Journal of Cross-Cultural Psychology

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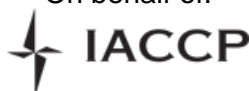
International Association for Cross-Cultural Psychology

>> Version of Record - Jan 13, 2013

OnlineFirst Version of Record - May 3, 2012

What is This?

Consanguinity as a Major Predictor of Levels of Democracy: A Study of 70 Nations

Michael A. Woodley[1] and Edward Bell[2]

Abstract

This article examines the hypothesis that although the level of democracy in a society is a complex phenomenon involving many antecedents, consanguinity (marriage and subsequent mating between second cousins or closer relatives) is an important though often overlooked predictor of it. Measures of the two variables correlate substantially in a sample of 70 nations ($r = –0.632$, $p < 0.001$), and consanguinity remains a significant predictor of democracy in multiple regression and path analyses involving several additional independent variables. The data suggest that where consanguineous kinship networks are numerically predominant and have been made to share a common statehood, democracy is unlikely to develop. Possible explanations for these findings include the idea that restricted gene flow arising from consanguineous marriage facilitates a rigid collectivism that is inimical to individualism and the recognition of individual rights, which are key elements of the democratic ethos. Furthermore, high levels of within-group genetic similarity may discourage cooperation between different large-scale kin groupings sharing the same nation, inhibiting democracy. Finally, genetic similarity stemming from consanguinity may encourage resource predation by members of socially elite kinship networks as an inclusive fitness enhancing behavior.

Keywords

cultural psychology, ethnic identity, group processes, health/behavioral medicine, intergroup relations/prejudice, measurement/statistics, national development, social cognition, values, attitudes, beliefs

Introduction

Over the past half century, a number of theories have been formulated to explain the different levels of democracy found in the nations of the world. As conceived here, democracy refers to a system in which there is opportunity for competitive elections and deliberative referendums, with broad public participation encouraged for both (Vanhanen, 2003). Democracy in this

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instance refers exclusively to the liberal variety where the emphasis is on competitive politics, rather than the classical type in which the focus is on consensus building and statesmanship (Werlin, 2002). Two key characteristics of liberal democratic systems include the presence of institutions that permit citizens to express preferences for alternative policies and leaders, and the existence of institutionalized constraints that prevent the misuse of power by an executive elite (Inglehart, 2003; Lipset, 1959; Marshall & Jaggers, 2010).

This article will examine the rarely considered hypothesis that *consanguinity* (marriage and subsequent mating between second cousins or closer relatives) is an important predictor of national levels of democracy. A key assumption of this study is that democracy is a complex phenomenon brought about by a constellation of factors acting together and that any effect consanguinity may have should be considered in the context of other, more commonly identified correlates of this form of government.

The Consanguinity Model

It has been speculated that high levels of consanguinity within nations (where the kinship coefficient (F) is ≥ 0.0156) inhibits democratic nation building (Kurtz, 2002; Pinker, 2007; Sailer, 2004). In many parts of the world, particularly in the region stretching from North Africa through the Arabian Peninsula to Pakistan and India, arranged cousin marriages are extensively practiced, especially between the children of brothers. It is estimated that the fraction of the global population practicing consanguineous marriage is around 10.4% (Bittles, 2010).

The effects of consanguinity at the individual level are well known. It is associated with a loss of biological fitness as it increases the homozygosity of deleterious recessive alleles (Bittles, 2010). Less well known are the ways in which consanguineous marriage may be advantageous. For example, it may enhance group survival potential by encouraging the sharing of resources and otherwise fostering group unity, which is especially important in times of intergroup conflict (MacDonald, 2001). It may also permit populations to maintain locally co-adapted immuno-gene complexes at a frequency necessary to counter locally occurring parasites, thus enhancing homozygote advantage (Hoben, Buunk, Fincher, Thornhill, & Schaller, 2010). Furthermore, consanguineous marriage may be associated with lower divorce rates than other forms of marriage and contribute to female autonomy (albeit restricted to regions controlled by the female's extended kin; see: Kurtz, 2002), and it may bring about financial gains involving the consolidation of dowries or bridewealth (Bittles, 2001; Sailer, 2004).

How might consanguinity affect democracy? Cousin marriages create extended families that are much more closely related than is the case where such marriages are not practiced. To illustrate, if a man's daughter marries his brother's son, the latter is then not only his nephew but also his son-in-law, and any children born of that union are more genetically similar to the two grandfathers than would be the case with non-consanguineous marriages. Following the principles of kin selection (Hamilton, 1964) and genetic similarity theory (Rushton, 1989, 2005), the high level of genetic similarity creates extended families with exceptionally close bonds. Kurtz succinctly illustrates this idea in his description of Middle Eastern educational practices:

> If, for example, a child shows a special aptitude in school, his siblings might willingly sacrifice their personal chances for advancement simply to support his education. Yet once that child becomes a professional, his income will help to support his siblings, while his prestige will enhance their marriage prospects. (Kurtz, 2002, p. 37)

Such kin groupings may be extremely nepotistic and distrusting of non-family members in the larger society. In this context, non-democratic regimes emerge as a consequence of individuals

turning to reliable kinship groupings for support rather than to the state or the free market. It has been found, for example, that societies having high levels of familism tend to have low levels of generalized trust and civic engagement (Realo, Allik, & Greenfield, 2008), two important correlates of democracy. Moreover, to people in closely related kin groups, individualism and the recognition of individual rights, which are part of the cultural idiom of democracy, are perceived as strange and counterintuitive ideological abstractions (Sailer, 2004).

In the theoretical perspective taken here, consanguinity encourages individuals to restrict expressions of self-interest primarily to those matters that simultaneously increase the collective utility of their kinship network and thus enhance their inclusive fitness. Local collectivism, manifesting itself in strong loyalties to the extended family or clan, resonates strongly in regions where high levels of consanguinity are found. We propose that where a plurality of such consanguineous kinship networks share a common statehood, autocracy is a likely outcome. In this model, the restricted gene flow, acting in conjunction with social, economic, and cultural factors, discourages intergroup and society-wide cooperation and encourages resource predation by members of the socially elite kinship network.

The model presented here is meant not to replace earlier explanations of democracy but rather to enhance them. Our view is that the traditional explanations can be better understood and more meaningfully evaluated when consanguinity is added to the picture. As mentioned, the model assumes that democracy is a complex phenomenon resulting from a combination of factors.

The aim of this study is to determine whether there is empirical evidence to substantiate the theoretical claim that consanguinity has a negative impact on national levels of democracy. Zero-order correlations between consanguinity and democracy are examined first, followed by multiple regression and path analyses. Owing to the potential for controversy, to avoid any misunderstanding we declare that our interest in this topic is purely scientific—we do not wish to cast aspersions on groups who practice consanguineous marriage or to imply that such marriages are immoral or irrational.

Other Theories of Democracy

Although the creation of a comprehensive theory of democracy is beyond the scope of this article, a number of variables associated with conventional theories of democracy were brought into a statistical analysis in order to determine whether consanguinity was a significant predictor when they were included. The other theories of democracy considered here are broken down into five basic categories:

Theories maintaining that democracy ultimately stems from economic factors

(a) *Economic development*: One of the most prominent theories of democracy in the social sciences involves the idea that higher levels of economic development are conducive to the emergence and stability of democracy (Boix & Stokes, 2003; Bollen, 1979, pp. 582-83; Bollen & Jackman, 1985a, p. 42; Bollen & Jackman, 1985b; Lipset, 1959; Lipset, 1994, p. 7; Lipset, Seong, & Torres, 1993, pp. 159-60; Przeworski, Alvarez, Cheibub, & Limongi, 2000). Similarly, it has been argued that economic freedom, specifically the recognition of property rights, is a prerequisite for democracy (Weimer, 1997). Mousseau (2000) has argued that both democratic consolidation and peace stem from market-generated norms of contract and the values upon which they are based. A related issue is resource dependence, particularly on non-renewable energy sources such as oil and gas, which has been described by some researchers as the "resource curse" due to its apparent association with low levels of democracy. It has been suggested that dependence on exports of nonrenewable resources encourages the political

elites in such systems to assume direct control of these resources as a means of maximizing their wealth and power, which are used in a variety of ways to inhibit democracy (Auty, 1993; Ross, 2001).

(b) *Human development*: Economic development is often linked with increased support for democratic values (e.g., Almond & Verba, 1963, p. 5; Inglehart & Welzel, 2005; Lipset, 1960, chapters 2-3; Lipset, 1990; Lipset, 1994, p. 3; Putnam, 1993, p. 183). Welzel (2006) has specifically claimed that the rise of emancipative values is the strongest factor associated with both the rise of new democracies and the maintenance of established ones. Similarly, various researchers have suggested that education is significant to democratization, as it is believed to influence how politically informed a populace is and also how likely it is to embrace pro-democratic values (Lipset, 1960; Organization for Economic Co-operation and Development, 2000; Rindermann, 2008; Schumpeter, 1942). This argument has been extended to encompass the effects of related measures such as national IQ (Rindermann, 2008; Vanhanen, 2010). Values and information are also seen as important in theories maintaining that enhanced social networking via communications technologies such as cellular phones and the Internet have contributed to democratization owing to their ability to make individuals more informed and governments more transparent. This is said to simultaneously enhance the demand for democracy and to make individuals more likely to participate in the democratic process (Bennett, 1998; Best & Wade, 2005; Groshek, 2009, 2010).

(c) *Inequality*: Several researchers have singled out various forms of inequality as potentially significant determinants of democratization (e.g., Acemoglu & Robinson, 2006; Vanhanen, 1979, 1984, 1990, 1997, 2003, 2010).

Islam incompatible with democracy thesis. Some scholars (e.g., Fukuyama, 2001; Huntington, 1984, pp. 208-209; Fish, 2002) claim that Islam, at least in its fundamentalist manifestation, is resistant to modern institutional practices such as liberal democracy. Others maintain that Islam is in fact compatible with democracy and related aspects of modernity (Stepan & Robertson, 2003), while a third camp holds that Islamic societies are able to incorporate some aspects of modernity but not all (al-Braizat, 2002, p. 269). It is important to differentiate between Islam and consanguinity as possible influences on democracy, as the latter is not unique to Muslim populations.

History of occupation by a foreign power. It has been proposed by some researchers that a historical legacy of colonialism may have served to arrest democratic transition insofar as postcolonial indigenous elites may merely perpetuate the largely arbitrary, authoritarian system of rule that had characterized the colonial regimes (Ake, 1996; Kedar, 2011). Others have argued that foreign intervention where the express purpose has been to facilitate democratic regime change has been an essential part of democratization for a number of nations, including Germany and Japan after World War II, South Korea in the 1950s, and Afghanistan, Iraq, and Libya in recent years (for a detailed history of the concept of exporting democracy, see Light, 2001).

Youth bulge effect. Cincotta (2008) has suggested that democracy persists better in nations in which the young age demographic (people under 29) comprise less than 40% of the population, as a population "youth bulge" fosters political tensions and insecurities.

Pathogen load theory. It has been suggested that environmental pathogen load may be the driving force behind collectivism at the local or regional level, which in turn predisposes societies towards autocracy. The mechanism proposed is predicated on the idea that collectivistic societies exhibit higher levels of xenophobia and more strongly emphasize in-group/out-group distinctions as part of a behavioral immune response aimed at reducing contact with groups that might be harboring novel parasites in a pathogen-rich environment (Fincher, Thornhill, Murray, & Schaller, 2008; Thornhill, Fincher, & Aran, 2009). In this model, pathogen prevalence would be expected to have a fairly direct effect on the level of democracy.

Although by no means a complete description of all extant theories of democracy, the theories reviewed above are both frequently cited and are largely representative of the tremendous breadth of thinking on this subject. Some of the theories may fit into more than one category (and the classification scheme itself is somewhat arbitrary), but given the absence of a widely used taxonomy in the literature, the typology employed here will suffice for the purposes of this study.

Covariates

The highest rates of consanguinity are associated with low socioeconomic status, low literacy rates, and rural residence patterns (Bittles, 2001). Similarly, measures of ethno-linguistic diversity were added to determine whether consanguinity had an effect on democracy that was independent of ethno-linguistic fractionalization. Since consanguinity could simply be a proxy for those characteristics, measures of those variables were included in the analysis as covariates.

Materials and Methods

Data on Democracy

A range of diverse but related measures of democracy have been developed by researchers. Coppedge (2005) points to a key difference between these various measures by classifying them as either "thin" or "thick." The former include only minimalist criteria, while the latter involve much wider concepts. The "polyarchy" concept of Dahl (1970) was used as the basis for Vanhanen's (2003) Index of Democracy, which provides a "thin" measure as it is based solely on institutional requirements that permit citizen participation in politics, such as near universal adult suffrage and free and fair elections. Another widely used "thin" measure of democracy is the Polity IV scale, which uses data on regime authority characteristics and political transitions in order to assign to each nation an ordinal polity score, which is the difference between democracy and autocracy scores (Marshall & Jaggers, 2010). A relatively new instrument is the Economist Intelligence Unit's (EIU) Index of Democracy, which is predicated on the view that measures reflective of civil liberties and political freedoms are not "thick" enough in that they do not consider factors that adequately capture the substantiality or quality of democracy. The EIU Index is based on five factors: the electoral process and pluralism, civil liberties, government functioning, political participation, and political culture (Kekic, 2007).

Given its broad use among democracy researchers, the Polity IV scale was the primary measure of democracy employed here. However, selected analyses were replicated using the EIU Index in order to determine whether the findings differ depending on the "thickness" of the democracy measure used. Polity IV showed high levels of convergent validity, correlating very highly with the EIU Index ($r = 0.868$, $p < 0.001$, two-tailed, $n = 70$) and with Vanhanen's Index ($r = 0.801$, $p < 0.001$, two-tailed, $n = 70$). In addition, a factor analysis of the three measures (using principal axis factoring) produced only one factor, which had very high loadings for all three variables: 0.970 for the EIU Index, 0.896 for Vanhanen's Index, and 0.894 for the Polity IV scale.

Data on Consanguinity

Values for percentage consanguineous marriage and inbreeding coefficients ($\propto$, the probability that two alleles of any gene are identical by descent) for a large number of nations have been collected and archived by community geneticist Alan Bittles (2001) as part of an extensive literature survey. The data in the works cited were gathered independently by a number of researchers over the course of many years, and a wide array of techniques were employed in

sourcing the data, ranging from household surveys to obstetric outpatient reports. The data are widely used by members of the international scientific community, having been cited in literally hundreds of peer-reviewed articles published in academic journals. In this study, percentage consanguineous marriages were used, as these data were available for more nations than were $\propto$ coefficients. Furthermore, there are theoretical reasons for favoring percentage consanguineous marriages over $\propto$ coefficients. Hoben et al. argue that the latter are abstract measures divorced from the actual behavioral adaptation of relevance (in this case the practice of cousin marriage and its attendant affects on democracy) (Hoben et al., 2010). Furthermore it has been argued that the $\propto$ coefficient may be a poor estimate of the proportion of alleles shared between individuals from a common ancestor (Markert et al., 2004). It is also worth noting that in previous work, these different measures of consanguinity have been found to correlate at $r = 0.96$ (n = 35), and so are basically isomorphic with respect to one another (Woodley, 2009). In the present study, data for 70 nations were used in total, comprising a combined sample size for that variable of several million individuals. Sample size weighted, transformed values were used in order to take into account multiple estimates for single nations. The appendix lists the percentage of consanguineous marriages for each nation in the study.

Data on Additional Theoretical Variables

To account for theories involving economic factors, a variety of data sources were used. Economic development was measured using data on Gross Domestic Product (GDP) per capita obtained from the *United Nation's Human Development Report* (United Nations Development Program, 2008). Values for economic freedom were obtained from the *2009 Index of Economic Freedom* (Miller & Holmes, 2009). The resource curse theory was brought into the analysis using national data on the percentage of exports comprised of non-renewable resources (fossil fuels and other mining products), which were obtained from the World Trade Organization's *Trade Profiles 2008* (World Trade Organization, 2009). Human development was measured using the UNDP's (2010) Human Development Index, UNDP's (2008) Education Index, and data on Internet users (per 1,000) taken from the *CIA World Factbook* (2008). To measure inequality, Gini coefficients provided by the UNDP (2008) were used. The UNDP does not list Gini coefficients for many Middle Eastern nations, so in those cases (Bahrain, Iraq, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia, Sudan, Syria and the United Arab Emirates) national Gini coefficients calculated by Vision of Humanity for their Global Peace Index (Vision of Humanity, 2008) were included. Vanhanen's (2003) Index of Power Resources (IPR), which was available only up to the year 2000, was also used to test for the effects of inequality.

The influence of the Muslim religion was measured by taking the percentage of the national population that was Muslim (from the Pew Research Center, 2009). For the effects of a history of foreign occupation, an indicator (dummy) variable was created wherein 1 signified that a nation had a history of occupation by a foreign power at some point in the last 100 years, and 0 indicated no such history. In the present study, foreign occupation was used in its broadest sense to include not only nations that had been subject to colonial rule in the early to mid-20th century (which comprise the majority of those scoring 1), but also nations which had been occupied by Nazi Germany during World War II and the Soviet Union. Nations that have been occupied with the express intention of establishing democracies were also given a score of 1.

To test for youth bulge effects, projected 2009 data on the median ages of nations taken from the U.S. Census Bureau's (2008) *International Data Base* were employed. To evaluate the epidemiological pathogen load theory, data on contemporary pathogen loads were sourced from Murray and Schaller's (2010) Historical Pathogen Prevalence Index.

Table 1. Correlations for Subsets of Cases Based on Data Quality

Data Quality	N	Pearson's *r* for Consanguinity and Democracy	Significance (Two-Tailed)
1	42	−.658	.000
2	11	−.478	.137
3	17	−.589	.013

Data for Covariates

A variable measuring ethno-linguistic diversity was introduced using data obtained from Loh and Harmon's (2005) Global Index of Biocultural Diversity. These authors list ethnic group and language diversity as separate entries, so they were averaged in order to create a composite ethno-linguistic diversity score. As there is disagreement among researchers about how to best measure ethno-linguistic fractionalization, an alternate ethno-linguistic diversity measure was obtained from Roeder (2001).

To control for possible confounds involving literacy and rural residence, literacy rates were included using figures from the *CIA World Factbook* (2008), and a variable measuring the per capita fraction of the population living in a rural setting was taken from the *World Developmental Indicators* database (2008). The economic variables mentioned above served as controls for socioeconomic status.

The values for consanguinity, GDP per capita, Internet usage, IPR, exports in fossil fuels, percent Muslim population, median age, ethno-linguistic diversity, and percent rural population were logarithmically transformed to normalize their positively skewed distributions in order to make them more amenable to parametric statistical testing.

Results

Correlation Analysis

The consanguinity variable correlated substantially with the Polity IV democracy scale and was highly significant ($r = -0.632$, $p < 0.001$, two-tailed, $n = 70$). A somewhat higher correlation was found using the "thicker" measure of democracy, the EIU Index ($r = -0.771$, $p < 0.001$, two-tailed, $n = 74$).

To determine whether the magnitude of the correlation with the Polity IV measure was robust to differences in decision rules regarding the data on consanguinity, three analyses of stability were performed. In the first one, the data were recoded into three categories based on their quality. Based on the protocol used in Woodley (2009), data quality was determined by estimating how representative they were of a whole nation. Data from studies that had been conducted for an entire nation were put into the highest quality category (1). Data from studies that broke countries down on an ethnic, religious, or regional basis were put into the next highest quality category (2), and data from studies that only took into account single regions or involved populations representative of one nation resident in another were placed in the lowest data quality category (3). The results are presented in Table 1, which indicates that the correlation is the highest where the data quality is the best. This suggests that the inclusion of the cases in Groups 2 and 3 did not inflate the overall correlation.

In the second stability analysis, the consanguinity data were quantitatively trichotomized, following the protocol of McDaniel and Whetzel (2006). The data were re-coded such that countries having less than 1% consanguineous marriages were given a score of 1, 1% to 11% a score of 2, and greater than 11% a score of 3. Here the idea is that if the correlation using the

Table 2. Correlations Using Random Selection of Approximately 50% of Cases

Randomization Run	N	Pearson's *r* for Consanguinity and Democracy	Significance (Two-Tailed)
I	43	−.655	.000
2	28	−.675	.000
3	4I	−.616	.000

Table 3. Multiple Regression Using Consanguinity to Predict Democracy in Which Covariates Are Controlled

	b (Unstandardized)	β (Standardized)	Significance	Tolerance	Variance Inflation Factor
(Constant)	7.018		.267		
Consanguinity	−2.519	**−.689**	**.000**	.650	1.539
Ethno-linguistic diversity	3.804	.152	.103	.980	1.020
Literacy	−.010	−.027	.825	.567	1.765
Percent rural	1.529	.178	.077	.842	1.187

Source: Dependent Variable: Polity IV Scale.

trichotomized variable remains substantial and significant, the use of the consanguinity variable (percent consanguineous marriages) is robust to imprecision of a sort that might result from either measurement error or temporal mismatch between dependent and independent variables. The correlation between the trichotomized variable and the Polity IV scale was $r = -.603$ ($p < .001$, two-tailed, $n = 70$).

For the third stability analysis, approximately 50% of the cases were sampled at random and then correlated, a procedure that was performed three times. The results are shown in Table 2, which indicates that even after the sample sizes were randomly reduced, the correlations remained substantial and significant.

Multiple Regression Analyses

In order to determine whether consanguinity remains a significant predictor of democracy when covariates and variables that feature prominently in other theories of democracy are included in the analyses, several multiple linear (OLS) regressions were performed.

(a) Covariates

Table 3 shows that consanguinity remained significant (β = −.689, $p < 0.001$) when ethno-linguistic diversity (Loh & Harmon, 2005), the percent rural population, and literacy rates were included in the model. A second analysis of covariates was conducted using Roeder's (2001) alternative ethno-linguistic fractionalization (ELF) estimates, but the results were substantially the same, with consanguinity remaining significant (β = −.703, $p < .001$).

(b) Theory-Driven Models

The next model featured consanguinity and three variables related to economic development: GDP per capita, the economic freedom measure, and percentage of exports in fossil fuels and

Table 4. Multiple Regression Using Consanguinity to Predict Democracy in Which Economic Development Is Controlled

	b (Unstandardized)	β (Standardized)	Significance	Tolerance	Variance Inflation Factor
(Constant)	19.197		.001		
Consanguinity	−2.398	**−.661**	**.000**	.733	1.364
GDP	−2.339	−.399	.000	.563	1.776
Economic freedom	.221	.358	.001	.663	1.508
Exports in fossil fuels	−1.407	−.261	.003	.925	1.081

Source: Dependent Variable: Polity IV Scale.

Table 5. Multiple Regression Using Consanguinity to Predict Democracy in Which Human Development Variables Are Controlled

	b (Unstandardized)	β (Standardized)	Significance	Tolerance	Variance Inflation Factor
(Constant)	14.171		.007		
Consanguinity	−2.688	**−.735**	**.000**	.584	1.712
Human Development Index	−10.821	−.231	.278	.199	5.018
Education	−.565	−.013	.946	.254	3.938
Internet users	.414	.087	.573	.380	2.634

Source: Dependent Variable: Polity IV Scale.

other mining products. Table 4 provides the results for this model, in which consanguinity was a significant predictor of the level of democracy ($\beta = -.661$, $p < .001$).

Another model was produced to control for the effects of human development. It included the Human Development Index, Education Index, and a variable measuring the number of Internet users per 1,000. As shown in Table 5, consanguinity was a significant predictor when controlling for these human development measures ($\beta = -.735$, $p < .001$). To test whether consanguinity holds up as a predictor of democracy when controlling for inequality, a regression was conducted which included the Gini Index and the Index of Power Resources. Consanguinity was significant when controlling for those variables ($\beta = -.518$, $p < 0.001$), as indicated in Table 6.

It is also important for theoretical reasons to determine whether consanguinity is a significant predictor of democracy when controlling for the influence of Islam. Table 7 shows that consanguinity remains significant ($\beta = -.448$, $p = .002$) when controlling for the percentage of the national population that is Muslim. Similarly, in order to control for the effects of occupation by a foreign power, youth bulge, and pathogen load, a regression was conducted that included measures of those variables. As shown in Table 8, consanguinity remained significant ($\beta = -.714$, $p < .001$) in that model. In all models multicollinearity was controlled by calculating variance inflation factors. In all cases these were below 10, indicating that this was not confounding the results of these analyses (Kutner, Nachtsheim, Nester & Li, 2005).

Path Analysis

In order to examine potential influences on levels of consanguinity and to explore how consanguinity might be part of a temporal sequence of democratization involving variables identified

Table 6. Multiple Regression Using Consanguinity to Predict Democracy in Which Variables Capturing Inequality Are Controlled

	b (Unstandardized)	β (Standardized)	Significance	Tolerance	Variance Inflation Factor
(Constant)	.728		.822		
Consanguinity	−1.892	**−.518**	**.000**	.602	1.660
Gini Index	.069	.104	.270	.969	1.032
Index of Power Resources	1.372	.209	.079	.615	1.627

Source: Dependent Variable: Polity IV Scale.

Table 7. Multiple Regression Using Consanguinity to Predict Democracy in Which the Percentage of the Population That Is Muslim Is Controlled

	b (Unstandardized)	β (Standardized)	Significance	Tolerance	Variance Inflation Factor
(Constant)	7.455		.000		
Consanguinity	−1.637	**−.448**	**.002**	.428	2.334
Percent Muslim	−.630	−.244	.090	.428	2.334

Source: Dependent Variable: Polity IV Scale.

Table 8. Multiple Regression Using Consanguinity to Predict Democracy in Which Occupation by a Foreign Power, Median Age, and Pathogen Index Are Controlled

	b (Unstandardized)	β (Standardized)	Significance	Tolerance	Variance Inflation Factor
(Constant)	6.734		.597		
Consanguinity	−2.612	**−.714**	**.000**	.491	2.037
Occupation by foreign power	−.561	−.041	.682	.913	1.095
Median age	.409	.016	.911	.451	2.215
Pathogen Index	2.133	.187	.138	.573	1.746

Source: Dependent Variable: Polity IV Scale.

in other theories of democracy, the path model shown in Figure 1 was produced. The model, which had adequate fit with the data ($\chi^2 = 6.823$, $df = 4$, $p = .146$; CFI = .987; RMSEA = .098), explained 76% of the variation in consanguinity and 55% of the variation in democracy. The model indicates that pathogen load, the distribution of power resources (measured with the IPR), and Islam have an impact on consanguinity levels, which in turn affect democracy. In the model the effects of pathogen levels and IPR on democracy are completely mediated by consanguinity, whereas the influences of economic freedom and exports in fossil fuels are not meditated by consanguinity. The model indicates that Islam has both direct effects on democracy and effects that are mediated by consanguinity, although the direct path from percentage Muslim to democracy only approached the conventional cutoff for significance ($p = .096$).

A similar model, depicted in Figure 2, was fitted using the EIU Index of Democracy rather than the Polity IV scale as the measure of democracy. The only difference is that IPR had both direct effects on democracy and effects that were mediated by consanguinity. It had better model fit ($\chi^2 = 2.592$, $df = 3$, $p = .459$; CFI = 1.000; RMSEA = .000), explaining 75% of the variation in consanguinity and 79% of the variation in levels of democracy.
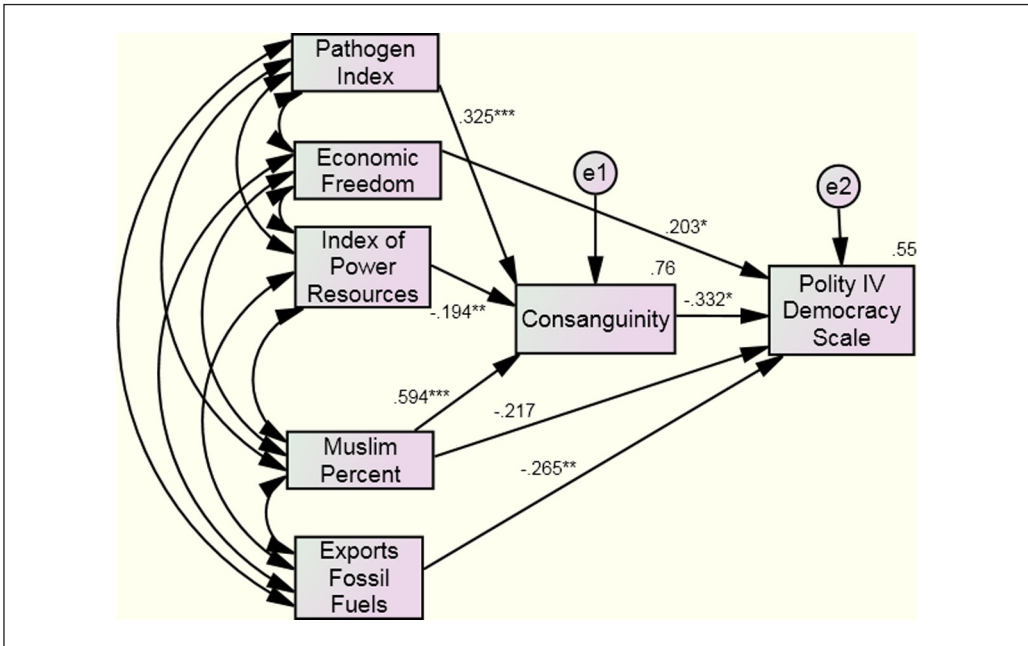
Figure 1. Path Model Using Polity IV Democracy Scale (Standardized Coefficients)
*p < .05. **p < .01. ***p < .001.

In both models the path from consanguinity to democracy was significant (*p* = .013 and *p* < .001, respectively). It must be stressed, however, that the data used are cross-sectional and that further research using longitudinal information is required to substantiate the time order assumed in the models.

Discussion

Summary

The reported correlation between democracy and consanguinity remained robust when different measures of the dependent variable were used. It also retained its position as a significant predictor when several other independent variables were included in multiple regression and path analyses. The latter identified some possible influences on levels of consanguinity and examined how consanguinity might combine with other factors to influence levels of democracy.

Consanguinity in the Context of National Differences in Levels of Democracy

The hypothesis first proposed by Kurtz (2002) that consanguinity produces social groupings that are antithetical to democracy is corroborated here. The evidence presented is sufficiently strong to make the case that consanguinity should be added to the list of factors to be considered by researchers who want to make theoretical and empirical sense of the complex phenomenon of democracy.

Democracies are fundamentally characterized by the ease with which the executive elites can shift alliances and loyalties in an effort to attract votes or to gain social status. This characteristic may be dependent on the fact that individuals in such societies are not strongly connected to one another through endogamous kinship networks and so are free to justify their self interest in terms of gains in individual utility rather than collective utility to an extended kinship grouping
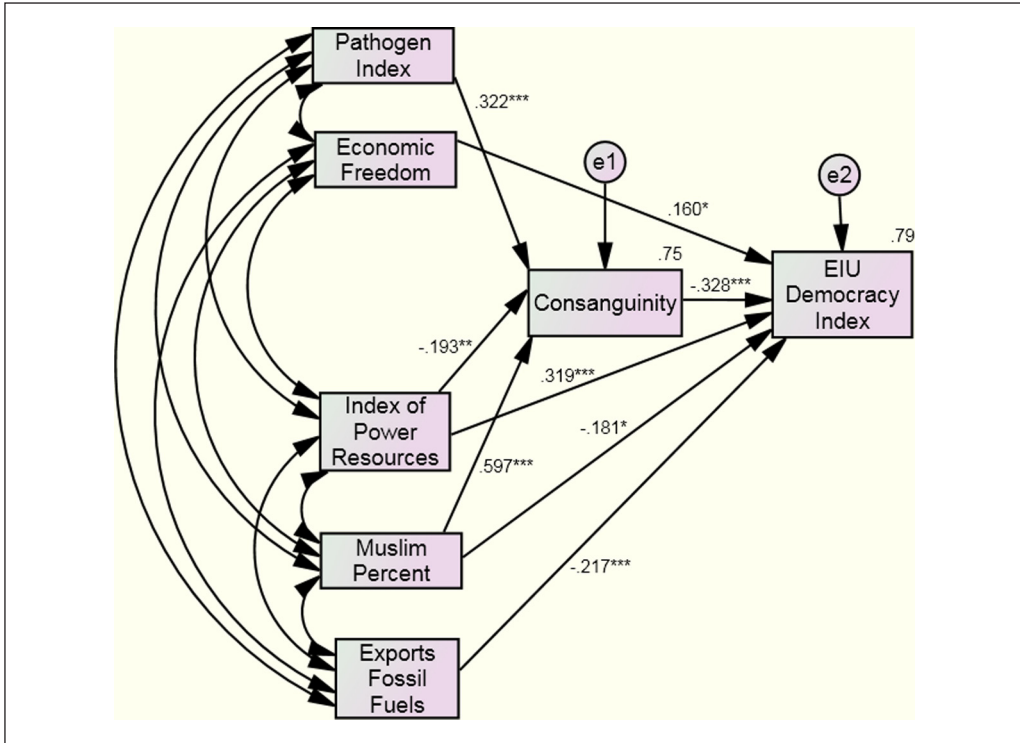
Figure 2. Path Model Using EIU Democracy Index (Standardized Coefficients)
*p < .05. **p < .01. ***p < .001.

such as a clan. The executive elites in non-consanguineous societies are therefore more likely to abide by institutional restrictions on their own power and to be tolerant of popular expressions of preference for alternative leaders and policies. Consanguinity, on the other hand, appears to severely restrict the political and social fluidity characteristic of democratic systems, as individual allegiances are primarily to kinship groupings where sophisticated group-level free-rider detection and social identity mechanisms serve to discourage expressions of self-interest that do not maximize collective utility (MacDonald, 2001, 2002). This process of collective utility maximization is consistent with the notion of inclusive fitness in which individuals exhibit altruistic behaviors toward those with whom they share genes, thus indirectly increasing their fitness (Hamilton, 1964; Rushton, 1989, 2005; Trivers, 1971).

The largest impacts on consanguinity in the path models were produced by pathogen load and the effect of the percentage of Muslims within a nation. In the first path model the latter variable did not have a significant direct path to democracy, which suggests that its effects on democracy are largely mediated by consanguinity. Both pathogen prevalence and the influence of Islam have been described in the literature as having an inhibitory effect on democracy (e.g., Fincher et al., 2008; Fish, 2002; Fukuyama, 2001; Huntington, 1984; Thornhill et al., 2009). Here we indicate that these variables, which had previously been posited to have independent effects on democracy, are actually mediated by consanguinity. From this the question arises as to why the practice of cousin marriage persists among the populations of contemporary Muslim countries. One possibility is that this may reflect its potential adaptive value, given the existence of circumstances such as high pathogen prevalence and the need to pool resources in an effort to pursue group evolutionary strategies. It is

also possible that our measure of the prevalence of Islam shares variance with other variables which are also thought to negatively impact democracy, such as polygyny (Korotayev & Bondarenko, 2000), which accounts for between 1 and 3% of all marriages in the Islamic world (Glassé, 2008).

With the advent of modernity and nation building, many small, formerly autonomous kin and clan groupings were incorporated into large states comprised of many competing consanguineous groups. The eventual hegemony of a single kinship grouping and the establishment of authoritarian rule could be a primary factor in not only achieving some form of political stability in the face of intense intergroup competition (Kedar, 2011) but also in maximizing the collective utility and fitness of members of the dominant kinship group via the transferring of power resources away from the other kin clusters that fall under their jurisdiction, hence the mediating effect of consanguinity on the index of power resources/democracy relationship.

Limitations of the Study

The biggest overall limitation was the sample size; only 70 nations were used in the analysis owing to the fact that this represents the near totality of countries for which consanguinity statistics are available (Bittles, 2001). Despite this, however, the nations surveyed were inclusive of all of the populated continents and were quite culturally diverse. A further shortcoming of the study is its cross-sectional nature; a panel study using data gathered at regular intervals would be ideal for testing the hypotheses and models presented in this study. Furthermore, the study is based on correlation only, and so any imputation of causation must be tentative although path analysis indicates a reasonable fit to models in which assumptions about the direction of causation amongst the variables consistent with the theory are tested. A final issue is spatial auto-correlation, which results from the non-independence of data-points owing to their proximity in space (Hassall & Sherratt, 2011). It has been argued that controlling for spatial autocorrelation might actually obviate meaningful ecological relationships (Legendre, 1993), and on these grounds a case can be made for not incorporating it into ecological study designs. However future research aiming to more thoroughly investigate the relationships elucidated here should attempt to control for this potential confound.

Future Research

As noted, it has been suggested by some researchers that pathogen load is a significant determinant of collectivism/individualism, with in-group/out-group distinction and avoidance mechanisms functioning as a behavioral immune response provoking collectivism as a defense against parasite exchange (Fincher et al., 2008; Thornhill et al., 2009). This hypothesis has recently been extended to suggest that consanguinity may serve as an extreme mating and therefore parasite exchange avoidance mechanism, with outbreeding being potentially disruptive to the co-adapted gene complexes and other local adaptations that form the basis of complex host immune adaptations, which would render inbreeding adaptive to a degree (Fincher & Thornhill, 2008a, 2008b; Hoben et al., 2010). The association between pathogen load and consanguinity observed in this study is consistent with that hypothesis.

However, future research in this area needs to consider the possibility that there are evolutionary benefits to consanguinity that are independent of its function as a potential behavioral immunity/gene complex conservation mechanism. There exist a number of groups that continue to maintain high levels of endogamy in the absence of significant parasite stress; these include the Roma (Gypsies), Amish, Hutterites, and Ashkenazi Jews among others. At a very basic level, the evolutionary benefits to maintaining high levels of endogamy/consanguinity would include enhanced cooperation in the acquisition of resources and in physical protection (MacDonald,

2001, 2002). The benefits of such cooperation are well known with regard to other species such as eusocial insects (Chapman, Crespi, Kranz & Schwarz, 2000; Hamilton, 1964).

Another potentially fruitful avenue of inquiry would be to try and expand the nomological net of seldom considered evolutionary determinants of democracy, by examining the relationships between consanguinity and polygyny, which has also been proposed as a variable relevant to understanding cross-cultural patterns of democracy (Korotayev & Bondarenko, 2000). Polygyny, like consanguinity, has been linked with parasite prevalence in both human (Nettle, 2009) and non-human animal populations (Read, 1990; Schmid-Hempel & Crozier, 1999), as it is thought that males who are resistant to specific parasites are more likely to be sexually selected by multiple females (Nettle, 2009). As consanguinity has now been identified as a robust predictor of differences in levels of democracy, the analysis of historical data sets illustrating how levels of democratization and consanguinity have varied over time would be informative. Historical data for democracy levels are available for both Vanhanen's Index of Democracy and for the Polity IV scale (Marshall & Jaggers, 2010; Vanhanen, 2003). However, at present only limited historical data on consanguinity are available (e.g. Cavalli-Sforza, Moroni & Zei, 2004 for Italy), and more work is needed to comprehensively expand this data set.

Appendix

A List of All of the Nations Used in This Study Along With Consanguinity Scores

Nation	Percent Consanguineous Marriages	Nation	Percent Consanguineous Marriages
Algeria	22.6	Lebanon	26.6
Argentina	0.5	Libya	37.6
Australia	0.5	Malaysia	7.6
Bahrain	44.4	Mexico	0.8
Bangladesh	10.5	Morocco	19.9
Belgium	1.1	The Netherlands	0.2
Bolivia	1.7	Nigeria	51.2
Brazil	4.3	Norway	0.5
Burkina Faso	65.8	Oman	35.9
Canada	1.5	Pakistan	51.0
Chile	0.9	Panama	1.7
China	5.0	Peru	2.5
Colombia	3.5	Philippines	0.4
Costa Rica	3.4	Portugal	1.6
Croatia	0.1	Qatar	44.5
Cuba	0.8	Republic of Ireland	0.6
Czech Republic	0.2	Saudi Arabia	38.4
Ecuador	3.5	Singapore	3.6
Egypt	31.0	Slovenia	0.6
El Salvador	4.9	South Africa	2.8
France	0.8	Spain	2.0
Great Britain	0.4	Sri Lanka	21.5
Guinea	25.9	Sudan	50.4
Honduras	3.4	Sweden	0.7
Hungary	0.1	Syria	31.6

(continued)

Appendix (continued)

Nation	Percent Consanguineous Marriages	Nation	Percent Consanguineous Marriages
India	26.6	Tajikistan	20.0
Indonesia	17.8	Tanzania	37.8
Iran	32.2	Tunisia	26.9
Iraq	34.3	Turkey	20.1
Israel	20.0	United Arab Emirates	36.0
Italy	0.6	United States	0.2
Japan	7.6	Uruguay	2.1
Jordan	31.6	Uzbekistan	23.3
Kuwait	51.7	Venezuela	1.4
Kyrgyzstan	45.2	Yemen	34.9

Source: Bittles (2001).

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