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CULTURE AND GROWTH: SOME EMPIRICAL EVIDENCE

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ABSTRACT

Using Hofstede's cultural data set, this paper examines the impact of cultural characteristics on a nation's economic performance. Using a two-step estimation procedure, we first estimate a panel growth regression and obtain estimates of each nation's fixed effects, which reflect idiosyncratic differences in growth performance. In the second step, we regress the fixed effects on invariant cultural and institutional variables. Our estimation results suggest that individuality and tolerance for uncertainty are the most important cultural factors in explaining nation-specific growth performance. Furthermore, our findings suggest that political and property rights play a major role in determining idiosyncratic growth.

Keywords: culture, economic growth, freedom, property rights

JEL classification numbers: C23, O1

I. INTRODUCTION

Using several measures of culture, we seek to determine the effect of culture on a nation's economic performance. Among the cultural characteristics that we examine, individuality and uncertainty avoidance are found to be the most important in predicting economic growth that is not otherwise explained by economic fundamentals. Moreover, we discover that these cultural characteristics indirectly influence growth by shaping the legal framework of the nations in our study. On an intuitive level, these findings are not particularly surprising, and are probably consistent with the 'prior' beliefs of many economists. What is surprising is that the current literature only indirectly addresses this important issue, providing anecdotal evidence in support of these findings (e.g., Lanyi, 2004). This lack of research linking culture to growth within the context of macroeconomic growth models most likely reflects that issues of culture have been largely ignored by the economics profession.[1] Until the mid-1990s, when issues of corruption (e.g., Mauro, 1995) and trust (e.g., Knack and Keefer, 1997; La Porta *et al.*, 1997) began

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[1] Some attempts have been made to empirically link culture directly with economic growth. For example, Diekmann (1996) attempts to measure the relationship between culture and growth using a long-run

to receive serious attention, most research on the relationship between culture, business and economics was conducted in the management sciences (for a survey of this literature, see Kirkman *et al.*, 2006). That has certainly changed. Recent research spans a diverse field of topics, including the link between culture and European Union integration (Zivko and Zver, 2006), the impact of cultural differences on environmental sustainability (Park *et al.*, 2007), the role of culture in asset manager decisions (Beckmann *et al.*, 2008), the effect of culture on female labour force participation rates (Fernandez, 2007), the role of culture in shaping trade patterns (Huang, 2007) and the link between culture and the formation/adoption of risky industries (Huang, 2008), to name a few.

Within this diverse literature, culture is frequently used to explain very specific economic decisions or phenomena, as seen from the list of topics discussed earlier. To the extent that broader economic performance is the variable of interest, researchers frequently postulate very specific channels/mechanisms through which culture impacts growth (e.g., by influencing trade and industrial growth patterns, etc.). The goal of this paper is to examine the impact of culture (broadly defined and measured) on overall economic performance within the context of a mainstream macroeconomic growth model. Specifically, we derive the fixed effects from a panel based on Barro's (1991) neoclassical growth model. This achieves two goals: first, the regressors in the panel model allow us to control for the effects of economic fundamentals on the growth process, and second we are able to extract estimates of the collective impact of all remaining invariant, nation-specific factors which impact economic growth (i.e., the fixed effects).[2] With fixed effect estimates in hand, we perform second-stage regressions in which the fixed effects are regressed on a list of cultural and institutional regressors. Although fairly straightforward, we are unaware of any research involving culture and growth which employs this estimation technique.

To measure culture, we follow the long-established precedent of using Hofstede's (1980) four measures of culture (also called 'culture scores'), which he derived using factor analysis on morale surveys administered to 88,000 IBM employees from 72 countries during the late 1960s and early 1970s (see Kirkman *et al.*, 2006, for a brief history).[3] The four culture measures identified and interpreted by Hofstede include (1) power distance (PDI), (2) individualism (IDV), (3) uncertainty avoidance (UAI) and (4) masculinity (MAS). In brief, power distance captures social attitudes and perceptions regarding the role of power in interpersonal relationships and the level of trust (i.e., higher power distance implies lower trust). Individualism measures the extent to which members of society are more individually oriented (as opposed to being more collectivist oriented). Uncertainty avoidance measures society's tolerance for uncertain outcomes, as reflected in part by the use of rules to regulate behaviour. Finally, masculinity measures society members' propensity to refrain from forming long-term relationships or engaging in cooperative efforts.

Apart from culture, we also investigate how political and property rights affect country-specific rates of economic growth. Like culture, these institutional variables are treated as invariant factors.[4] To proxy for political rights, we use Freedom House's freedom classification.

cross-sectional growth model, while Papamarcos and Watson (2006) fail to include any economic control variables in their growth regression and simply regress growth on culture alone.

[2] Implicitly, we are assuming that culture does not change over the sample period. While it is reasonable to assume that culture is not immutable, we believe that it is reasonable to assume that culture changes very little over short periods of time.

[3] It is important to note that because these cultural indexes are the product of factor analysis, their precise meaning and interpretation is inherently subjective.

[4] We fully acknowledge that revolutionary movements can lead to abrupt changes in both political and property rights, but assert that such radical changes are rare.

Property rights are captured by the contract enforcement measure from the Business Environmental Risk Intelligence study (see Section III.1 for more details on these variables). Consistent with our prior belief that these institutional factors can be treated as fixed within each nation, we find that both measures are remarkably stable over the short time span covered by our growth model. Specifically, nearly half (18 out of 41) of the nations in our sample possess freedom classifications that do not vary over the sample period. On average, less than 20 percent of freedom classification values vary within nations. Similarly, we find that the average variance of the contract enforcement variable (expressed as a percentage of each nation's mean value) is only 2.1 percent. We include these rights measures because numerous studies have found them to be important determinants of growth. Among those that investigate the relationship between growth and political freedom we include Barro (1996, 1999), Sala-i-Martin (1997), Minier (1998) and Dollar and Kraay (2003) among others. The general finding is that greater freedom/rights positively impact economic growth. Similarly, most empirical studies find that greater property rights are associated with higher rates of economic growth. Examples of this branch of the growth literature include Hall and Jones (1999), Acemoglu *et al.* (2001), Barro (2003), Dollar and Kraay (2003) and Rodrik *et al.* (2004), to name a few.

Overall, our estimation results reveal that masculinity and power distance are statistically insignificant predictors of growth, while individualism and uncertainty avoidance are significant. We find that greater political rights and greater property rights are robust in promoting growth. These findings, which are discussed in more detail in Section III, also suggest that culture may indirectly affect economic growth by influencing a nation's judicial system.

II. THE EMPIRICAL MODEL

To adequately investigate the impact of culture on economic growth, one must construct a model that simultaneously controls for the major determinants of growth while also capturing culture's influence on the growth process. This task is complicated by the fact that one cannot simply add measures of a nation's culture to a standard growth model, as culture changes very slowly over time, and thus is likely to appear to be static over the time period covered by the growth model. This problem is exacerbated by the fact that the best available data set on culture, Hofstede's culture scores, is a cross-sectional snapshot. As a result, these measures do not vary within a given nation in a panel growth model, and thus cannot be individually estimated apart from the nation-specific fixed effects. To overcome this limitation, we implement a two-step estimation procedure whereby we obtain estimates of each nation's fixed effects, which capture the influence of invariant, nation-specific factors.[5] Because cultural changes typically progress at a glacial pace, the fixed effects should capture variation in growth rates *across* nations due to differences in a slew of invariant factors, including culture. Next, these fixed effects are regressed on a set of invariant factors (including culture), to determine the effect (if any) of culture on growth.[6]

[5] We are implicitly assuming that the relationship between economic fundamentals (i.e., the right hand side variables in model (1) excluding the nation and time effects and the error term) and the rate of economic growth are unaffected by culture. While this is a somewhat strong assumption, virtually all neoclassical growth models assume that the right hand side slope coefficients are equal across nations and constant over time. Moreover, the limited number of observations for each nation further necessitates this assumption.

[6] Hausman and Taylor (1981) develop a method for estimating models with time-invariant observable variables within the context of panel models with endogenous random effects, but their estimation method is not suited for the estimation of dynamic panels.

To implement this estimation procedure, we begin by obtaining estimates of the fixed effects from the commonly used 5-year growth model based on Barro (1991):[7]

$$\begin{aligned}\text{growth}_{it+1} = {} & \beta_1 \text{income}_{it} + \beta_2 \text{education}_{it} + \beta_3 \text{gov}_{it} + \beta_4 \text{inv}_{it} \\ & + \beta_5 \text{trade}_{it} + \alpha_i + \eta_t + \varepsilon_{it+1} \end{aligned} \tag{1}$$

where the dependent variable (growth_{it+1}) measures the average annual growth in real GDP per capita of country i over the next 5-year period ($t + 1$). To account for convergence, our model includes income_{it}, which is the natural log of PPP-adjusted, chain-weighted per-capita GDP in period t. Human capital is controlled by way of the proxy education_{it}, which equals the average years of secondary and higher education for the male population aged 15 and above. Differences in fiscal policies are captured by gov_{it}, which measures public expenditures relative to GDP (i.e., G_{it}/Y_{it}). The rate of capital formation is controlled for by way of the investment share of output (i.e., I_{it}/Y_{it}), denoted as inv_{it}. The potential impact of gains from trade are captured using the openness measure, denoted by trade_{it}, which is the ratio of total trade activity to GDP, i.e., $(\text{IM}_{it} + \text{EX}_{it})/Y_{it}$. Finally, α_i is a country-specific effect, η_t is a period-specific effect and ε_{it+1} is a stochastic shock with zero mean and constant variance (σ_ε^2) that captures growth over the next 5-year period ($t + 1$) not otherwise determined by the model's regressors in period t.

After obtaining estimates of the country-specific effects ($\hat{\alpha}_i$), we estimate the following second-stage regression model:

$$\hat{\alpha}_i = W_i B + \Lambda_i G + u_i \tag{2}$$

where W_i is a (1×2) row vector of nation-specific control variables including measures of human rights and personal property rights, Λ_i is a (1×4) row vector of Hofstede's culture scores, i.e., power distance (PDI_i), individualism (IDV_i), masculinity (MAS_i) and uncertainty avoidance (UAI_i), and u_i is a mean zero i.i.d. shock.

This approach is particularly attractive because it allows us to use a relatively large panel of 93 nations in the first stage regression, despite the fact that we only have corresponding culture data for 41 of these countries. The larger first stage panel thereby improves the precision of the common slope coefficients in model (1), allowing us to more precisely estimate the nation-specific fixed effects used in model (2). Furthermore, on a more heuristic level, the ability to examine idiosyncratic differences in growth rates gives one a clearer picture of actual performance differences across nations.

III. THE DATA AND ESTIMATION

III.1 The data

Our panel data set, used to estimate model (1), is constructed from three sources, while the data used to estimate model (2) comes from three additional sources. Focusing on model (1), economic growth, log per capita income, government and investment's shares of output, and trade openness are taken from the Penn World Table v. 6.2 (Heston *et al.*, 2006). With the exception of income, which is expressed as the natural log of constant (2000) international dollars ($I), the remaining variables are expressed as percentages. The human capital series, which measures the average years of secondary and higher schooling for the male population aged 15 and above, is from the Barro and Lee (2000) data set.

[7] Following Barro (2000), we include a trade variable in model (1). The empirical model, data set and estimation results for model (1) match the benchmark growth model in Chambers and Guo (2009). For an in-depth discussion of 'Barro regressions', see Durlauf *et al.* (2005).

In sum, our primary data set (used to estimate model (1)) consists of an unbalanced panel of 93 countries, with growth covering the period 1961–2001, yielding a total of 794 observations. Table 1 lists the nations and periods covered in the data set. Although some of the nations used to estimate model (1) are not included in Hofstede's cultural data set, the inclusion of these extra nations in the first stage of estimation improves the precision of the coefficient estimates in model (1), thus yielding more efficient estimates of the fixed effects that are used in the second estimation stage of model (2).

Hofstede's culture scores, provided in Table 2, are from his website, although they were originally published in his influential 1980 book. Although we obtained culture data for 51 countries, only 41 of them were usable (i.e., only 41 nations overlap in the model (1) and model (2) data sets). As stated earlier, the first culture measure, power distance, measures society's tolerance for and open acknowledgement of political and social class structures and hierarchies. Societies that are more power distant are interpreted to harbour less trust, whereas low power distance signals higher levels of trust within a society. The second culture measure, individualism, measures the degree of independence of economic agents (both households and firms) in managing their affairs, and the lack of long-term allegiance to institutions and groups beyond their own affiliation. When cultures exhibit less individualism, they typically are more collectivist in character. The third culture measure, uncertainty avoidance, measures the extent to which societies tolerate uncertainty. Societies with higher uncertainty avoidance scores tend to erect rules that formally govern behaviour, while their lower uncertainty avoidance counterparts are less restrictive and grant members of society more latitude in their personal affairs. We argue that uncertainty avoidance is also a reasonable proxy for risk aversion. Strictly speaking, uncertainty implies that the set of conceivable outcomes of a given process are known, but that the probability distribution over those outcomes is unknown. By contrast, risk implies that both the outcomes and their corresponding probability distribution are known. Because Hofstede's uncertainty avoidance reflects a general social loathing of uncertainty, it stands to reason that members of such a society would also shun risk in both their personal and professional lives.[8] Finally, Hofstede's concept of cultural 'masculinity' reflects the average aggressiveness/boldness of the agents within the society. Nations with high masculinity scores tend to refrain from forming long-term relationships and are less likely to engage in cooperative efforts, whereas low masculinity scores are typical of cultures that are more cooperative and less individually competitive.[9]

Freedom is measured by averaging the annual civil liberties and political rights measures published by Freedom House (2001) from 1973 to 2001. Each year, Freedom House subjectively scores each nation's level of political rights using an array of factors, including voting rights and the electoral process, constitutional/legislative limits on the power of government officials, tolerance for political opposition and the oppression of minority groups. The civil liberties index reflects a nation's status in four broad categories: freedom of expression and belief, associational and organizational rights, rule of law and personal autonomy and individual rights. Both indices range in value from 1 (free) to 7 (not free). Following Freedom House's classification criteria, a nation is classified as 'free' if the combined average score lies in the range 1.0–2.5, 'partly free' if the score lies in the range 2.5–5.5 and 'not free' if the score is in excess of 5.5. For our purposes, we utilize this measure as a dummy variable which equals one if a nation is classified as free, and zero otherwise (i.e., if a nation is classified as either partly free or not free).[10]

[8] Admittedly, risk is insurable while general uncertainty is not; thus it is conceivable that someone who loathes uncertainty may be willing nonetheless to assume actuarially fair risk/gambles.

[9] For an interesting discussion of Hofstede's 'masculinity' variable, see Papamarcos and Watson (2006).

[10] While alternative measures of political freedom exist, e.g., the Heritage Foundation and the Fraser Institute indexes, the Freedom House index is widely respected and has been used by many economists,

TABLE 1
Countries and periods

Country	*Observations*	*Range*	*Country*	*Observations*	*Range*
Afghanistan	7	1971–2001	Lesotho	9	1961–2001
Algeria	9	1961–2001	Liberia	7	1971–2001
Argentina	9	1961–2001	Malawi	9	1961–2001
Australia	9	1961–2001	Malaysia	9	1961–2001
Austria	9	1961–2001	Mali	9	1961–2001
Bangladesh	6	1976–2001	Mauritius	9	1961–2001
Benin	9	1961–2001	Mexico	9	1961–2001
Bolivia	9	1961–2001	Mozambique	9	1961–2001
Botswana	7	1971–2001	Nepal	9	1961–2001
Brazil	9	1961–2001	Netherlands	9	1961–2001
Cameroon	9	1961–2001	New Zealand	9	1961–2001
Canada	9	1961–2001	Nicaragua	9	1961–2001
Central African Republic	7	1971–2001	Niger	9	1961–2001
Chile	9	1961–2001	Norway	9	1961–2001
China	6	1976–2001	Pakistan	9	1961–2001
Colombia	9	1961–2001	Panama	9	1961–2001
Congo, Republic of	4	1986–2001	Papua New Guinea	7	1971–2001
Costa Rica	9	1961–2001	Paraguay	9	1961–2001
Denmark	9	1961–2001	Peru	9	1961–2001
Dominican Republic	9	1961–2001	Philippines	9	1961–2001
Ecuador	9	1961–2001	Poland	7	1971–2001
Egypt	6	1976–2001	Portugal	9	1961–2001
El Salvador	9	1961–2001	Rwanda	9	1961–2001
Finland	9	1961–2001	Senegal	9	1961–2001
France	9	1961–2001	Sierra Leone	7	1971–2001
Gambia, The	9	1961–2001	South Africa	9	1961–2001
Germany	7	1971–2001	Spain	9	1961–2001
Ghana	9	1961–2001	Sri Lanka	9	1961–2001
Greece	9	1961–2001	Sudan	7	1971–2001
Guatemala	9	1961–2001	Swaziland	7	1971–2001
Guinea-Bissau	9	1961–2001	Sweden	9	1961–2001
Haiti	6	1971–1996	Switzerland	9	1961–2001
Honduras	9	1961–2001	Syria	9	1961–2001
Hungary	7	1971–2001	Tanzania	9	1961–2001
India	9	1961–2001	Thailand	9	1961–2001
Indonesia	9	1961–2001	Togo	9	1961–2001
Iran	9	1961–2001	Trinidad &Tobago	9	1961–2001
Iraq	7	1971–2001	Tunisia	9	1961–2001
Ireland	9	1961–2001	Turkey	9	1961–2001
Israel	9	1961–2001	Uganda	9	1961–2001
Italy	9	1961–2001	UK	9	1961–2001
Jamaica	9	1961–2001	USA	9	1961–2001
Japan	9	1961–2001	Uruguay	9	1961–2001
Jordan	9	1961–2001	Venezuela	9	1961–2001
Kenya	9	1961–2001	Zambia	9	1961–2001
Korea, Republic of	9	1961–2001	Zimbabwe	9	1961–2001
Kuwait	7	1971–2001			

TABLE 2
Hofstede's cultural measures

Nation	*PDI*	*IDV*	*MAS*	*UAI*	*Nation*	*PDI*	*IDV*	*MAS*	*UAI*
Argentina	49	46	56	86	Japan	54	46	95	92
Australia	36	90	61	51	Malaysia	104	26	50	36
Austria	11	55	79	70	Mexico	81	30	69	82
Belgium	65	75	54	94	Netherlands	38	80	14	53
Brazil	69	38	49	76	New Zealand	22	79	58	49
Canada	39	80	52	48	Norway	31	69	8	50
Chile	63	23	28	86	Pakistan	55	14	50	70
Colombia	67	13	64	80	Panama	95	11	44	86
Costa Rica	35	15	21	86	Peru	64	16	42	87
Denmark	18	74	16	23	Philippines	94	32	64	44
Ecuador	78	8	63	67	Poland	68	60	64	93
El Salvador	66	19	40	94	Portugal	63	27	31	104
Finland	33	63	26	59	Singapore	74	20	48	8
France	68	71	43	86	South Africa	49	65	63	49
Germany	35	67	66	65	South Korea	60	18	39	85
Greece	60	35	57	112	Spain	57	51	42	86
Guatemala	95	6	37	101	Sweden	31	71	5	29
Hong Kong	68	25	57	29	Switzerland	34	68	70	58
Hungary	46	55	88	82	Taiwan	58	17	45	69
India	77	48	56	40	Thailand	64	20	34	64
Indonesia	78	14	46	48	Turkey	66	37	45	85
Iran	58	41	43	59	UK	35	89	66	35
Ireland	28	70	68	35	USA	40	91	62	46
Israel	13	54	47	81	Uruguay	61	36	38	100
Italy	50	76	70	75	Venezuela	81	12	73	76
Jamaica	45	39	68	13					

Property rights are measured using the Business Environment Risk Intelligence study (BERI) measure of contract enforcement, which is based on the subjective risk assessment of BERI's panel of experts. Nations that possess better judicial systems that are more apt to uphold contractual agreements and respect private property rights have higher contract enforcement index values.[11] The contract enforcement index is a continuous variable that lies in the range 0–4, such that a 0 denotes no contract enforcement, whereas a 4 denotes perfect enforcement.

III.2 Estimation method for models (1) and (2)

Dynamic panel models such as model (1) cannot be estimated (without bias) using standard fixed or random effect methods. As a result, we use the popular Arellano and Bond (1991) two-step generalized methods of moments (GMM) estimator.[12] The first step of

including Barro (1999). Moreover we include a single dummy variable for 'free' nations, rather than a second dummy for 'partly free' nations, because all but two nations are classified as either free or partly free; thus the correlation between these dummy variables is very high (see Table 5).

[11] The BERI data set used in this paper covers the period 1972–1995, and was compiled by the Center for Institutional Reform and the Informal Sector (http://www.iris.umd.edu/), and distributed by Political Risk Services (http://www.prsonline.com). For our purposes, we use each nation's average contract enforcement score. For more information on this and other BERI measures, see Knack and Keefer (1994).

[12] The finite sample performance of GMM estimators has been criticized by some researchers. For example, Bao and Dhongde (2009) use Monte Carlo simulations to demonstrate the poor performance of GMM in estimating income convergence in dynamic panel models.

Arellano and Bond's estimation procedure is to take the first difference of (1), which can be expressed as

$$\Delta \text{income}_{it+1} = (1+\beta_1)\Delta \text{income}_{it} + \beta_2 \Delta \text{education}_{it} + \beta_3 \Delta \text{gov}_{it} + \beta_4 \Delta \text{inv}_{it} + \beta_5 \Delta \text{trade}_{it} + \Delta\eta_t + \Delta\varepsilon_{it+1} \quad (3)$$

Thus the country-specific term α_i is removed. Next, a suitable set of instruments is constructed using all the lagged predetermined, untransformed endogenous variables from Equation (3), in addition to the strictly exogenous variables in Equation (3). Following previous studies, we assume that both per capita GDP and investment's share of output are endogenous.[13] Therefore, our instrument set consists of all lagged endogenous variables (in levels) $\{\text{income}_{it-1}, \ldots, \text{income}_{i1}, \text{inv}_{it-1}, \ldots, \text{inv}_{i1}\}$, together with the remaining exogenous variables (in differences) $\{\Delta\text{education}_{it}, \Delta\text{gov}_{it}, \Delta\text{trade}_{it}\}$.[14]

Once coefficient estimates are obtained for Equation (3), they are used to partial out their corresponding regressors from model (1), thus yielding consistent estimates of the fixed nation and time period effects plus noise:

$$\text{growth}_{it+1} - X_{it}\hat{\beta} = \alpha_i + \eta_t + u_{it+1} \quad (4)$$

where $X_{it} \equiv \{\text{income}_{it}, \text{education}_{it}, \text{gov}_{it}, \text{inv}_{it}, \text{trade}_{it}\}$, $\hat{\beta}$ is the corresponding vector of coefficient estimates, and $u_{it+1} = X_{it} \cdot \{\beta - \hat{\beta}\} + \varepsilon_{it+1}$. A straightforward use of an OLS dummy variable regression yields consistent estimates of the fixed effects ($\hat{\alpha}_i$).[15] Finally, model (2) can be estimated using the fixed effects derived earlier:

$$\hat{\alpha}_i = W_i B + \Lambda_i G + \upsilon_i \quad (5)$$

As Equation (5) is a simple cross-sectional model, OLS can again be used to obtain consistent estimates of the model's coefficients (B and G).

III.3 Specification tests

To verify that our model is free of second-order serial correlation, a necessary condition for the consistency of Arellano and Bond's estimator, we perform two tests: (1) the Sargan test for overidentifying restrictions and (2) the m_2 test for second-order serial correlation. The Sargan test statistic for model (1) is equal to 82.86, with a corresponding p-value of 0.44; thus we *cannot* reject the null hypothesis that the overidentifying restrictions are valid. Conducting the Arellano and Bond m_2 test for second-order serial correlation, we obtain a test statistic of 0.33, with a corresponding p-value of 0.74. These results are consistent with the assumption that model (1) lacks second- or higher-order serial correlation, thus supporting the conclusion that the coefficient estimates discussed later are consistent and efficient.

III.4 Estimation results

The coefficient estimates for model (1) (henceforth the baseline model) are provided in Table 3, and are generally consistent with economic theory and the empirical growth literature. Starting with income, the estimated coefficient is negative and statistically significant at the

[13] See for example Barro (2000) and Forbes (2000).

[14] The one exception are the time-period effects, which (as is customary) enter the instrument matrices in levels, not in differences.

[15] In this specific model, identification is guaranteed if the fixed effects (N) and time period effects (T) satisfy the necessary and sufficient rank condition that the $NT \times (N+T)$ matrix of fixed effect and time period effect dummy variables has full column rank (i.e., $\text{Rank}[\alpha_1, \ldots, \alpha_N, \eta_1, \ldots, \eta_T] = N+T$).

TABLE 3
Model (1) two-step GMM estimation results

Variable	*Model (1)*
Income	−0.0493
	(0.0012)***
Education	0.0099
	(0.0025)***
Government	0.0241
	(0.0170)
Investment	0.1054
	(0.0241)***
Trade	0.0174
	(0.0063)***
Sargan test	64.44
Sargan *p*-value	0.156
Nations	93
Observations	608

Notes: White robust (period) standard errors in parenthesis. ***,**,*Statistically significant at the 1, 5 and 10% levels, respectively.

1 percent level, which is consistent with convergence (i.e., growth rates decline with economic development). The coefficients on education, investment and trade (openness) possess the proper signs and are statistically significant. They suggest that higher rates of education (and hence greater human capital), greater levels of capital formation and greater international flows of goods and services all contribute to higher rates of economic growth. The sign of the coefficient on government expenditures is inconsistent with economic theory, but is statistically insignificant.

Calculating the residuals from model (1), the country-specific fixed effects are estimated and provided in Table 4. Nations with historically low levels of economic growth and development possess the lowest fixed effects (i.e., idiosyncratic growth). Specifically, sub-Saharan African nations like the Democratic Republic of the Congo and Liberia perform exceptionally poorly, while war-torn nations outside the region (e.g., Afghanistan) fare little better. Highly developed nations (e.g., the members of the OECD) are the best performers. Before proceeding with the estimation of model (2), it is instructive to look at the correlation matrix between the fixed effects and the regressors in model (2) – i.e., human rights (freedom), property rights (contract enforcement) and Hofstede's cultural measures (IDV, MAS, PDI and UAI) – which is provided in Table 5.

Clearly, there is a strong correlation between the fixed effects (which capture idiosyncratic growth not otherwise explained by economic fundamentals) and Hofstede's individuality and power distance measures of culture, as well as human and property rights. The remaining measures of culture (i.e., masculinity and uncertainty avoidance) are not strongly correlated with the fixed effects. Moreover, masculinity is not strongly correlated with any of the other regressors, casting strong doubt on its importance in either explaining economic growth or shaping institutional measures like human and property rights. Uncertainty avoidance, while weakly correlated with the fixed effects, is somewhat correlated with contract enforcement. These informal observations are given further currency upon inspection of Figure 1, which provides pairwise scatter plots of the fixed effects against both the culture and human and property rights measures.

TABLE 4
Fixed effect estimates derived from model (1)

Country	*Model (1) – fixed effects (%)*	*Country*	*Model (1) – fixed effects (%)*
Afghanistan	−7.63	Kenya	−5.51
Argentina	4.21	Korea, Republic of	2.63
Australia	5.63	Kuwait	2.52
Austria	4.58	Liberia	−11.92
Benin	−5.07	Sri Lanka	−2.72
Bangladesh	−2.02	Lesotho	−6.02
Bolivia	−2.18	Mexico	2.78
Brazil	2.67	Mali	−6.27
Botswana	2.58	Mozambique	−4.38
Central African Republic	−6.72	Mauritius	4.09
Canada	4.96	Malawi	−7.27
Switzerland	4.82	Malaysia	1.88
Chile	2.62	Niger	−6.66
China	0.02	Nicaragua	0.22
Cameroon	−1.57	Netherlands	5.17
Congo, Republic of	−9.55	Norway	5.58
Colombia	1.72	Nepal	−5.07
Costa Rica	3.13	New Zealand	4.59
Denmark	5.19	Pakistan	−2.38
Dominican Republic	1.93	Panama	−0.16
Algeria	0.62	Peru	−0.82
Ecuador	−0.84	Philippines	−1.45
Egypt	1.87	Papua New Guinea	0.93
Spain	6.39	Poland	2.53
Finland	5.02	Portugal	5.72
France	6.61	Paraguay	1.13
UK	6.54	Rwanda	−4.64
Germany	3.51	Sudan	−6.04
Ghana	−4.26	Senegal	−4.67
Gambia, The	−6.52	Sierra Leone	−7.18
Guinea-Bissau	−8.68	El Salvador	1.32
Greece	4.56	Sweden	4.60
Guatemala	0.91	Swaziland	3.21
Honduras	−2.84	Syria	−3.29
Haiti	−2.38	Togo	−7.43
Hungary	3.46	Thailand	0.37
Indonesia	−1.29	Trinidad &Tobago	3.04
India	−2.32	Tunisia	1.42
Ireland	4.68	Turkey	1.73
Iran	0.33	Tanzania	−7.34
Iraq	−3.31	Uganda	−6.16
Israel	4.84	Uruguay	3.11
Italy	6.15	USA	6.85
Jamaica	−1.30	Venezuela	2.19
Jordan	−3.00	South Africa	3.35
Japan	5.98	Zambia	−7.78
		Zimbabwe	−1.21

TABLE 5
Cultural and institutional correlation coefficients

		Culture scores				*Institutional measures*		
	Fixed effects	*IDV*	*MAS*	*PDI*	*UAI*	*Free*	*Partly free*	*Contract enforcement*
Fixed effects	1.00	0.73	−0.06	−0.61	0.08	0.79	−0.69	0.71
IDV	0.73	1.00	−0.05	−0.69	−0.39	0.66	−0.60	0.79
MAS	−0.06	−0.05	1.00	0.16	0.20	−0.10	0.09	−0.09
PDI	−0.61	−0.69	0.16	1.00	0.19	−0.65	0.59	−0.75
UAI	0.08	−0.39	0.20	0.19	1.00	−0.10	0.18	−0.41
Free	0.79	0.66	−0.10	−0.65	−0.10	1.00	−0.91	0.74
Partly free	−0.69	−0.60	0.09	0.59	0.18	−0.91	1.00	−0.62
Contract enforcement	0.71	0.79	−0.09	−0.75	−0.41	0.74	−0.62	1.00

Notes: The culture scores are from Hofstede's data set, and consist of (1) individuality (IDV), (2) masculinity (MAS), (3) power distance index (PDI) and (4) uncertainty avoidance index (UAI).
Free and partly free are from Freedom House's country ratings, and contract enforcement is a measure of contract rights enforcement from the Business Environmental Risk Intelligence (BERI) survey.

A total of six alternative specifications of model (2) are estimated and reported in Table 6. Starting with specification (1), the fixed effects are regressed on all four measures of culture (i.e., IDV, PDI, UAI and MAS) and the measures of human and property rights (i.e., 'freedom' and 'contract'). The overall fit of the regression is good (R^2 is 0.83), and all of the regressors are statistically significant except PDI and MAS. The insignificance of masculinity (MAS) is not too surprising given the weak correlation with the fixed effects, but the insignificance of the power distance (PDI) measure is more unexpected. Reviewing the correlation table (see Table 5), it is clear that PDI is strongly correlated with a number of the right-hand side regressors, especially contract enforcement and individuality. This collinearity may have inflated the variance of the coefficient on PDI (which has a p-value of 0.23), making it marginally insignificant. The remaining significant regressors have signs that are generally in line with prior expectations. IDV is positive, signifying that greater individuality (and hence less collectivism) is growth promoting. We also find that nations with greater freedom or better contract enforcement experience higher rates of economic growth. The only surprising finding is that nations with higher uncertainty avoidance grow more quickly than nations that are more willing to accept uncertainty. This is an interesting finding given the recent work of Huang (2007, 2008), who finds that higher uncertainty avoidance reduces growth through specific, and indirect channels (i.e., trade patterns and industry mix). Specifically, he finds that risk averse nations are less likely to engage in international trade with more distant nations (Huang, 2007), and that more risk averse nations are slow adopters of risky but high-growth industries (Huang, 2008), with both effects tending to restrict growth. It should be noted that our results do not directly test Huang's hypotheses (i.e., he utilizes a gravity model to investigate bilateral trade patterns, whereas we only include aggregate trade openness as an exogenous variable in model (1), and he examines industry-specific growth in various nations, while we are concerned with overall growth). It is possible that Huang's findings hold at the micro-level, but not at the macro-level.

Examining specification (2) in Table 6, we remove PDI and MAS from the model. The fit drops from 0.83 to 0.82, while the corresponding F-statistic on the restriction that PDI and MAS are jointly irrelevant is only 0.18; thus we cannot reject the null hypothesis that PDI and

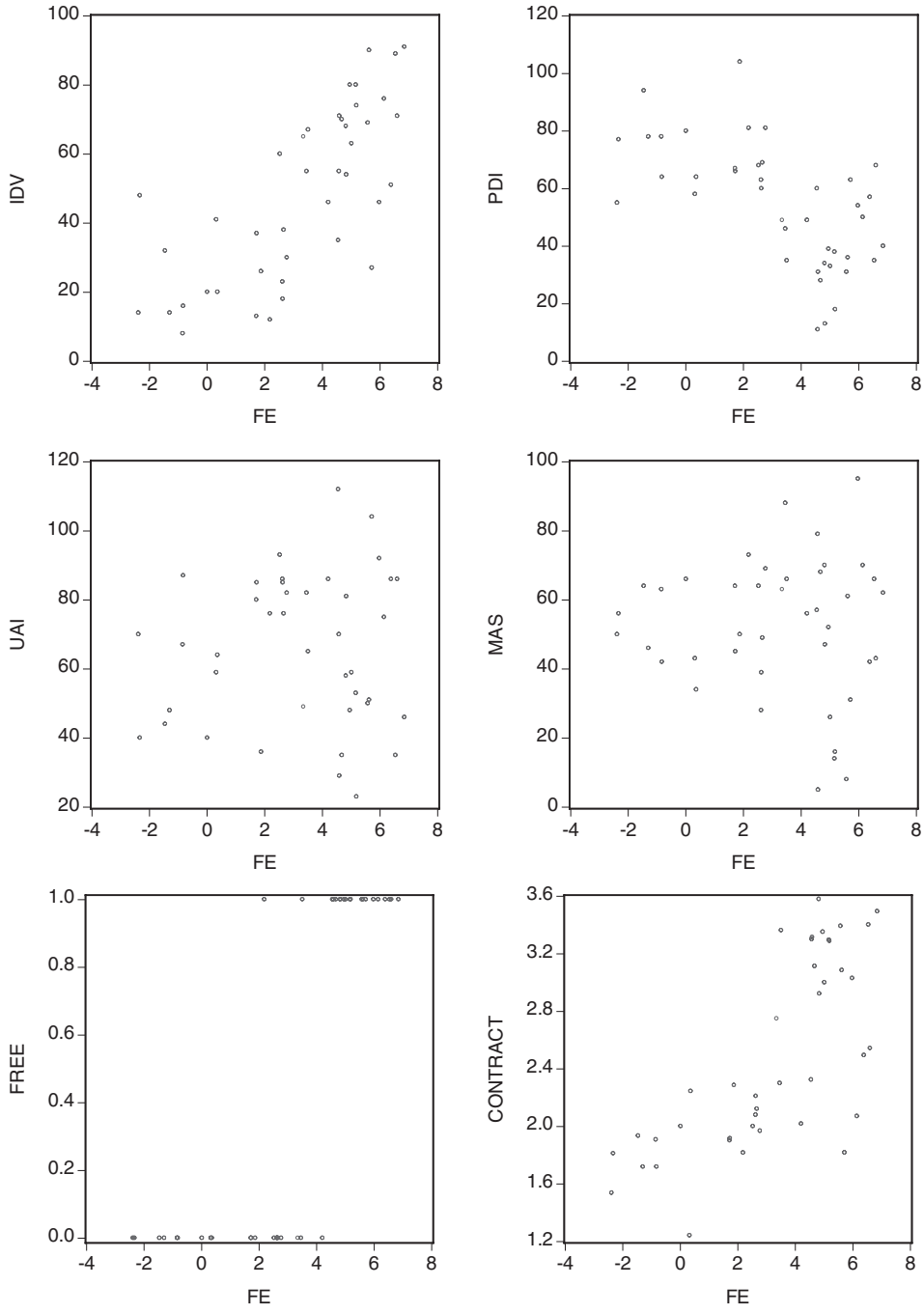

Fig. 1. Scatter plots of fixed effects vs. cultural and institutional measures.

TABLE 6
Model (2) estimation results

	Model (2) alternative specifications					
Variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
IDV	0.051	0.047	0.085	–	0.043	0.037
	(0.013)***	(0.013)***	(0.014)***		(0.012)***	(0.014)**
PDI	0.017	–	−0.016	–	–	−0.139
	(0.014)		(0.016)			(0.077)*
UAI	0.053	0.048	0.052	–	0.122	0.035
	(0.011)***	(0.01)***	(0.012)***		(0.042)***	(0.012)***
MAS	−0.010	–	−0.010	–	–	–
	(0.01)		(0.012)			
Freedom	1.758	1.758	–	3.079	1.668	2.145
	(0.606)***	(0.6)***		(0.728)***	(0.583)***	(0.599)***
Contract	1.449	1.130	–	1.113	3.033	−1.620
	(0.609)**	(0.555)**		(0.557)*	(1.175)**	(1.597)
UAI ∗ Contract	–	–	–	–	−0.030	–
					(0.017)*	
PDI ∗ Contract	–	–	–	–	–	0.060
						(0.03)*
R^2	0.83	0.82	0.70	0.67	0.84	0.84
Observations	41	41	41	41	41	41

Notes: ***,**,*Statistically significant at the 1, 5 and 10% levels, respectively. Models include a constant term that is not reported.

MAS are extraneous. The signs, magnitudes and statistical significance are virtually identical between specifications (1) and (2).

For completeness, we estimate specifications (3) and (4), which include, respectively, only the Hofstede culture measures (i.e., IDV, PDI, UAI and MAS), and just the human and property rights measures. Examining specification (3), the results are similar to specifications (1) and (2), whereby the signs, statistical significance and magnitude of IDV and UAI are little changed, and the remaining variables, PDI and MAS, remain statistically insignificant. Shifting focus to specification (4), both freedom and contract enforcement are positive and statistically significant, with 'contract' changing very little, but the magnitude of 'freedom" increases to capture variation in idiosyncratic growth previously explained by the cultural variables.

Finally, it seems entirely reasonable that the quality of a nation's institutions either mitigate or enhance the influence of culture on economic growth. Similarly, the characteristics of a nation's culture probably affect the benefits of improved institutions. To investigate the extent to which the cultural variables influence nations' institutions (i.e., human and property rights) and vice versa, we add, one-by-one, interaction terms that consist of each unique combination of the institution and culture variables (e.g., IDV ∗ Freedom, MAS ∗ Contract, etc.) to model (2) (specification (2)). Of the eight possible combinations of interaction terms, only two are statistically significant, and are reported in Table 6 under specifications (5) and (6). Starting with specification (5), the UAI ∗ Contract interaction term is negative and statistically significant. One way to interpret this result is to examine the marginal impact of higher uncertainty avoidance, which equals $\partial\widehat{\alpha}_i/\partial \mathrm{UAI}_i = (0.122 - 0.030 \cdot \mathrm{Contract}_i)$. Recall that contract enforcement is a continuous variable ranging from 0 to 4; thus, in nations with very high contract enforcement (Contract = 4),

$\partial\widehat{\alpha}_i/\partial \mathrm{UAI}_i \approx 0$, i.e., uncertainty avoidance has virtually no effect on growth in nations that have highly developed legal systems that uphold private property rights. Examining this result from the alternative perspective, i.e., the marginal impact of higher contact enforcement on growth, we find that $\partial\widehat{\alpha}_i/\partial \mathrm{Contract}_i = (3.033 - 0.030 \cdot \mathrm{UAI}_i)$. This suggests that in nations with low uncertainty avoidance (i.e., nations that are more willing to take risks), contract enforcement is relatively more important in promoting growth. This makes sense if one believes there is a risk–return tradeoff with regard to aggregate output, and that risk-taking is facilitated by diversification and contractual enforcement, both of which require a strong judicial system.

Finally, specification (6) states that there is an interaction effect between PDI and contract enforcement. This result also makes a lot of sense, given that PDI is a proxy for trust, whereby higher power distance (i.e., higher values of PDI) are associated with *lower* levels of trust. Therefore, in nations with low levels of trust (high values of PDI), the importance of a strong judicial system is especially pronounced, as reflected by our empirical findings, $\partial\widehat{\alpha}_i/\partial \mathrm{Contract}_i = (-1.620 + 0.060 \cdot \mathrm{PDI}_i)$. In other words, the greater the level of distrust (PDI), the more valuable (in terms of economic growth) an honest judiciary. Based on this estimated marginal effect, nations with PDI values in excess of 27 find that higher contract enforcement raises economic growth. Of the 51 nations in our data set, all but four have PDI values greater than 27; thus higher contractual enforcement promotes growth virtually across the entire sample. Examining this result from the alternative perspective, i.e., the marginal impact of higher levels of distrust (PDI) on growth, we find that $\partial\widehat{\alpha}_i/\partial \mathrm{PDI}_i = (-0.139 + 0.060 \cdot \mathrm{Contract}_i)$. In general, nations that have weak contract enforcement are heavily penalized (in terms of economic growth) as distrust rises. However, if contract enforcement is improved, the corrosive effects of distrust are reduced. In fact, the model predicts a 'healthy scepticism' phenomenon, whereby nations with contract enforcement scores in excess of 2.32 actually experience economic growth as a result of greater distrust.[16]

IV. CONCLUSION

Using Hofstede's (1980) cultural variables and a convenient two-stage estimation procedure, we find that cultural variables and measures of political and human rights explain just over 80 percent of nations' idiosyncratic economic growth not otherwise explained by economic fundamentals. Overall, individuality and uncertainty avoidance appear to be growth promoting, while political freedom and the presence of an honest judiciary that enforces contracts also promotes growth. Hofstede's masculinity variable appears to have no effect on growth. Both uncertainty avoidance and power distance (a proxy for trust) appear to interact with contract enforcement, suggesting that culture indirectly affects growth *vis-à-vis* a nation's political and legal institutions. Presumably, this broad finding is consistent with the beliefs of many economists and social scientists, and suggests that future research should focus on the direct connections and transmission mechanisms between culture and political institutions, to determine how culture affects these institutions (and vice versa).

Friedman (2007, p. 420) accurately summed up the importance of this topic when he recently wrote: 'To reduce a country's economic performance to culture alone is ridiculous, but to analyse a country's economic performance without reference to culture is equally ridiculous, although that is what many economists and political scientists want to do'.

[16] It is important to note that interaction terms do not reveal the direction of causality between the variables in question. Typically, tests such as the Granger causality test can be used to infer the direction of causality between two variables. Unfortunately, however, there is no time series dimension to the culture data, which precludes the use of such a test.

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