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## **Democracy and economic growth: the role of intelligence in cross-country regressions**

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### **Highlights:**

- This article examines the effect of democracy and intelligence on economic growth.
- This article reports novel evidence of a new channel through which democracy has impact on economic growth.
- Weak democratic regimes are harmful for economic growth in low-IQ nations.
- This article interacts democracy and intelligence

### **Abstract**

Empirical literature has long conjectured that institutional arrangements, proxied by democracy, social capital and intelligence, are relevant determinants in cross-country differences in economic performance. Related literature, however, predominantly documents that democracy has either a negative or not significant impact on economic growth, while intelligence is assumed to have strong and direct effect on economic performance. We propose that the effect of democratization is mediated by the degree of the approval to such policies, and that intelligence may alleviate or diminish the negative effect of weak institutions on economic growth. We empirically, investigate the interactive effect of democracy and intelligence on economic growth, using data from 93 nations, over the period 1970-2013. The results show that the relationship link between democracy and the real GDP growth varies with a nation's level of cognitive abilities. The results remain robust to various estimation techniques, control variables and time periods.

**Keywords:** intelligence, democracy, economic growth, IQ, cross-country

## 1. Introduction

Since the seminal work of Barro (1991), the empirical literature on the cross-national determinants of economic growth has mushroomed (e.g. Acemoglu, Johnson & Robinson, 2005; Beck, Levine & Loayza, 2000; Temple, 1999). One potential antecedent that attracted substantial attention from researchers is the effect of political regimes on economic growth, with a notable focus on democratic institutions. Despite the widely recognized relevance of democratic institutions for economic development (e.g. Gerring, Bond, Barndt & Moren, 2005; Piatek, Szarzec & Pilic, 2013), ‘the impact of democracy on economic growth is less straightforward and has been a matter of much more controversy among scholars’ (Jaunky, 2013 p. 990). Some studies document negative or not significant effect, while others argue that democracy fosters economic growth (Adelman & Morris, 1967; Banks, 1970, Dick, 1974; Drury, Krieckhaus & Lusztig, 2006).

A separate line of empirical literature questions the direct effect of democracy conjecturing that democracy is endogenous in economic growth regressions and that quality of human skills, cognitive structures, national capacity, social capital and regime stability (“natural order” as suggested by Hoppe (2001)) are exogenous antecedents of economic growth (e.g. Glaeser, La Porta, Lopezde-Silanes & Shleifer, 2004; Oesterdiekhoff, 2014). Abundant evidence reported in cross-national studies also suggests that the indirect effect of political regime on economic growth is captured by political stability, low levels of corruption and higher human capital accumulation (Helliwell, 1994; Baum & Lake, 2003)<sup>1</sup>.

This study further contributes to the literature that investigates how democracy and economic growth are related, and is motivated by recently published articles in this journal that report statistically significant link between intelligence and institutional arrangements (e.g. Kanyama, 2014; Carl, 2015; Salahodjaev, 2015). This paper links the related studies in the sense that intelligence and political regimes are complementary in inducing the foundations for long run economic growth. In particular, we propose that there are two possible explanations for anticipating significant interactive effect between intelligence and democracy on economic growth, the first of which is cognitive capacity. According to Kanyama (2014) “intelligence captures the level of the national ability to understand the principles and rules that govern national institutions and to orient their structure toward market-oriented policies, with the

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<sup>1</sup>Knutsen (2013) suggests that ‘there is still much uncertainty and debate on the economic effects of [democratic institutions] and whether such effects are context-dependent’. Moreover, empirical evidence seems to suggest that ‘the resources necessary for investment cannot be accumulated by democratic means’ (Rao, 1984 - 1985 p. 74).

ultimate objective of benefiting the general population” (p. 45). In particular, Potrafke (2012) documents that corruption is lower in high-IQ societies because economic agents with higher cognitive abilities are more likely to detect and punish rent-seeking actions (Galston, 2001). In a similar vein, Salahodjaev (2015) tested the hypothesis that the size of shadow economy is lower in high-IQ nations, using cross-country data for the period 1999-2007. The study finds that intelligence predicts the size of informal economy even after controlling for reverse causality between institutional arrangements and the quality of human capital devoted to productive activities.

Second, intelligence and education are closely correlated and there is plenty evidence that education determines the quality of democratic institutions (e.g. Lipset, 1959, 1960). According to Aristotle/Lipset hypothesis education as an essential antecedent of “civic culture” and democratic behavior. Almond & Verba (1989 p. 315) argue that “[t]he uneducated man or the man with limited education is a different political actor from the man who has achieved a higher level of education”.

In data from the USA and the UK, Milligan et al. (2004) find positive link between extra schooling caused by mandatory schooling laws and the probability of becoming politically involved. Likewise, Glaeser, Ponzetto & Shleifer (2007), using data from 34 countries, document that education increases benefits of political participation and promotes society-wide support for democratic institutions. In line with the education-as-a-cause view, intelligence affects individual’s cognitive abilities, which in turn instrumental to political orientations. In addition, factors such as, political interest, social attitudes and voter turnout are also the basis of the cognitive abilities (e.g. McCourt et al., 1999; Deary, Batty & Gale, 2008b). A number of articles in this journal have presented evidence that intelligent individuals are more likely to vote for a party with a democratic agenda (Rindermann et al., 2012), and attend demonstrations and petitions (Deary, Batty & Gale, 2008a).

In sum, we conjecture that democracy does not have statistically effect on economic growth in regressions where the interrelation between cognitive abilities of citizens and democratic institutions is not accounted. Rather, we anticipate the indirect impact of political regimes through intelligence of nations in weak democratic countries. While authoritarian regime might have negative effect on economic growth, there is evidence that authoritarian countries, with high-IQ population, in East Asia managed to escape rent-seeking and politically motivated policy failures (Haggard, 1990) because more intelligence of economic agents is associated with longer time horizons (Shamosh & Gray, 2008).

The anticipated link between democracy, intelligence and economic growth is explored on a sample 93 nations for the period 1970-2013. This paper contributes to empirical literature in a number of ways. First, ours is the first study that considers the interaction effect of intelligence and political regime on democracy-growth nexus. With the dataset by Lynn & Vanhanen (2012), we revisit how previous findings change when we include the national IQ scores in the growth models.

Second, to maximize the sample size and to retain comparability with related literature, we investigate the impact of democracy on long-term and short-term economic growth. We utilize two sample periods: 1970–2013 and 1990–2013.

This study documents that the association between democracy and economic performance is non-linear and depends on the intelligence of nations. In particular, we find that the interaction between IQ and democracy is negative, suggesting countries with higher level of cognitive abilities (higher than the threshold = 85.6 national IQ points) can neutralize the negative effect of non-democratic institutions on economic growth.

## 2. Model and data

We now turn to a discussion of the main data we use in our empirical analysis. The main results cover the years 1970–2013 and we include both developed and developing nations in our sample. Summary statistics for the data are presented in Table 1. The dependent variable in our article is average annual GDP growth rates ( $GROWTH7013_i$ ) at market prices based on constant local currency from 1970 to 2013. Annual percentage growth rate of GDP in our sample averaged 3.81%, and this average change ranged from -5.41% (South Sudan) and 16.96% (Equatorial Guinea). The data is retrieved from World Development Indicators (WDI).

Our key independent variable is democratic index ( $DEMOCRACY_i$ ) calculated as an arithmetic mean of civil liberties and political rights indices. Political rights allow citizens to join political parties and organizations, compete for public office, vote freely for distinct alternative candidates in legitimate elections, and elect representatives who have a real impact on public policies and are accountable to voters. Civil liberties allow for the freedoms of expression and belief, associational and organizational rights, rule of law, and personal autonomy, including economic freedom, without interference from the state<sup>2</sup>. This proxy for the quality of democratic institutions has been extensively used in empirical literature (see e.g. Hanke & Walters, 1997; Salahodjaev, 2015). Democratic index is from Freedom in the World survey. We recode the data

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<sup>2</sup> The complete description is available at <http://www.democracyweb.org/about/fiw1.php>

so that the most democratic nations (for example, Australia, and so on) score a seven, while the least democratic (for example, Mongolia, Guinea and so on) score one.

Regarding the intelligence indicator, we rely on average national IQ scores. This dataset was constructed by Lynn & Vanhanen (2002), although the revised version we use is from Lynn & Vanhanen (2012). This dataset provides national IQ scores for a sample of 196 nations. Although the role of national IQ in empirical literature has been criticized (e.g. Barnett & Williams, 2004; Hunt & Sternberg, 2006), there is ample cross-country evidence that average IQ does promote growth (Weede & Kampf, 2002), reduces income inequality, and unravels why some nations are rich and some poor (Miller, 2002).

We also include four control variables in our regression model: initial income (*logGDP per PERSON*), the investment rate (*INVESTMENT*), annual population growth rates (*POP\_GROWTH*) for the period and average years of schooling of the population (*SCHOOLING*). Initial income is logged GDP per capita at the beginning of the period. The investment rate is proxied by gross capital formation as a share of GDP over the period. With the exception of human capital data, our control variables are derived from the World Bank<sup>3</sup>.

Selecting all of the nations for which data were available, the sample consists of more than 90 countries over a 33-year period. We report robust standard errors to correct for the potential heteroskedasticity that may arise in cross-country regressions. To control for the effect of democracy on economic growth under different levels of intelligence, we interact  $DEMOCRACY_i$  and  $IQ_i$ . This approach allows us to compare the effect of intelligence on economic growth in strong and weak democracies. The correlation matrix for the main variables is presented in Table 2. Throughout this article, we use STATA 13 for our estimations

The regression model where the  $i$ th country's average GDP growth rate between 1970 and 2013 is regressed on democracy ( $DEMOCRACY_i$ ), intelligence ( $IQ_i$ ), the interaction between intelligence and democracy, and a set of control variables is:

$$growth7013_i = \alpha_0 + \alpha_1 DEMOCRACY_i + \alpha_2 IQ_i + \alpha_3 IQ_i * DEMOCRACY_i + \lambda X + \varepsilon_i \quad (1)$$

[Table 1 about here]

[Table 2 about here]

### 3. Main results

The main regression results are reported in Table 3. In model 1, democratic index has anticipated sign, although bounded below zero at traditional levels of statistical significance. In line with predominant view, we find that 'democracies are associated with no statistically

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<sup>3</sup> The data is available at <http://data.worldbank.org/indicator/all>

significant differences in economic growth' (Rodrick & Wacziarg, 2005 p. 50). The coefficient for intelligence is positive and statistically significant at the 1% level. The model predicts when intelligence increases by one standard deviation the long run economic growth increases by 1.17 percentage points. In model 2, we test whether the link between democracy and economic growth varies with a nation's level of cognitive abilities. As conjectured above we do so by adding an interaction effect into the model. Notice, that after accounting for non-linear effect of democracy,  $DEMOCRACY_i$  is now positive and statistically significant. Further, we document that interaction between  $DEMOCRACY_i$  and  $IQ_i$  is negative and statistically significant at the 1% level, indicating that weak democratic institutions are harmful for economic development only in countries with low level of cognitive abilities. In particular, for nations with high levels of IQ (higher than the threshold  $1.0717/0.0123 = 87.13$ ) the negative effect of weak democratic regime does not apply.

Related literature reports that economic growth may lead to greater accumulation of human skills (Mankiw, 1997). Furthermore, intelligence may be correlated with other potential sources of economic growth that are not included in the econometric specification. If for instance, human capital (intelligence) is accumulated together with implementation of anti-corruption or other growth-enhancing policies, this leads to omitted variable bias. To address this issue we regress national IQ scores on a vector of instruments (per capita energy consumption, per capital protein consumption from FAO and continental dummies from La Porta et al. (1999)) and use predicted values of intelligence in our regression (see e.g. Salahodjaev, 2015). Model 3 shows that interaction term retains its sign and significance even when the potential endogeneity is controlled for. Furthermore, the estimates are similar in magnitude, compared to the results in Model 2.

**[Table 3 about here]**

One the other hand, one may argue that superior growth performance in democratic countries may be driven by omitted factor that is correlated with the quality of democratic institutions. For example, there is evidence that political participation and political constraints are negatively correlated with government size (Persson, 2002; Plumper & Martin, 2003) and this may bias our empirical results. In addition, empirical literature reports strong and positive association between trade openness and democracy (e.g. Cameron, 1978; Rodrik, 1998). Therefore, we test sensitivity of our results by controlling for the government size ( $GS_i$ ), measured by gross government final consumption relative to GDP, and bilateral trade ( $T_i$ ) as a share of GDP (in model 1 in Table 4). The data is from World Bank.

The regression results show that while trade openness has positive effect on economic growth, the estimates for democracy index and interaction effect remain qualitatively and quantitatively unaffected.

Another concern is that the democracy-intelligence interaction might be solely driven by influential observations and does not apply to mean data. In model 2, we rely on robust regression (RREG) developed by Hamilton (1991). RREG first performs a preliminary analysis based on Cook's distance  $> 1$  to remove gross outliers prior to estimating starting values and then performs Huber iterations followed by biweight iterations, as suggested by Li (1985)<sup>4</sup>. The estimates retain their signs and are statistically significant at the 5% level, although the value of the coefficient for democracy is somewhat reduced. The signs of control variables are also robust.

**[Table 4 about here]**

We next test whether the link between democracy, intelligence and interaction effect changes across time. In Table 5 we re-estimate Eq. (1) but for the short-run. As can be seen, these variables have stable estimates and are very similar to the ones for the period 1970-2013. In particular, the interaction effect is negative and statistically significant. Initial GDP per capita is negatively linked to economic growth. Investment rate is significant only when using robust regression. Average years of schooling and population growth rates are positive and significant (Barlow, 1998; Darrat & Al-Yousif, 1999). Moreover, comparing the values of the interaction terms in the short-run and long run regressions, we find that cognitive abilities boost economic growth in weak democracies more in the short-run.

**[Table 5 about here]**

#### **4. Robustness tests**

We have tested robustness of our findings in a number of ways. First, the highest IQ scores are recorded in East Asian countries (e.g. Lynn & Meisenberg, 2010). Second, Eastern European and Central Asian countries have suffered from substantial economic decline and have undergone democratization process in 1990's. We therefore included dummy variables for these countries because their extant political regimes and cultural heritage could affect our estimates.

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<sup>4</sup>rreg is implemented as an ado-file in STATA



The results presented in Table 6 suggest that controlling for East Asian and post-soviet nations do not affect main results.

**[Table 6 about here]**

Geography is believed to be linked with long run economic growth. Latitude, for example, has indirect effect on long run economic development through its impact on institutions (Masters & McMillan, 2001; Easterly & Levine, 2003). Access to coast, on the other hand, has been documented to have positive effect on economic development (Faye, McArthur, Sachs & Snow, 2004). To control for these geographical differences, we include latitude and binary variable for landlocked countries in our regression. The regression results presented in Table 7 indicate that latitude has inverted U-shaped effect on long run economic growth (significant at the 10% level). Notice, that controlling for the effect of geography on economic growth does not affect the inferences with respect to the democracy and intelligence.

**[Table 7 about here]**

Finally, we tested whether the positive effect of democracy on economic growth in high-IQ nations differ in sub-samples. We have therefore divided the data into two groups: high-IQ countries and low-IQ countries. Indeed, while the coefficient for DEMOCRACY is not significant in low-IQ nations, the results in Model 2 suggest that democracy has significant positive effect in high-IQ nations.

**[Table 8 about here]**

## **5. Conclusion**

Empirical studies have long conjectured that intelligence and institutional arrangements such as democracy are potential determinants of economic growth. Our theoretical predictions, supported by econometric results, lead to a substantial reconceptualization of heterogeneous association between political regimes, intelligence and economic development. Most cross-country literature on the impact of democracy on economic growth has yielded contradictory results. Most studies of intelligence investigate its overall effect on growth and report a positive effect. We believe that the relationship between these antecedents of economic development is more complex. Particularly, we argue that the effect of democratization is mediated by the degree of the approval to such policies, and that intelligence may alleviate or weaken the

negative effect of weak democratic institutions on economic growth. Specifically, it is the social capital, civic culture and political behavior that is linked to intelligence seems to alleviate the insignificant effect of democracy on economic growth. For example, many non-democratic countries, those have high levels of cognitive abilities, maintained superior growth rates over the past decades (China, Singapore and Republic of Korea).

Our econometric findings show that the link between democracy and economic growth varies with a nation's level of cognitive abilities. In particular, the interaction between democracy index and national IQ is negative indicating that weak democratic institutions are harmful for economic development only in countries with low level of social capital and short-term horizon of economic agents, measured by intelligence. Another casual feedback may be that intelligent economic agents put in place mechanisms that restrict rent-seeking behavior and market failures.

Finally, our estimates produce novel evidence into the link between political regimes and economic growth. In addition to documenting a positive effect of democracy, we find that intelligence has robust benefit to economic development – mitigating the negative effect of weak political institutions. Considering that rampant levels of corruption and weak rule of law has growth-impairing effect on financial development, innovative activity and macroeconomic stability in developing countries, investing in cognitive skills within them may not only increase the stock of human capital, but also promote market-oriented policies.

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**Table 1**

Descriptive statistics

Variable	Description	Mean	Std. Dev.
GROWTH7013	Average annual GDP growth rates, 1970-2013	3.8119	2.1971
DEMOCRACY	Democracy index	3.6732	2.0136
IQ	National IQ	84.1026	10.8476
LogGDP per PERSON	Logged initial GDP per capita	7.7171	1.5534
INVESTMENT	Gross fixed capital formation (% of GDP)	22.9574	8.3431
SCHOOLING	Average years of schooling at all levels	4.3087	2.6328
POP_GROWTH	Population growth (annual %)	1.7552	1.2228
TRADE	Trade (% of GDP)	83.5279	43.9915
GS	General government final consumption expenditure (% of GDP)	17.4101	8.9821

**Table 2**

Correlation matrix

	I	II	III	IV	V	VI	VII	VIII
GROWTH7013	1.000							
logGDP per PERSON	-0.356	1.000						
INVESTMENT	0.363	0.237	1.000					
POP_GROWTH	0.284	-0.643	-0.312	1.000				
SCHOOLING	-0.153	0.742	0.280	-0.678	1.000			
TRADE	0.243	0.132	0.306	-0.038	0.179	1.000		
GS	-0.123	0.403	0.264	-0.270	0.345	0.199	1.000	
DEMOCRACY	-0.230	0.633	0.123	-0.588	0.630	0.101	0.177	1.000
IQ	0.124	0.694	0.434	-0.704	0.696	0.109	0.199	0.532

**Table 3**

Intelligence, democracy and economic growth: long run effect

	(1)	(2)	(3)	(4)
	OLS	OLS	IV	OLS
				Standardized

	betas			
LogGDP per PERSON	-0.7456*** (0.1197)	-0.6381*** (0.1239)	-0.721*** (0.1482)	-0.605***
INVESTMENT	0.1049*** (0.0363)	0.0987*** (0.0356)	0.1410*** (0.0341)	0.317***
POP_GROWTH	0.9915*** (0.1844)	0.9794*** (0.1789)	0.8183*** (0.1979)	0.568***
SCHOOLING	0.0610 (0.0509)	0.0699 (0.0496)	0.1338** (0.0527)	0.116
DEMOCRACY	0.0256 (0.0743)	1.0717*** (0.3634)	0.9631*** (0.4828)	1.416***
IQ	0.1075*** (0.0194)	0.1440*** (0.0238)	0.1206*** (0.0277)	1.051***
DEMOCRACY*IQ		-0.0123*** (0.0042)	-0.0106*** (0.0057)	-1.631***
Constant	-3.9928*** (1.4173)	-7.6408*** (2.0295)	-6.0836*** (2.4287)	-
<i>N</i>	93	93	91	93
adj. <i>R</i> <sup>2</sup>	0.5842	0.6352	0.5791	0.6352

Dependent variable: Average annual growth in real GDP, 1970-2013. Heteroskedasticity adjusted robust standard errors in parentheses. Significance at the 1% level is denoted by \*\*\*; \*\* denotes significance at the 5% level; and \* significance at the 10% level.

**Table 4**

Intelligence, democracy and economic growth: sensitivity test

	(1)	(2)	(3)
	OLS	RREG	OLS
			Standardized betas
LogGDP per PERSON	-0.6794*** (0.1316)	-0.7397*** (0.1071)	-0.6441***
INVESTMENT	0.0770** (0.0365)	0.0949*** (0.0208)	0.2476**

POP_GROWTH	0.9306*** (0.1957)	0.6570*** (0.1498)	0.5399***
SCHOOLING	0.0408 (0.0498)	0.0732 (0.0575)	0.0675
DEMOCRACY	1.0951*** (0.4007)	0.9234** (0.3854)	1.4470***
IQ	0.0499* (0.0268)	0.0404 (0.0256)	1.1007
DEMOCRACY*IQ	-0.0126*** (0.0045)	-0.0103** (0.0045)	-1.6999**
TRADE	0.0053** (0.0027)	0.0057*** (0.0020)	0.1571**
GS	0.0202 (0.0313)	-0.0031 (0.0206)	0.0638
Constant	-7.9329*** (2.3660)	-4.9469*** (1.8162)	-
<i>N</i>	93	93	93
adj. <i>R</i> <sup>2</sup>	0.6610	0.6770	0.6610

Dependent variable: Average annual growth in real GDP, 1970-2013. Heteroskedasticity adjusted robust standard errors in parentheses. Significance at the 1% level is denoted by \*\*\*; \*\* denotes significance at the 5% level; and \* significance at the 10% level.

**Table 5**

Intelligence, democracy and interaction effect: short run effect

	(1) OLS	(2) RREG	(3) OLS Standardized betas
LogGDP per PERSON	-0.7028*** (0.1505)	-0.7423*** (0.1328)	-0.6571***
INVESTMENT	0.0536 (0.0333)	0.0832*** (0.0241)	0.1522
POP_GROWTH	0.8264*** (0.1477)	0.7658*** (0.1299)	0.5224***



SCHOOLING	0.1187*	0.1498**	0.1770*
	(0.0601)	(0.0694)	
DEMOCRACY	1.5665***	1.3129***	1.8052***
	(0.5790)	(0.4851)	
IQ	0.1682***	0.1385***	1.0408***
	(0.0371)	(0.0270)	
DEMOCRACY*IQ	-0.0192***	-0.0155***	-2.2493***
	(0.0069)	(0.0056)	
TRADE	0.0029	0.0022	0.0777
	(0.0021)	(0.0025)	
GS	-0.0024	-0.0232	-0.0071
	(0.0266)	(0.0238)	
Constant	-7.9629**	-5.8251***	-
	(3.1203)	(2.1878)	
<i>N</i>	120	120	120
adj. <i>R</i> <sup>2</sup>	0.5884	0.5666	0.5884

Dependent variable: Average annual growth in real GDP, 1990-2013. Heteroskedasticity adjusted robust standard errors in parentheses. Significance at the 1% level is denoted by \*\*\*; \*\* denotes significance at the 5% level; and \* significance at the 10% level.

**Table 6**

Intelligence, democracy and economic growth: East Asia and post-soviet nations

	(1)	(2)
	OLS	OLS
LogGDP per PERSON	-0.7096***	-0.7660***
	(0.1450)	(0.1507)
INVESTMENT	0.0818**	0.0607*
	(0.0381)	(0.0324)
POP_GROWTH	0.9423***	0.7757***
	(0.1980)	(0.1579)
SCHOOLING	0.0569	0.1515**
	(0.0506)	(0.0587)
DEMOCRACY	1.0604***	1.6422***

	(0.3926)	(0.5751)
TRADE	0.0055**	0.0035
	(0.0027)	(0.0022)
GS	0.0174	-0.0114
	(0.0315)	(0.0260)
IQ	0.1520***	0.1897***
	(0.0276)	(0.0390)
DEMOCRACY*IQ	-0.0123***	-0.0207***
	(0.0044)	(0.0069)
East Asia & Pacific	-0.2156	-0.7852**
	(0.3295)	(0.3206)
Europe & Central Asia	0.7202***	-0.7842
	(0.2065)	(0.6278)
Constant	-7.9183***	-9.0512***
	(2.4161)	(3.1828)
<i>N</i>	93	120
adj. <i>R</i> <sup>2</sup>	0.6187	0.5659
Period	1970-2013	1990-2013

Dependent variable: Average annual growth in real GDP. Heteroskedasticity adjusted robust standard errors in parentheses. Significance at the 1% level is denoted by \*\*\*; \*\* denotes significance at the 5% level; and \* significance at the 10% level.

**Table 7**

Democracy, intelligence and economic growth: the role of geography

	(1)
	OLS
LogGDP per PERSON	-0.6564***
	(0.1306)
INVESTMENT	0.0977***
	(0.0349)
POP_GROWTH	1.0553***
	(0.1948)

SCHOOLING	0.0845 (0.0536)
DEMOCRACY	1.4644*** (0.4784)
IQ	0.1536*** (0.0258)
DEMOCRACY*IQ	-0.0171*** (0.0056)
=1 if landlocked	0.1647 (0.3638)
LATITUDE	0.0831* (0.0465)
LATITUDE SQUARED	-0.0003* (0.0002)
Constant	-2.5639 (3.3314)
<hr/>	
<i>N</i>	93
adj. <i>R</i> <sup>2</sup>	0.6059

Dependent variable: Average annual growth in real GDP, 1970-2013. Heteroskedasticity adjusted robust standard errors in parentheses. Significance at the 1% level is denoted by \*\*\*; \*\* denotes significance at the 5% level; and \* significance at the 10% level.

**Table 8**

Intelligence, democracy and economic growth: the sub-samples

	(1)	(2)
	RREG	RREG
LogGDP per PERSON	-0.589*** (0.186)	-1.117*** (0.139)
INVESTMENT	0.086*** (0.029)	0.032 (0.036)
POP_GROWTH	0.661*** (0.179)	1.463*** (0.152)
SCHOOLING	0.131	0.028

	(0.106)	(0.070)
DEMOCRACY	0.034	0.192*
	(0.103)	(0.105)
IQ	0.069***	0.103***
	(0.026)	(0.034)
Constant	-1.223	0.238
	(1.813)	(2.503)
<hr/>		
<i>N</i>	73	45
adj. <i>R</i> <sup>2</sup>	0.252	0.865
Threshold	IQ<88	IQ>88

Dependent variable: Average annual growth in real GDP, 1990-2013. Heteroskedasticity adjusted robust standard errors in parentheses. Significance at the 1% level is denoted by \*\*\*; \*\* denotes significance at the 5% level; and \* significance at the 10% level.