Tilly 2004). Broad and equal political rights enable citizens to participate freely in political processes that culminate in binding consultation—free, competitive elections. This implies that adults have the right to vote and to compete for political offices. Civil liberties allow freedom of discussion, assembly, and demonstration; free and independent media; an independent judiciary; the rule of

[9] The region-to-region variance of slavery is $\hat{\sigma}_R^2 = .36$ ($z = 2.28$, $p = .011$); its country-to-country variance within regions is $\hat{\sigma}_c^2 = 3.25$ ($z = 8.14$, $p < .0001$). The regional mean level of slavery is 2.02 on the scale of 1 to 4; the regions of Western Africa ($p < .0015$), South–Central Asia ($p < .0001$), and South–Eastern Asia ($p < .002$) have higher levels; North America ($p < .035$) lower levels.

law in civil and criminal matters; trade unions and collective bargaining; secure property rights; freedom of religion and personal freedoms; freedom from corruption and from an intrusive government; and freedom from exploitation. Dahl's (1989, pp. 221–222) institutions of polyarchy and the democratic process comprise all of the above aspects of political freedom.

This study measures democracy by using the 1999 Freedom House composite index that combines their collinear ($r_s = .92$) seven-category political rights and civil rights scales—it groups countries as fully democratic (score = 1), partly free (score = 2), or unfree (score = 3).[10] This trichotomy strongly correlates with validating indicators of democracy that the *Human Development Report 2002* tabulates (Table A1.1, pp. 38–41). These include the democratic polity index (10, democratic to −10, authoritarian), freedom of the press, voice and accountability, political stability, rule of law, and governmental effectiveness. All of the bivariate r_s are statistically significant ($p < .0001$).[11]

Although democracy and human development reciprocally interact (Paxton 2002), and economic development sustains democracy (Lipset [1959] 1981, pp. 27–63; Barro 1999; Welzel et al. 2003, p. 367),[12] this study assesses how a country's political system influences its human development (Haq 1995, pp. 67–75; Hoff and Stiglitz 2001, pp. 427–428; Heller 1999). As these conjectures suggest: If democracy is strong, then poor people can exercise their voice to claim basic capacities for healthcare, education, and economic support, which are components of the HDI. If democracy is weak, then elites may transfer resources from the poor to the rich, or to the military, thus limiting funds for health and education and limiting the real GDP per capita (Bollen and Jackman 1985, pp. 438–439). Moreover, dictatorships compared with democracies have higher levels of infant mortality (Zweifel and Navia 2000) and female mortality (Przeworski et al. 2000, pp. 256–257), thereby reducing scores on the longevity component of the index.

Thus, as hypothesis 2b suggests, countries that exhibit higher levels of political freedom will also exhibit enhanced human development (F value = 44.7, $p < .0001$), but this relationship is not linear—countries classified as fully democratic have considerably enhanced human development ($p < .0001$, Bon.) compared with the partly free and the unfree countries, with little difference between the latter two ($p = .71$). The unconditional least-squares means are respectively 48, 103.6, and 106.5, which suggest this dichotomy: democracy (1 = fully democratic political system) versus not fully democratic (0). Both components of the Freedom House measure are associated with human development. Regarding political rights and HDI rank, the crucial distinction is between countries with a score of 1 (most free) versus all other countries with scores 2 through 7 ($p < .0001$, Bon.). Regarding civil rights,

[10] York et al. (2003, p. 290) created dummy variables for political rights and for civil rights and found no effects on the ecological footprint of a country. Their groupings are free = 1–2, partly free = 3–5, and not free = 6–7.

[11] The region-to-region variance in political freedom ($\hat{\sigma}^2_R = .29, z = 2.35, p = .0095$) is statistically significant as is the country-to-country variance within regions ($\hat{\sigma}^2_c = 1.78, z = 8.53, p < .0001$). The mean level of political freedom is 2.2. North America ($p < .024$), Northern Europe ($p < .017$), Southern Europe ($p < .04$), and Western Europe ($p < .009$) have higher levels of freedom. Northern Africa ($p < .002$), Eastern Africa ($p < .045$), Middle Africa ($p < .0041$), Eastern Asia ($p < .039$), and Western Asia ($p < .009$) have lower levels.

[12] Linz (2000, p. 37) states that a free enterprise, liberal economic infrastructure does not necessarily lead to the development of a liberal political democracy. Przeworski et al. (2000, pp. 178–179)) find that economic development does not tend to create democracies, but wealthy societies that are democratic tend to be stable.

the crucial distinctions are between countries with scores of 1 or 2 versus those with scores 3 through 7 ($p < .0001$, Bon.).[13]

3.2.6 National debt

Circa 1999 the World Bank and the International Monetary Fund identified highly indebted poor countries (HIPCs) that could participate in their debt relief program. This study contrasts the less debt-encumbered countries with these thirty-eight HIPCs: Angola, Benin, Bolivia, Burkina Faso, Cameroon, Central African Republic, Chad, Congo (Republic), Côte d'Ivoire, Equatorial Guinea, Ethiopia, Ghana, Guinea-Bissau, Guyana, Honduras, Kenya, Laos, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nicaragua, Niger, Rwanda, São Tomé and Príncipe, Senegal, Sierra Leone, Somalia, Sudan, Tanzania, Togo, Uganda, Vietnam, Yemen, and Zambia.[14]

HIPCs are weak states: their world-system positions place them in the periphery or semi-periphery and not in the core. York et al. (2003, pp. 289–290) report a correlation of .53 ($N = 110, p < .001$) between their measures of total national debt and weak world-system position. HIPCs are more likely to exhibit higher scores for perceived corruption and graft, slavery, conflict, and infant mortality; and lower scores for governmental effectiveness, political rights, civil liberties, and GDP; these bivariate r_s are statistically significant ($p < .0001$). Foreign investment concentration is uncorrelated with this measure of national debt ($r_s = .11$, $p = .30$). HIPCs may have lower human development because funds, which could be used to improve health, education, and economic facilities, are used instead to pay off the national debt and interest. Thus, consistent with hypothesis 2c, low national debt significantly improves the HDI rank from the mean of 135.9 by −65.3 ($p < .0001$, Bon.); Eastern Africa ($p < .0001$), Middle Africa ($p < .003$), and Western Africa ($p < .0001$) have higher debt than other regions.

3.2.7 Internal conflict and social unrest

Internal conflict and social unrest (hereafter, conflict) imply a lack of protective security. Conflict reduces human development because it may lead to deaths, which reduce longevity; to disruptions of schooling, which reduce literacy and learning; and to disruptions of work, which constrain economic development and economic security. Bales assessed a country's level of conflict in years just prior to 1999 as no serious internal conflict and unrest = 0, low = 1, and high = 2. Countries with higher scores are more likely to exhibit abuse of power by police, unlawful killings, and human rights abuses, and less likely on UN measures to exhibit political stability, lack of violence, democracy, law and order, and the rule of law (UNDP 2002, Table A1.1, pp. 38–41); all of these bivariate r_s are statistically significant ($p < .0001$). Consistent with hypothesis 2d, at high levels of conflict the mean HDI rank is

[13] To count democracies Dahl (1998, p. 198) suggests regrouping the Freedom House measures as follows: group countries ranked 1, or most free, on political rights with countries ranked 1, 2, or 3 on civil liberties. His grouping enhances the effects of democracy on the HDI.

[14] This list, which Bales downloaded from the Jubilee 2000 website, is very similar to that reported by Easterly (2002, p. 128). His recent list of HIPCs also includes Burundi, the war-torn Congo (Democratic Republic), and Guinea. For the period 1979–1997 because of missing data he analyzed only twenty-eight to thirty-seven of these countries. If these three countries are classified as HIPC then the explanatory power of debt is increased. It also accounts for the between-region variance in the HDI: its $\hat{\sigma}^2_{R(n)} = 79.03$, standard error = 63.66, $p = .107$.

111.8; low conflict improves it by −10.53; and no serious conflict improves it by −64.7.[15] The difference in the mean rank between countries with no conflict and countries with either of the other two categories is statistically significant ($p < .0001$, Bon.), suggesting this dichotomy: no internal chaos (1) versus some conflict and unrest (0).

3.2.8 Corruption

Corruption is the use of public and organizational resources for private gain through bribery, favoritism, and fraud (Myrdal 1971, pp. 200–210); it implies a lack of transparency guarantees. As did Lipset and Lenz (2000, p. 13) and Welzel et al. (2003, p. 357), this study uses the corruption perception index (CPI) of Transparency International, which synthesizes numerous surveys of expert and public views of the extent of corruption in the various countries of the world. The scores for perceived corruption range from 1 (Most Corrupt, assigned to Iraq and Myanmar) to 10 (Least Corrupt, assigned to Denmark).[16] Countries with scores indicative of high corruption also have high scores for graft, abuse of power by police, unlawful killings, and human rights abuse; and low scores for government effectiveness, the rule of law, and law and order—these r_s are statistically significant ($p < .0001$).

Corruption adversely affects human development via its negative effects on economic and social development and on effective democracy (UNDP 2002, pp. 63–67; Thomas 2001, p. 164; Welzel et al. p. 357). Consistent with hypothesis 2e, each unit decrease in corruption improves the HDI rank of a country by −17.45 ($p < .0001$) from the intercept value of 152.3. The explanatory analyses nest the regions by this ordinal attribute: low = 1 to high = 4; the significant differences are between the low corruption category and the other three ($p_{12} = .02$; $p_{13} = .01$; $p_{14} = .08$, Bon.). Thus, integrity (1 = low corruption) versus the three other levels (0) is an appropriate dichotomy.

4 Statistical methods

The analyses apply multilevel modeling to quantify the effects of the instrumental factors on substantive freedoms. Because the UNDP annual reports emphasize the rank-order of countries, this study first develops descriptive and explanatory models that probe the determinants of HDI rank. Assessing the robustness of these findings, the study then replicates these analyses using the underlying scores for the index and for its components. In the replications the effect size of a fixed covariate is quantified by dividing its regression coefficient by the standard deviation of the response variable.

[15] The region-to-region variance in conflict is not large ($\hat{\sigma}^2_R = .158, z = 2.1, p = .018$) but significant, as is the much larger country-to-country variance within regions ($\hat{\sigma}^2_c = 1.6, z = 8.6, p < .0001$). The mean level is .75. Middle Africa ($p < .003$), Northern Africa ($p < .031$), and South–Central Asia ($p < .005$) have higher levels. North America ($p < .03$), Northern Europe ($p < .02$), and Western Europe ($p < .01$) have lower levels.

[16] The region-to-region variance in corruption ($\hat{\sigma}^2_R = 3.5, z = 2.73, p = .0032$) is significant as is the country-to-country variance within regions ($\hat{\sigma}^2_c = 5.65, z = 8.54, p < .0001$). The mean is 4.45. North America ($p < .0001$), Northern Europe ($p < .0001$), Western Europe ($p < .0001$), and Oceania ($p < .0014$) have less corruption than the mean. Eastern Africa ($p < .006$), Middle Africa ($p < .0035$), Western Africa ($p < .001$), South–Central Asia ($p < .015$), and South–Eastern Asia ($p < .006$) exhibit more corruption than the mean.

4.1 Weights, Bonferroni adjustments, and measures of model fit

The SAS runs adjust for differences in population size by weighting each country by the square root of its population (SAS Institute 1990, p. 927). This mild transformation reduces the spread (Tukey 1977, p. 545) and is a compromise between weighting the data by population sizes and not weighting the data (Firebaugh 2003, p. 126–127). SAS minimizes the weighted residual sum of squares $\Sigma_i w_i (y_i - \hat{y}_i)^2$, where w_i is the square root of the population of country i, y_i is the observed value of the response variable, and $\hat{y}_i$ is the predicted value. Thus, the squared difference between actual and predicted HDI level for a gigantic country like China is weighted more heavily than that for a miniscule country like Haiti, rather than allowing these countries to have equal weights in the calculation of the residual sum of squares. The weight has no effect on the degrees of freedom or on the number of observations but it does influence the calculation of means and the results of multiple comparison tests.

The effects on the response variable of some of the categories of the covariates were not specified in advance of the analysis. Consequently, to tighten the tests of significance, some statistical analyses apply Bonferroni adjustments (Bon.) for post-hoc multiple comparisons. For pair-wise comparisons among a set of means, these adjustments reduce the likelihood of erroneous rejections of the null hypothesis (type-1 errors or false positives) but increase the likelihood of erroneous acceptances of the null hypothesis (type-2 errors or false negatives).

For selecting which of a number of related models provides the most parsimonious fit to the data, Schwarz's Bayesian information criterion (BIC) statistic (sometimes referred to as SBC) provides a useful criterion. Holding constant the quantity –2(log likelihood), the model that uses fewer parameters to provide a close fit is preferred to models that require more parameters to provide a close fit. When the smaller value of the BIC indicates the better fitting model (i.e., "Smaller is Better") as in these models, the formula for the BIC is $-2l + d(\log n + 1)$ where l denotes the maximum value of the log likelihood, d denotes the dimension of the model (the number of estimated covariance parameters and the rank of the design matrix of fixed effects), and n denotes the number of observations (SAS Institute 1997, p. 587; Schwarz 1978).

For quantifying explained variance, R^2 analogs are defined at each level as the difference between the variance component for the baseline (i.e., intercepts only) model and the variance component for the current model divided by variance component for the baseline model (Kreft and DeLeeuw 1998, pp. 116–119).

For testing the significance of the between-region variance, the log likelihood of the model that includes $\hat{\sigma}^2_R$ can be compared with the log likelihood of the almost identical model that does not include $\hat{\sigma}^2_R$. If the χ^2 test with one degree of freedom rejects the null hypothesis of no difference at $\alpha \leq .05$, then $\hat{\sigma}^2_R$ is statistically significant. If p is noticeably larger than .05, say $p > .10$, then $\hat{\sigma}^2_R$ is not statistically significant.

4.2 The variance components model

In the following weighted unconditional model (i.e., no control variables), which groups 161 countries in the 18 regions, there is region-to-region variance in the HDI ranking ($\hat{\sigma}^2_R = 1{,}826.4, z = 2.8, p = .003$) and country-to-country variance within a region ($\hat{\sigma}^2_c = 2{,}132.5, z = 8.46, p < .0001$). Following Littell et al. (1996, p. 137), the statistical model that produced these estimates is as follows: Let y_{ij} denote the rank of the jth country of the ith region. Then,

$$y_{ij} = \mu + a_i + e_{ij}, \quad i = 1, 2, \ldots, r, \quad j = 1, 2, \ldots, c_i \tag{1}$$

where

$$a_i = \text{iid N}(0, \sigma_R^2)$$
$$e_{ij} = \text{iid N}(0, \sigma_c^2).$$

In words, Eq. 1 states that the HDI rank of country j in region i equals the overall mean rank on the HDI, which is μ (this is the fixed part of the model) plus two random effects: a_i and e_{ij}. There are $r = 18$ regions and c_i countries in the ith region. The random effect a_i is assumed to be composed of independent, identically distributed normal errors that have a mean of zero and constant variance σ_R^2. This variance assesses the region-to-region variability; here it is the variance of the true HDI means of the regions around the grand mean μ. The random effect e_{ij} is assumed to be composed of independent, identically distributed normal errors that have a mean of zero and constant variance σ_c^2, which is the country-to-country variance within a region. A similar model guides the analysis of HDI scores.

For the rank data the Shapiro–Wilk test does not reject the null hypothesis that the residuals are normally distributed ($p < W = .80$, which is much greater than $p = .05$, the critical probability); the stem and leaf plot and normal probability plot also suggest this. The intraclass correlation ρ (Bryk and Raudenbush 1992, p. 63), which represents here the proportion of the variance in the response variable that is between regions, is $\hat{\rho} = \hat{\sigma}_R^2/(\hat{\sigma}_R^2 + \hat{\sigma}_c^2) = 1{,}826.4/(1{,}826.4 + 2{,}132.5) = .46$; it is substantial.

The estimate of the overall mean HDI rank (i.e., the intercept) is 75.9. Its reliability is defined as $\hat{\lambda}_{\cdot} = \text{Reliability}(\bar{Y}_{\cdot}) = \hat{\sigma}_R^2/[\hat{\sigma}_R^2 + (\hat{\sigma}_c^2/n_{\cdot})] = 1{,}826.4/[1{,}826.4 + (2{,}132.5/161)] = .99$. It is very high, as is the average of the regional reliabilities, $\bar{\hat{\lambda}} = .83$. Regions that have significantly poorer levels (i.e., higher rank scores) include Eastern Africa ($p < .0001$), Middle Africa ($p < .0001$), Northern Africa ($p < .025$), Western Africa ($p < .0001$), and South-Central Asia ($p < .002$). Regions that have significantly enhanced levels (i.e., lower rank scores) include North America ($p < .0001$), Northern Europe ($p < .0001$), Southern Europe ($p < .0012$), and Western Europe ($p < .0001$). The analyses aim to account for this variation by developing conditional hierarchical models that have additional fixed covariates and that classify the random effects of region by the categories of typologies.[17]

4.3 Descriptive and explanatory models

In the descriptive models the fixed effects of a country's covariates predict a country's HDI level and account for some of the region-to-region variance. Because these models relate various properties of countries to another property, its HDI level, they are associational (i.e., descriptive) and not causal (Holland 1986). The explanatory models can be thought of as potentially causal because there is some "doing"—the regions are classified by a property of its constituent elements (Lazarsfeld and Menzel [1961] 1972, pp. 233), and the classification may cause the variance between regions to disappear. For example, a country has the property

[17] Strictly, this model requires a random sample of regions from a population of regions, and a random sample of countries within each region. However, this study follows an approach that is often applied in analysis of variance. Imagine these data being arrayed by region and by country within region and for each of these observations there is a mean HDI score for a particular year. Now imagine that each of that year's HDI scores represents the result of random sampling from a distribution of hypothetical replications for each region–country unit. Although this study focuses on the HDI scores for all regions and countries in 1999, the year of the human development report could have been selected at random from the distribution of reports from 1990 through 2005. Each report replicates earlier reports. For assumptions of this kind see King et al. (1994, pp. 56–59, pp. 76–82) and Moore and McCabe (1989, pp. 714–715, p. 719).

"regime type." It may have the value "democracy" or "not a democracy" on this property. In the descriptive models this property of a country is merely one predictive covariate of HDI level along with the others. However, in a model that tests the explanatory power of democracy, the regions are classified (i.e., nested) by regime type while holding constant its fixed effect and those of the other covariates. This nesting creates homogeneous subgroups. If the variance between the regions ($\hat{\sigma}^2_R$) across these subgroups becomes insignificant, then that nesting variable accounts for the regional differences in the HDI.

4.3.1 Descriptive models

To quantify the variance components and the fixed-effects of the covariates, descriptive multilevel models with random effects are estimated first: Let y_{ij} denote the level on the HDI of the jth country of the ith region; μ, the intercept level of the HDI; X_{kij}, a covariate; and β_{ij}, a regression coefficient. Then,

$$y_{ij}=\mu + \Sigma\beta_k \mathrm{X}_{kij} + a_i + e_{ij}, \quad i=1, 2, \ldots, \mathrm{r}, \quad j=1, 2, \ldots, c_i, \quad k=1, 2, \ldots, K \qquad (2)$$

where

$$a_i = \text{iid N}(0, \sigma^2_R)$$
$$e_{ij} = \text{iid N}(0, \sigma^2_c).$$

After Proc Mixed calculates the estimates of the variance components of this system, the region-to-region variance quantified by $\hat{\sigma}^2_R$ becomes of special interest.[18] If it is still statistically significant after all of the covariates have had their effects, then the reasons why the different regions have different levels of human development are not fully known; other models, perhaps those that classify the regions, are needed.

4.3.2 Explanatory models

Conceptually, the explanatory models may uncover causal relationships as follows: Regions have random effects on the level of HDI as quantified by the region-to-region variance and the random effect estimates for the regions. Holding constant the other covariates, a typology that encompasses an instrumental factor (designated IFTYPE) is used to classify the regions' random effects—this "doing" of the classification is consistent with Pearl's $do(x)$ operator (2000, p. 85). The IFTYPE is more diffuse than the regional variable—countries in different regions may have the same value on IFTYPE and countries in the same region may have different values. The typologies that IFTYPE encompasses can be the eight civilization zones, the four (or two) values of slavery, the three (or two) values of freedom, the three (or two) values of conflict, the two values of national debt, or the four (or two) values of corruption.

Here the IFTYPE can be conceptualized as either prior to both region and the HDI or as intervening between region and HDI. Regarding the first conceptualization, because the IFTYPE classification nests the region within its categories, it can be thought to be at a

[18] Proc Mixed will compute the confidence limits for the random effects producing either the asymmetric Satterthwaite limits or the symmetric Wald limits (SAS Institute 1997, p. 585). The Parms/Nobound statement allows it to calculate the symmetric Wald confidence limits, which this study prefers. If this statement is not used and if the random effect is bounded by zero it calculates the Satterthwaite limits. For these data the upper bound of the Satterthwaite limits are very high and the lower bound is near zero. For the Wald limits the lower bound often is negative and must be truncated to zero and the upper bound is much lower than that of the Satterthwaite limits.

higher structural level than region and also HDI and thus causally prior to both of these variables; it may *explain* their covariance parameter $\hat{\sigma}^2_R$. (Lazarsfeld 1955, p.*xi*; Lieberson 1997, pp. 375–378):

$$\mathrm{R} \leftarrow \mathrm{IFTYPE} \rightarrow \mathrm{HDI}.$$

Regarding the second conceptualization, because regions of the world can be viewed as ultimate exogenous variables, the IFTYPE classification is then an intervening variable between region and HDI; it may *interpret* their covariance parameter $\hat{\sigma}^2_R$:

$$\mathrm{R} \rightarrow \mathrm{IFTYPE} \rightarrow \mathrm{HDI}.$$

In either case, Proc Mixed can create region $*$ IFTYPE subgroups and calculate the estimate of the regional random effect for each subgroup, testing its significance (Littell et al. 1996, pp. 149–152). If this nesting of the regions in the categories of IFTYPE eliminates the significance of the regional random effects, then that classification is a causal factor since it accounts for (i.e., eliminates) the relationship between regions and the HDI. Because of the ambiguity about which ordering of these variables is best, this exposition uses "accounts for" rather than "explains" or "interprets" when a test factor in IFTYPE reduces to insignificance a level-2 variance. But it refers to models that nest the random effects of region by IFTYPE as "explanatory models."

The explanatory models aim to determine if the between region variance in the HDI can be attributed to the different values of the IFTYPE. IFTYPE is considered to be a fixed effect as are the other covariates; the regions nested within an IFTYPE are considered as random effects. Region has a covariance parameter ($\sigma^2_R = \tau_{00}$) with the HDI. If the control [i.e., nesting $= do(x)$] eliminates the significance of this parameter, then the initial relationship is either spurious or interpreted and the nesting typology accounts for the original relationship. Let y_{ijk} denote the value of the HDI of the kth country of the jth region of the ith category of IFTYPE; $\mathrm{X}_{\mathrm{m}ijk}$ denotes a covariate m (m not equal to IFTYPE), and β_m denotes its regression coefficient. Then,

$$\begin{aligned} y_{ijk} &= \mu + \beta_{\mathrm{m}+1}\mathrm{IFTYPE}_i + \Sigma\beta_m \mathrm{X}_{\mathrm{m}ijk} + a_{j(i)} + e_{ijk}, \\ i &= 1, 2, \ldots, t, \quad j = 1, 2, \ldots, r, \quad k = 1, 2, \ldots n_{ij} \end{aligned} \tag{3}$$

where

$$\begin{aligned} a_{j(i)} &= \text{iid } \mathrm{N}(0, \sigma^2_{R(\mathrm{IFTYPE})}) \\ e_{ijk} &= \text{iid } \mathrm{N}(0, \sigma^2_c). \end{aligned}$$

In the subsequent explanatory models an estimate of $\sigma^2_{R(\mathrm{IFTYPE})}$ will be depicted as $\hat{\sigma}^2_{R(n)}$ to indicate the nesting of the random regions by a typological test factor.

5 Results

All of the subsequent models are based on the same 138 countries, use the square root of a country's population as a weight, and relate various fixed properties of a country to the response variables.[19] The preferred models are selected by considering the statistical

[19] Lack of information about the level of the new slavery is primarily responsible for the reduction in the number of cases from 179 to 138. The 30 countries that lack usable slavery codes are: Bahamas, Belize, Comoros, Cuba, Cyprus, Dominica, East Timor, Fiji, Finland, Grenada, Honduras, Iceland, Ireland, North Korea, Latvia,

significances of the variance components and the fixed effects, the sizes of the intraclass correlation coefficient $\hat{\rho}$ (rho), and the sizes and changes in the BIC and the R^2 analogs.

5.1 Descriptive models of HDI rank

Table 2 presents the random and fixed-effects for eight descriptive models.[20] Model 1 includes only the intercept, which here is the grand mean HDI rank; it equals 75.6. The intraclass $\hat{\rho} = .46$, the BIC = 1,349, and the R^2 analogs (0 and 0) provide baselines for comparing the models—models that produce smaller values of $\hat{\rho}$ and BIC and larger values of R^2 usually are preferred to other models. Model 2, which includes the main effects of all of the covariates, is the best of these eight descriptive models: it has the second smallest $\hat{\rho}$, smallest BIC, largest level-2 R^2, the largest reduction and percent reduction in BIC, and the smallest variance that is between regions, $\hat{\sigma}^2_R = 120$ ($z = 1.2$, $p = .107$, one tailed-test). However, the log likelihood ratio test, which compares the difference in log likelihood between the model that specifies region as random and the independent-errors model that lacks σ^2_R, rejects the null hypothesis of no difference—the variance between regions, although small, still is important (df $= 1$, $\chi^2 = 5.5$, $p = .019$): Eastern Africa's random effect estimate of 13.9 ($p = .038$) and Western Asia's random effect estimate of -13.36 ($p = .027$) are statistically significant; the other sixteen estimates are not significant. This model produces the largest reduction in the variance that is between countries within regions, from $\hat{\sigma}^2_c = 2{,}214.7$ to $\hat{\sigma}^2_c = 1{,}119.3$, a percentage reduction of 49.5. The Type 3 test of the statistical significance of the independent contributions of each fixed covariate indicates that all but the trichotomous indicator of political freedom significantly influences rank on the HDI. The effect of political freedom becomes statistically significant ($F = 5.38$, $p = .022$) when the dichotomy fully democratic (1) versus not (0) is used, and the model is re-estimated.

By deleting in succession each covariate and re-estimating the system without the effect of the deleted variable, Models 3 through 8 ascertain which of the covariates in the full model most pivotally accounts for a country's HDI rank. The deletion of an important predictor will noticeably increase the BIC from that of the full model; produce smaller decreases and percent change in BIC from the benchmark values of Model 1; reduce the estimates of the R^2 analogs, increase the significance of $\hat{\sigma}^2_R$; shift the lower bound of the confidence interval away from zero; increase the intraclass correlation $\hat{\rho}$; and increase the volatility of the random effects. Using these criteria the statistics for Model 3 indicate that civilization zone is more important than the other variables in predicting the HDI rank for this system.

To illustrate the flattening of the random effects due to the covariates, Fig. 2 plots the random effect estimates by region for three models: the baseline unconditional model with

Footnote 19 continued
Lithuania, Maldives, Malta, Micronesia, New Zealand, Nicaragua, Norway, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa (Western), Seychelles, Solomon Islands, Taiwan, Vanuatu. Many of these countries also lack region codes. Antigua and Barbuda, Hong Kong (China), and São Tomé and Príncipe lack region codes and perhaps other information as well. The following 14 countries generally lack substantive information: Afghanistan, Bosnia, Iraq, Liberia, Libyan Arab Jamahiriya, Macedonia, Moldova Republic, Myanmar (Burma), Somalia, Turkmenistan, and United Arab Emirates.

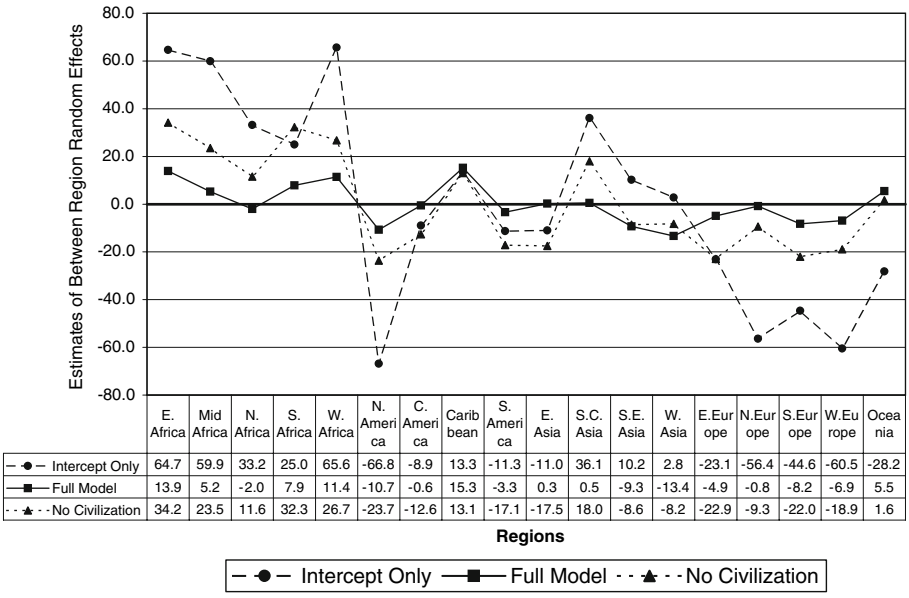
[20] The Shapiro–Wilk test, the stem and leaf plot, and normal probability plot are consistent with the assumption that the residuals of these models are normally distributed. The residuals suggest that Mauritius, Singapore, Barbados, Israel, and Japan often have better human development scores than predicted by the models; Laos, Mongolia, Albania, Yemen, and especially Papua New Guinea have worse scores. For the details please contact the author.

Table 2 Descriptive models of human development rank, random and fixed effects

	1 Intercept	2 Full descriptive model	3 Model without civiliza-tions	4 Model without slavery	5 Model without freedom	6 Model without HIPC	7 Model without conflict	8 Model without corruption
Variance components								
σ_R^2	1,878.4	120.0	468.5	159.4	104.3	213.2	133.4	190.5
z	2.8	1.2	2.5	1.4	1.2	1.5	1.3	1.4
p	0.003	0.107	0.007	0.081	0.122	0.062	0.104	0.079
σ_c^2	2,214.7	1,119.3	1,161.3	1,162.5	1,168.2	1,229.9	1,269.8	1,164.8
z	7.8	6.7	7.4	6.9	6.8	6.9	6.8	6.7
p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Intraclass ρ	0.46	0.10	0.29	0.12	0.08	0.15	0.10	0.14
Fit statistics								
Level 2 R^2	0.00	0.94	0.75	0.92	0.94	0.89	0.93	0.90
Level 1 R^2	0.00	0.49	0.48	0.48	0.47	0.44	0.43	0.47
BIC	1,349	1,119	1,198	1,144	1,134	1,141	1,146	1,132
Change in BIC	0	−229.9	−150.3	−204.6	−214.6	−207.1	−203.0	−216.8
%Change in BIC	0	−17.0%	−11.1%	−15.2%	−15.9%	−15.4%	−15.1%	−16.1%
Intercept	75.6	127.1	148.8	122.9	119.9	113.7	129.9	110.1
t	7.2	12.0	15.7	11.3	11.8	10.3	11.6	11.3
p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Type 3 tests of fixed effects								
Civilization zone								
F value	–	5.5	–	6.0	7.1	4.5	4.7	6.2
$Pr > F$	–	<.0001	–	<.0001	<.0001	<.0001	<.0001	<.0001
New slavery								
F value	–	3.5	6.2	–	3.8	3.6	2.0**	4.9
$Pr > F$	–	0.0176	<.0006	–	0.0121	0.0153	0.1242	0.0033
Political freedom								
F value	–	2.8*	6.2	3.3	–	2.1*	3.9	3.4
$Pr > F$	–	0.0689	0.0028	0.0423	–	0.1272	0.0234	0.0369
Not a HIPC								
F value	–	19.4	16.2	19.9	18.7	–	15.8	21.9
$Pr > F$	–	<.0001	0.0001	<.0001	<.0001	–	0.0001	<.0001
Conflict								
F value	–	9.1	6.5	6.8	10.5	7.5	–	17.2
$Pr > F$	–	0.0002	0.0022	0.0017	<.0001	0.0009	–	<.0001
Corruption								
F value	–	11.1	18.4	15.5	12.6	13.5	26.9	–
$Pr > F$	–	0.0012	<.0001	0.0001	0.0006	0.0004	<.0001	–

*When political freedom is dichotomized as fully democratic versus the other two categories its effect is statistically significant: Model 2 – $F = 5.4$, $p = .02$; Model 6 – $F = 4$, $p = .049$

**When slavery is dichotomized as None (1) or very little (2) versus high (3) or very high (4) then the effect is statistically significant: Model 7 – $F = 5.7$, $p = .02$

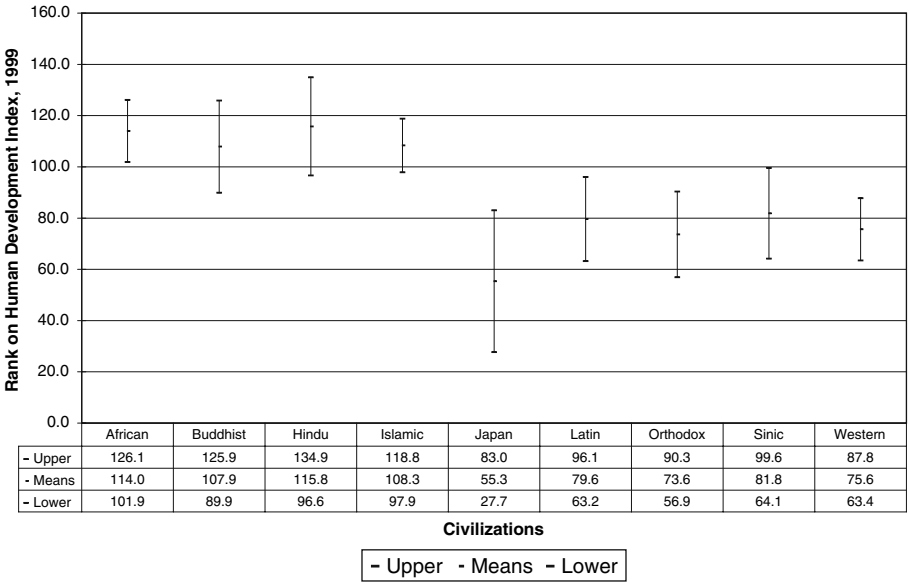


	E. Africa	Mid Africa	N. Africa	S. Africa	W. Africa	N. America	C. America	Caribbean	S. America	E. Asia	S.C. Asia	S.E. Asia	W. Asia	E.Europe	N.Europe	S.Europe	W.Europe	Oceania
Intercept Only	64.7	59.9	33.2	25.0	65.6	-66.8	-8.9	13.3	-11.3	-11.0	36.1	10.2	2.8	-23.1	-56.4	-44.6	-60.5	-28.2
Full Model	13.9	5.2	-2.0	7.9	11.4	-10.7	-0.6	15.3	-3.3	0.3	0.5	-9.3	-13.4	-4.9	-0.8	-8.2	-6.9	5.5
No Civilization	34.2	23.5	11.6	32.3	26.7	-23.7	-12.6	13.1	-17.1	-17.5	18.0	-8.6	-8.2	-22.9	-9.3	-22.0	-18.9	1.6

Fig. 2 The controls for the covariates flatten the distributions of random effects

no fixed covariates (Model 1), the full conditional model (Model 2), and the conditional model that lacks the control for civilization (Model 3). When there are no covariates the random effects vary from a positive peak value of 65.6 to a negative peak value of −66.6 HDI rank units. When the model includes all of the covariates, the estimates of the random effects flatten hugging the zero axis, the positive peak is only 15.3 HDI units; the negative, −13.4. When civilization is dropped from the model, the variance increases; the positive peak is 34.2; the negative, −23.7 HDI units.

Depicting the differences among civilization zones in their HDI rank, Fig. 3 presents their least-squares means from Model 2. There are three clusters: consistent with hypothesis 1, Japan has the most favorable rank; the African, Buddhist, Hindu, and Islamic have unfavorable scores; and the Latin, Orthodox, Sinic, and Western have middling scores. The Bonferroni tests indicate the following differences and similarities. The African category has impoverished (that is, elevated) rank scores compared with Japan (+58.6, $p = .0071$), Latin (+34.4, $p = .04$), Orthodox (+40.4, $p = .0042$), and the West (+38.4, $p = .0013$). The Buddhist category has impoverished rank scores compared with Japan (+52.5, $p = .028$) and the West (+32.3, $p = .065$). The Hindu category has impoverished scores compared with Japan (+60.4, $p = .018$), Orthodox (+42.2, $p = .032$), and the West (+40.2, $p = .006$). Similarly, the Islamic category has impoverished scores compared with Japan (+52.98, $p = .017$), Orthodox (+34.7, $p = .008$), and the West (+32.7, $p = .002$). Japan has more favorable scores than Latin, Orthodox, Sinic, and Western categories, but these differences are not statistically significant ($p = 1.0$). The Latin scores are similar to those of the Orthodox, Sinic, and Western categories ($p = 1.0$). The Orthodox scores are similar to those of the Sinic and Western categories ($p = 1.0$). Finally, the Sinic and Western categories have similar scores ($p = 1.0$). Apparently, civilization zones matter when predicting the HDI rank, but other factors account for the regional differences.



	African	Buddhist	Hindu	Islamic	Japan	Latin	Orthodox	Sinic	Western
- Upper	126.1	125.9	134.9	118.8	83.0	96.1	90.3	99.6	87.8
- Means	114.0	107.9	115.8	108.3	55.3	79.6	73.6	81.8	75.6
- Lower	101.9	89.9	96.6	97.9	27.7	63.2	56.9	64.1	63.4

Fig. 3 Least-squares means of human development rank scores by civilization zones

5.2 Explanatory models of HDI rank

These analyses aim to uncover which of the covariates, when used as a typology that nests the random regions thereby creating homogeneous subgroups of countries, will, when compared with the full predictive model, further flatten the estimated regional random effects and the estimated regional means. This further flattening is indicated primarily by smaller and less statistically significant values of $\hat{\sigma}^2_{R(n)}$ compared with $\hat{\sigma}^2_R$. Other diagnostic indicators are a likelihood ratio test that indicates no statistical difference between the model and an analogous independent-errors model that lacks the regional covariance parameter, smaller values of $\hat{\rho}$ and of BIC, larger reductions and percent reductions in the BICs, and favorable R^2s. These analyses also aim to uncover which variables reduce $\hat{\sigma}^2_c$, the variance between countries within regions.

Table 3 presents the seven alternative explanatory models (Models 3 through 9) that classify the random effect of region; to facilitate comparisons it also reports again Model 1, which includes only the intercept, and Model 2, the full descriptive model.

5.2.1 Civilization zones

These zones have important fixed effects but when they classify the regional random effects they do not explain the variance in rank that is between regions, see Model 3. The $\hat{\sigma}^2_{R(n)} = 98.3$ is smaller than the $\hat{\sigma}^2_R$ of the full descriptive model, but it approaches statistical significance, the $p = .066$. Moreover, when the log likelihood of Model 3 is compared with that of the analogous independent-errors model (i.e., the model that lacks the level-2 random effect) the likelihood ratio test rejects the null hypothesis of no difference, thereby indicating the significance of $\hat{\sigma}^2_{R(n)}$ (DF $= 1$, $\chi^2 = 5.67$, $p = .017$).

Table 3 Explanatory models of human development rank, random and fixed effects

	1 Intercept only	2 Full descriptive model	3 Region classified by civilizations	4 Region classified by slavery	5 Region classified by freedom index	6 Region classified by full democracy	7 Region classified by not a HIPC	8 Region classified by conflict	9 Region classified by corruption
Variance components									
σ^2_R and $\sigma^2_{R(n)}$	1,878.4	120.0	98.3	126.5	123.5	65.3	120.3	196.1	220.1
z	2.8	1.2	1.5	1.0	1.8	0.9	1.4	1.7	1.9
p	0.003	0.107	0.066	0.171	0.036	0.176	0.088	0.044	0.032
Likelihood ratio test χ^2	146	5.52	2.69	1.45	7.21	2.60	5.45	5.26	12.61
p	<.0001	0.019	0.017	0.228	0.007	0.107	0.020	0.022	0.0004
σ^2_c	2,214.7	1, 119.3	1, 116.0	1, 062.7	1, 028.0	1, 184.4	1, 095.7	940.3	855.3
z	7.8	6.7	6.8	4.4	6.4	6.3	6.5	5.5	5.3
p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Intraclass ρ	0.46	0.10	0.08	0.11	0.11	0.05	0.10	0.17	0.20
Fit statistics									
Level 2 R^2 analog	0.00	0.94	0.95	0.93	0.93	0.97	0.94	0.90	0.88
Level 1 R^2 analog	0.00	0.49	0.50	0.52	0.54	0.47	0.51	0.58	0.61
BIC	1,349	1, 119	1, 120	1, 125	1, 119	1, 123	1, 141	1, 121	1, 101
Change in BIC	0	−229.90	−228.60	−224.00	−230.00	−225.90	−207.10	−227.90	−248.00
%Change in BIC	0	−17.0%	−17.0%	−16.6%	−17.1%	−16.8%	−15.4%	−16.9%	−18.4%
Intercept	75.6	127.1	121.7	128.5	132.1	127.2	130.5	122.5	114.5
t	7.2	12.0	11.2	11.5	11.5	11.8	11.8	10.9	10.6
p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Table 3 continued

	1 Intercept only	2 Full descriptive model	3 Region classified by civilizations	4 Region classified by slavery	5 Region classified by freedom index	6 Region classified by full democracy	7 Region classified by not a HIPC	8 Region classified by conflict	9 Region classified by corruption
Type 3 tests of significance									
Civilization zone									
F value	–	5.5	7.5	6.7	7.7	8.2	6.2	7.1	5.5
$Pr > F$	–	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
New slavery									
F value	–	3.5	3.9	2.0*	5.7	3.9	4.1	5.7	2.8
$Pr > F$	–	0.0176	0.0119	0.1234	0.0013	0.0109	0.0084	0.0014	0.0472
Political freedom									
F value	–	2.8**	3.1**	2.2**	1.8**	2.1**	2.8**	2.3**	3.6
$Pr > F$	–	0.0689	0.0487	0.118	0.1878	0.1273	0.0682	0.1115	0.0325
Not a HIPC									
F value	–	19.4	17.3	21.8	15.6	19.8	12.5	20.2	28.4
$Pr > F$	–	<.0001	0.0001	<.0001	0.0002	<.0001	0.0018	<.0001	<.0001
Conflict									
F value	–	9.1	8.5	8.8	9.8	9.2	8.2	6.0	10.3
$Pr > F$	–	0.0002	0.0004	0.0004	0.0002	0.0002	0.0005	0.0054	0.0001
Corruption									
F value	–	11.1	11.1	11.6	12.7	11.5	11.6	6.0	4.2
$Pr > F$	–	0.0012	0.0013	0.0010	0.0006	0.001	0.0010	0.0168	0.0111

*When slavery is dichotomized as none (1) or very little (2) versus high (3) or very high (4) then the effect is statistically significant, $F = 5.7$, $p = .02$

**When political freedom is dichotomized as fully democratic versus the other two categories its effects are statistically significant as follows: Model 2 – $F = 5.4$, $p = .02$; Model 4 – $F = 4.4$, $p = .04$; Model 5 – $F = 4.2$, $p = .05$; Model 6 – $F = 4.2$, $p = .0497$; Model 7 – $F = 5.5$, $p = .02$; and Model 8 – $F = 4.5$; $p = .04$

Proc Mixed parameterizes the estimates of the random effects so that their mean is zero. It tests the hypothesis that there is no difference between an estimate and this mean. Using this test, different civilization zones do not explain all the variance that is between regions: Western African countries that are classified as Islamic have a significantly higher (i.e., worse) rank (+16.17, $p = .030$) than the mean of zero; and Western Asian countries that are classified as Islamic have a significantly lower (i.e., better) rank (−13.8, $p = .031$). However, this model does explain a lot: for the other 35 region ∗ zone combinations the null hypothesis of no difference between the random-effect estimate and the mean of zero is not rejected. When compared with Model 2, the nesting of region by civilization zone does not add much explanatory power: the log likelihoods differ by only .2 and the BIC and changes in BIC are about the same. Slavery and fully democratic regimes account for more of the regional variance in HDI rank.[21]

5.2.2 Contemporary slavery

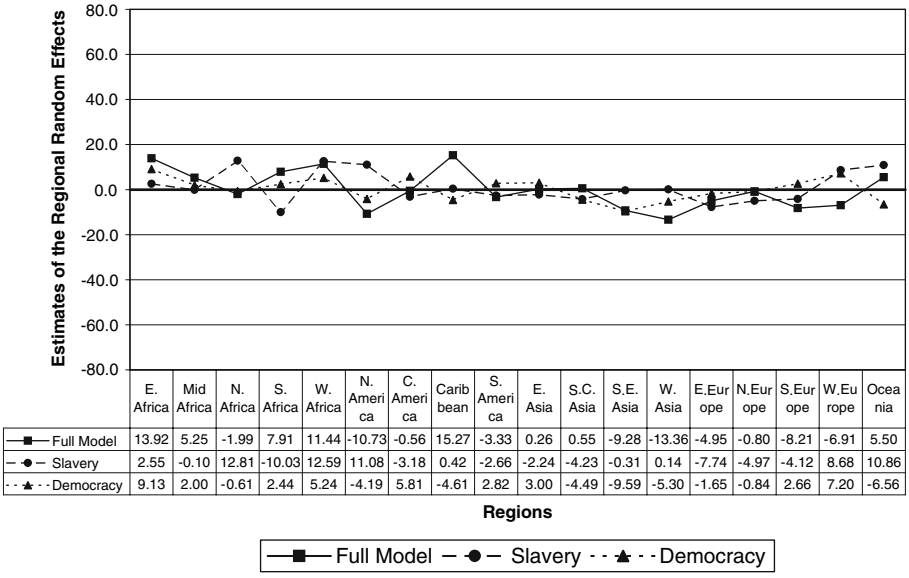
When all of the covariates are retained, and when the four categories of slavery are used to classify the regions, the resulting Model 4 is the best of the models thus far in terms of reducing the significance of the variance that is between regions. Although its value of $\hat{\sigma}^2_{R(n)} = 126.5$ is higher than the estimates of $\hat{\sigma}^2_R$ or $\hat{\sigma}^2_{R(n)}$ for other key models—the full predictive model and the classification models for civilization zone, democracy models, and debt—the null hypothesis that implies no variance between the regions is not rejected, the probability = .171. Moreover, when the likelihood ratio test compares the log likelihood of this model (1,116.9) with that (1,118.4) of the analogous independent-errors model, the difference in χ^2 of 1.5 (DF = 1, $p = .23$) indicates that the null hypothesis of no difference between these models is not rejected. In fact, in all 45 trials the null hypothesis of no difference between the random-effect estimate for a unique region ∗ slavery combination and the mean of zero is not rejected; the differences lack statistical significance. These statistics imply that for these data slavery universally explains much of the regional variance in the HDI ranking. However, compared with the other models both the level-2 $R^2 = .93$ and the intraclass correlation $\hat{\rho} = .11$ are middling, which suggests that $\hat{\sigma}^2_{R(n)}$ is still rather high relative to the total of the covariance parameters. The value of $\hat{\sigma}^2_c = 1,062.7$ is lower than those for the other competitive models assessed thus far. The Type 3 tests of the significance of the fixed effects on the HDI indicate that the contributions of civilization zone ($p < .0001$), national debt ($p < .0001$), conflict ($p = .0004$), and corruption ($p = .0010$) are very statistically significant. But, to obtain significance the measures of freedom ($p = .039$) and slavery ($p = .019$) need to be dichotomized. For the various levels of slavery the least-squares HDI means are as follows: slavery 1 = 84.3; 2 = 83; 3 = 93; and 4 = 99.6.

5.2.3 Democracy

When the categories of freedom are dichotomized as fully democratic (i.e., free) versus not (partly free plus unfree) and then used to nest the regions, Model 6, the resulting model, accounts for the variance that is between the regions. (Model 5 that nests regions by the trichotomous measure of freedom does not account for this variance.) The $\hat{\sigma}^2_{R(n)} = 65.3$,

[21] Since region and civilization are both macro variables, a plausible alternative model would cross-classify the countries by these two variables (Littell et al. 1996, pp. 437–453). However, when this model is estimated the region ∗ civilization random effect is zero. Moreover, when this interaction is classified by either freedom or slavery, the random effect is not significant. These null effects support the choice of models of this study.

the two R^2s (.97 and .47), and the intraclass $\hat{\rho} = .05$ are the most favorable of these models. The null hypothesis of no significant between-region variance is not rejected, $p = .174$, which is about the same as the $p = .176$ for slavery in Model 4. In all 30 unique region $*$ democracy combinations the null hypothesis of no difference between the random-effects estimates and the mean of zero is not rejected. The Type 3 tests indicate that all of the fixed effects of the covariates are statistically significant except for democracy, which must be dichotomized to attain significance ($p = .0497$). The likelihood ratio test for the significance of the between-region covariance parameter (DF $= 1$, $\chi^2 = 2.69$, $p = .107$) slightly favors the slavery model (DF $= 1$, $\chi^2 = 1.45$, $p = .228$). But the BIC statistics very slightly favor the democracy classification model (BIC = 1,123) over the slavery classification model (BIC = 1,125), as do the ranges of the random effects estimates (18.72 to 22.85). Figure 4 depicts the SAS estimates of these regional random effects, comparing their reduced variability with estimates for the full descriptive model.[22]



	E. Africa	Mid Africa	N. Africa	S. Africa	W. Africa	N. America	C. America	Caribbean	S. America	E. Asia	S.C. Asia	S.E. Asia	W. Asia	E.Europe	N.Europe	S.Europe	W.Europe	Oceania
Full Model	13.92	5.25	-1.99	7.91	11.44	-10.73	-0.56	15.27	-3.33	0.26	0.55	-9.28	-13.36	-4.95	-0.80	-8.21	-6.91	5.50
Slavery	2.55	-0.10	12.81	-10.03	12.59	11.08	-3.18	0.42	-2.66	-2.24	-4.23	-0.31	0.14	-7.74	-4.97	-4.12	8.68	10.86
Democracy	9.13	2.00	-0.61	2.44	5.24	-4.19	5.81	-4.61	2.82	3.00	-4.49	-9.59	-5.30	-1.65	-0.84	2.66	7.20	-6.56

Fig. 4 Compared with the full descriptive model, the nesting of the regions by slavery or by full democracy (1 or 0) further flattens the distributions of random effects estimates

5.2.4 Highly indebted poor countries

Model 7 reports the results when the regions are nested by the HIPC typology. For these data the resulting variance that is between regions $\hat{\sigma}^2_{R(n)} = 120.3$ is not as favorable as

[22] When the ratio of female primary school enrollment as a percentage of the male primary enrollment (for years 1995 through 1997) taken from the World Bank Index is added as an additional control, it strengthen slavery's explanation of the variance that is between regions, its $\hat{\sigma}^2_{R(n)} = 100.7$, $z = .87$ and the $p = .192$. The latter probability is higher than that of any of the other models. This variable weakens the explanatory power of the dichotomous democracy typology, its $\hat{\sigma}^2_{R(n)} = 265$, $z = 1.50$ and the $p = .067$. However, when women's primary education is used as an additional covariate it severely increases the missingness of the data. Also, this variable may be confounded with the knowledge dimension of the HDI. Subsequent research will address these issues.

those provided by the full descriptive model and the classification models for civilization zone, slavery, and freedom. However, the least-squares means clearly indicate that countries referred to as low debt have much more favorable human development rank than highly indebted poor countries (estimate $= -25.5$, $p = .002$, Bon.). This model does provide a better explanation of the between-region variance than either the conflict or corruption nested models; in only one of the 25 debt $*$ region combinations (Western Asia) is the null hypothesis of no difference between the random-effect estimate and the mean of zero rejected (-15, $p < .015$).

5.2.5 Conflict

In Model 8, which classifies the regions by the level of conflict, the variance that is between the regions remains high ($\hat{\sigma}^2_{R(n)} = 196.1$) as does the intraclass correlation $\hat{\rho} = .17$. The variance that is among countries within regions is relatively low ($\hat{\sigma}^2_c = 940.3$) and the level-1 R^2 also is favorable. The BIC statistic is about the same as those for Models 2 through 5. The null hypothesis of no difference between the random-effects estimate of a unique region $*$ conflict combination and the mean of zero is rejected in three of the 41 comparisons. When the level of conflict is very low, Western Africa has a worse HDI rank ($+19$, $p = .04$) but South–Eastern Asia (-18.94, $p < .03$) and Western Asia (-17.75, $p = .04$) have better HDI positions. The least-squares means indicate that countries with the least conflict have a better rank, 77.1, compared with the other two categories, 98.4 and 100.83, respectively ($p < .02$, Bon.).

5.2.6 Corruption

When in Model 9 the regions are classified by the four levels of corruption, the variance between regions is larger ($\hat{\sigma}^2_{R(n)} = 220.1$) and more statistically significant ($p = .03$) than that of any of the other substantive models and the level-2 R^2 is the least favorable (.88). In five of the 47 region $*$ corruption combinations the null hypothesis of no difference between the random-effects estimate and the mean of zero is not rejected, so there is variance between regions that remains to be explained. But the corruption typology offers the best explanation of the variance among countries within regions, $\hat{\sigma}^2_c = 855.3$ is the smallest value. The BIC = 1,101 suggests that this model fits better than the other models, as do the statistics for change and percentage change in BIC. The Type 3 tests of the fixed effects indicate that all of the covariates have statistically significant effects. The least-squares means indicate that countries with the lowest level of corruption have the better rank, 71.2, whereas the countries with the other levels of corruption have significantly worse rank, 97.7, 100.2, and 96.6, with no significant difference among them. When the latter three categories are grouped together their mean rank is 98.9, which is significantly higher than 71.2 ($p = .002$, Bon.).

These analyses of the countries' rank on the HDI generally are consistent with the sensitizing hypotheses: Civilization zones correlate with human development—Japan and less so the West have the most favorable rank; all of the instrumental factors have strong fixed effects; the typologies of emancipative employment (i.e., low slavery) and democracy tend to explain the regional differences; highly indebted poor countries have very significant negative effects; and differences in corruption noticeably influence the variance among countries within the regions. Because these findings are based on the countries' rank on the HDI, they may be fragile. Consequently, to test this empirical theory, the underlying scores are modeled next.

5.3 Tests and replications using index scores

This section first relates an overall index of instrumental factors supportive of freedom to the HDI and to its underlying scores, combined and disaggregated. Then, it assesses the unique effects of the binary indicators of the instrumental factors on the measures of human development. Finally, it replicates the explanatory analyses using the underlying HDI scores and finds that emancipative employment and full political democracy coupled with the lack of internal chaos explain the regional differences in human development scores.

5.3.1 The index of instrumental factors

The index of instrumental factors supportive of freedom is the sum of the following binary indicators: emancipative employment (1 = no or low slavery) versus slavery (0); fully democratic political system (1) versus not fully democratic (0); low national debt (1) versus HIPC (0); no internal chaos (1) versus conflict and unrest (0); and integrity (1 = low corruption) versus corruption (0). Their sum creates a reliable index ($\alpha = .69$ weighted, $\alpha = .68$ unweighted). As Sen's theory predicts, this index of instrumental factors is strongly positively correlated with a country's substantive freedoms, assessed by its HDI rank (reversed so 1 is the lowest value), HDI score, and the scores for the component indexes, either weighted by the square root of the countries' populations or not weighted, see Table 4. [23]

Table 4 The Pearson correlations between the index of instrumental factors supportive of freedom and the indicators of substantive freedoms are positive and statistically significant

Indicators of substantive freedom	Index of instrumental factors (weighted data)	Index of instrumental factors (data not weighted)
HDI rank	0.84	0.82
	$p < .0001$	$p < .0001$
HDI score	0.78	0.80
	$p < .0001$	$p < .0001$
Longevity score	0.68	0.69
	$p < .0001$	$p < .0001$
Literacy score	0.69	0.72
	$p < .0001$	$p < .0001$
GDP per capita	0.84	0.81
	$p < .0001$	$p < .0001$

Note: The square root of a country's population is the weight

5.3.2 Effects on the HDI ranks and scores, and on component scores

Table 5 documents that civilization zones and each of the binary indicators of the instrumental factors have associational effects on the various measures of the substantive freedoms—

[23] Contemporary Iraq provides a qualitative illustration of how cultural and instrumental factors can influence human development. There is a clash of cultures between Kurds, Sunni Muslims, and Shiite Muslims; the political regime provides no protective consultation and therefore it is not a democracy. Moreover, there is internal chaos, corruption, and heavy national debt. The military intervention by the US and its allies further reduced this country's already low human development, even though it removed Saddam Hussein and the Bath party from power.

Table 5 Effects of indicators of instrumental factors on indicators of substantive freedoms, controlling for civilization zones, proc mixed estimates

Response variable	HDI ranking	HDI scores	Longevity scores	Literacy scores	GDP per capita scores
Measures					
σ_R^2	149.34*	0.0031*	0.0097*	0.0038*	0.0008
z	1.3	1.5	2.1	1.6	0.9
p	0.21	0.15	0.03	0.12	0.38
Likelihood ratio test p	0.02	0.001	<.0001	0.001	0.20
Bonferroni p	0.1	0.005	0.0005	0.005	1
σ_c^2	158.5	0.020	0.016	0.049	0.029
z	6.7	6.9	7.09	7.33	7.29
p	<.0001	<.0001	<.0001	<.0001	<.0001
BIC	1, 137	−212.7	−220.0	−108.8	−179.1
Intercept β_0	74.3	0.55	0.54	0.60	0.47
t	8.8	14.8	13.5	11.1	11.9
p	<.0001	<.0001	<.0001	<.0001	<.0001
Civilization zones					
F value	5.5	3.97	2.8	4.1	3.6
$Pr > F$	<.0001	0.0004	0.008	0.0003	0.001
Bonferroni p	0.0005	0.002	0.040	0.0015	0.005
Instrumental freedoms					
Emancipative employment					
β	12.1	0.058	0.052	0.079	0.045
t	3.3	3.62	3.45	3.20	2.44
p	0.0015	0.0005	0.001	0.002	0.016
Bonferroni p	0.0075	0.0025	0.005	0.010	0.080
Effect size	0.12	0.15	0.14	0.18	0.11
Full democracy					
β	10.00	0.042	0.048	0.04	0.05
t	2.1	2.09	2.53	1.2	2.0
p	0.036	0.039	0.013	0.221	0.045
Bonferroni p	0.180	0.195	0.065	1.000	0.225
Effect size	0.10	0.11	0.12	0.09	0.12
Not a HIPC					
β	24.6	0.119	0.093	0.134	0.137
t	5.1	5.7	4.7	4.2	5.8
p	<.0001	<.0001	<.0001	<.0001	<.0001
Bonferroni p	0.0005	0.0005	0.0005	0.0005	0.0005
Effect size	0.25	0.31	0.24	0.31	0.34
No internal chaos					
β	19.7	0.055	0.043	0.048	0.076
t	5.3	3.4	2.9	1.9	4.0
p	<.0001	0.001	0.004	0.057	0.0001

Table 5 continued

Response variable	HDI ranking	HDI scores	Longevity scores	Literacy scores	GDP per capita scores
Bonferroni p	0.0005	0.005	0.020	0.285	0.0005
Effect size	0.20	0.15	0.11	0.11	0.19
Integrity					
β	21.7	0.064	0.043	0.046	0.124
t	3.5	2.4	1.7	1.2	4.3
p	0.001	0.019	0.101	0.248	<.0001
Bonferroni p	0.001	0.095	0.505	1.000	0.0005
Effect size	0.22	0.17	0.11	0.11	0.31
Standard deviation of response variable	97.9	0.379	0.382	0.428	0.399

*The likelihood ratio test suggests that this variability between regions is statistically significant

The Bonferroni p values calculated by Proc Multtest weaken the statistical significance of the parameters

In this table the effect size equals the unstandardized regression coefficient divided by the standard deviation of the response variable

that is, on HDI rank, scores for the HDI, and scores for longevity, literacy, and GDP per capita. When the size of the effect of each instrumental factor is assessed by dividing its unstandardized fixed effect on the zero to one scale by the standard deviation of the response variable, low national debt (i.e., countries that are not HIPCs) consistently has the strongest effect on the measures of substantive freedoms, compared with the other instrumental factors. The likelihood ratio test of the significance of $\hat{\sigma}^2_R$ indicates that this set of covariates accounts for the variance between the regions only when the response variable is the country's score for GDP per capita. To account for $\hat{\sigma}^2_R$ for the total HDI scores it is necessary to classify the random effect by typological variables, as follows.

5.3.3 Replication of the explanatory analysis using HDI scores

Table 6 replicates the earlier explanatory analysis of the HDI ranking of Table 3 by using a country's total HDI score as the response variable and the dichotomized measures of the instrumental factors as covariates. The earlier analysis suggested that full democracy and the absence of slavery account for the variance between regions. However, when the total HDI score is the response variable and democracy or slavery is used singularly to classify the random regions, there is unexplained variance in $\hat{\sigma}^2_{R(n)}$. To account for this variance a joint classification with no internal chaos (1) versus some chaos (0) is necessary. As expected, the classification by civilization zone (with or without the joint classification by absence of internal chaos) does not account for the regional random effect.

When the dichotomous typological test variable is fully democratic (1) versus not (0), the likelihood ratio test indicates that $\hat{\sigma}^2_{R(n)}$ is statistically significant ($p = .0165$); in three of the 30 unique region $*$ democracy combinations the null hypothesis of no difference between the random-effect estimate and the mean of zero is rejected. However, when democracy and no internal chaos jointly classify the random effect, these attributes of a country strongly account for the variance between the regions. The likelihood ratio test indicates that $\hat{\sigma}^2_{R(n)}$ is not statistically significant ($p = .37$): in the 44 unique region $*$ democracy $*$ no internal

Table 6 Explanatory models of human development scores, random and fixed effects

	1 Intercept only model HDI scores	2 Full descriptive model HDI scores	3 Region classified by civilizations & no chaos	4 Region classified by slavery & no chaos	5 Region classified by full democracy & no chaos	6 Region classified by not HIPC & no chaos	7 Region classified by no chaos	8 Region classified by integrity & no chaos
Measures								
σ_R^2 and $\sigma_{R(n)}^2$	0.026	0.003	0.003	0.002	0.0007	0.003	0.003	0.003
z	2.8	1.5	1.8	1.4	0.7	1.5	1.3	1.5
p	0.005	0.15	0.08	0.17	0.51	0.14	0.19	0.15
Likelihood ratio test p	<.0001	0.001	0.01	0.12	0.37	0.03	0.05	0.04
σ_c^2	0.0324	0.020	0.019	0.019	0.024	0.020	0.020	0.020
z	7.8	6.9	5.9	4.7	6.1	5.9	5.9	6.1
p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Intraclass ρ	0.45	0.13	0.13	0.11	0.03	0.11	0.12	0.12
BIC	−177.7	−212.7	−206.4	−202.3	−201.4	−205.2	−205.1	−205.3
Change in BIC	–	−35.0	−28.7	−24.6	−23.7	−27.5	−27.4	−27.60
%Change in BIC	–	19.7%	16.2%	13.8%	13.3%	15.5%	15.4%	15.5%
Intercept	0.71	0.55	0.56	0.54	0.55	0.52	0.55	0.55
t	18.0	14.8	14.7	14.2	15.0	12.8	20.7	13.9
p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Type 3 test of significance								
Civilization zones								
F value	–	4.0	6.7	7.0	10.0	6.2	5.1	5.2
$Pr > F$	–	0.0004	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Table 6 continued

	1 Intercept only model HDI scores	2 Full descriptive model HDI scores	3 Region classified by civilizations & no chaos	4 Region classified by slavery & no chaos	5 Region classified by full democracy & no chaos	6 Region classified by not HIPC & no chaos	7 Region classified by no chaos	8 Region classified by integrity & no chaos
Effects of								
Emancipatory employment								
β	–	0.06	0.07	0.07	0.06	0.06	0.06	0.06
t	–	3.62	4.1	3.2	3.7	3.6	3.7	3.8
p	–	0.001	<.0001	0.002	0.000	0.001	0.000	0.000
Effect size	–	0.15	0.19	0.19	0.17	0.17	0.17	0.17
Democracy								
β	–	0.04	0.04	0.04	0.04	0.04	0.04	0.04
t	–	2.09	1.58	1.97	1.7	1.82	1.94	1.74
p	–	0.04	0.12	0.05	0.10	0.07	0.06	0.09
Effect size	–	0.11	0.09	0.12	0.11	0.11	0.11	0.10
Not a HIPC								
β	–	0.12	0.11	0.12	0.13	0.14	0.12	0.1
t	–	5.67	5.26	5.42	6.26	4.98	5.72	5.75
p	–	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Effect size	–	0.31	0.29	0.32	0.35	0.37	0.32	0.32
No internal chaos								
β	–	0.06	0.05	0.06	0.05	0.07	0.06	0.06
t	–	3.42	2.31	2.79	2.88	2.75	2.48	2.33
p	–	0.00	0.03	0.01	0.01	0.01	0.02	0.03
Effect size	–	0.15	0.14	0.15	0.15	0.17	0.17	0.15

Table 6 continued

	1 Intercept only model HDI scores	2 Full descriptive model HDI scores	3 Region classified by civilizations & no chaos	4 Region classified by slavery & no chaos	5 Region classified by full democracy & no chaos	6 Region classified by not HIPC & no chaos	7 Region classified by no chaos	8 Region classified by integrity & no chaos
Elite integrity								
β	–	0.06	0.07	0.07	0.07	0.06	0.06	0.08
t	–	2.38	2.36	2.49	2.76	2.07	1.95	2.59
p	–	0.02	0.02	0.02	0.01	0.04	0.05	0.01
Effect size	–	0.17	0.18	0.18	0.19	0.15	0.15	0.22
Standard deviation of response variable	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379

Note: Here the effect size equals the unstandardized regression coefficient divided by the standard deviation of the response variable

chaos subgroups not one difference between the random-effect estimate and the mean is statistically significant.

When the typological test variable is the four categories of slavery, the likelihood ratio test indicates that $\hat{\sigma}^2_{R(n)}$ is statistically significant ($p = .0185$); in two of 45 region $*$ slavery combinations the difference between the random effect estimate and the mean is statistically significant. When slavery and no internal chaos jointly classify the random effect, these attributes do explain the variance between the regions, but less strongly than democracy in combination with no internal chaos. The likelihood ratio test indicates that now $\hat{\sigma}^2_{R(n)}$ is not statistically significant ($p = .115$). In the 62 region $*$ slavery $*$ no internal chaos combinations only two random effect estimates differ from the mean by statistically significant values.

Of the five instrumental factors, countries that are HIPCs consistently exhibit the largest negative effects on human development rank and scores.

6 Conclusions

This study clarified why the various regions of the world have different levels of human development. To do so, it measured instrumental factors and civilization zones and assessed how these attributes of countries influence their substantive freedoms. The latter were measured by the 1999 human development index and its component indexes of longevity, literacy, and gross domestic product per capita. The study developed four parallel analyses that are based on the cross-tabulation of the form of measurement—HDI ranks or scores—with the level of causality—association or causation. When the response variable was the ranking of the 138 countries, and the regions were not nested by typologies, then the civilization zone had a more important associational effect on the HDI ranking than any of the indicators of the instrumental factors. However, when the regions were nested by the typologies based on the instrumental factors, fully democratic polities and the emancipative employment (i.e., the relative absence of contemporary slavery) accounted for the differences in HDI rank between the regions and influenced the variance on the HDI of the countries within the regions. Highly indebted poor countries (HIPCs) exhibited consistently low levels of human development, as did countries that were marked by corruption and internal conflict and unrest.

This basic pattern of results holds when the countries' underlying summary HDI scores are modeled. But now, in order for democracy and emancipative employment to account for the regional variation, these attributes need to classify the regions jointly with the indicator of no internal chaos. Once again, HIPCs are characterized by noticeably lower scores for human development compared with the other instrumental factors.

The three dimensions of the HDI—longevity, literacy, and economic welfare—form a unitary measure in that the same predictors—civilization zones and instrumental factors—have similar effects on each of the dimensions. Moreover, when a summary index of instrumental factors supportive of freedom is correlated with the various response measures—HDI rank, HDI scores, and the scores for the components—the correlations are very high, thus further substantiating Sen's linkage between instrumental factors and substantive freedoms that hypothesis 2 foretold. Consistent with hypothesis 1, across all of the hierarchical models Huntington's civilization zones have important predictive effects on human development. Civilization zones may matter but they do not necessarily determine development outcomes; instrumental factors are more important.

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