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IQ and Economic Development: A Critique of Lynn and Vanhanen

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Abstract We re-examine Lynn and Vanhanen's argument that gross domestic product (GDP) depends upon IQ. We argue that their analysis suffers from three types of biases, each of which would tend to erroneously favor their hypothesis. Despite this stacked deck, we find that their results are rather fragile. Rather, education has a stronger impact on GDP than does IQ, whose effect we find to be insignificant. In other words, it is a country's actual human capital, rather than its potential human capital, which determines its GDP. In short, we are unable to replicate their results.

Keywords: economic growth, human capital, IQ

INTRODUCTION

Why are some countries poor and others rich? Inquiries into the nature and causes of the wealth of nations have been ongoing since before Adam Smith. More recently, a cottage industry of cross-country and time-series regression analysis has emerged to answer this question.

The neoclassical theory of growth (Solow 1956, Cass 1965, Koopmans 1965) models the growth rate of per capita gross domestic product (pcGDP) as a function of the difference between the current and equilibrium levels of pcGDP, the latter of which depends upon physical capital, labor, and technology. Barro (1991) provided early empirical support of this hypothesis.

Mankiw *et al.* (1992) argued that human capital also belongs in the Solow model. For Barro (1991, 1997, 2001) and Barro and Sala-i-Martin (1992) the most essential variables for economic growth were education, human capital, its level of income, fertility, and democracy. In Barro and Lee (1996) education plays the main role.

Despite numerous controversies regarding the measurement of IQ, there is some (highly controversial) evidence that IQ is related to income inequalities between individuals. The most infamous of these recent studies is Herrnstein and Murray's (1994) *The Bell Curve*. Lynn and Vanhanen (2002, 2006) take Herrnstein and Murray's argument a step beyond the individual level, arguing that countries themselves have differences in IQs, and contend that these differences translate into differences in GDP and GDP growth rates.

Lynn and Vanhanen (henceforth L&V) believe that the major cause of global income inequality can be traced to the diversity in mental abilities as measured by the average national IQ level. They argue that higher standards of living are found where the average level of intelligence is the highest: "people with high IQs work more proficiently than those with low IQs, and this makes them more productive" (2006: 48–49). They conclude: "According to our interpretation, the major cause of global inequalities can be traced to the diversity of human aptitudes and especially to significant differences in the mental abilities of nations measured by national IQs" (2006: 275). According to L&V, IQ should also be considered one of the essential determinants of a country's growth rate. Their studies imply a rather fatalistic conclusion: GDP and growth are determined by IQ, a factor with a large, unchangeable, genetic component. On the other hand, Jones *et al.* (2011) find that state level IQ has no relevant effect on growth across the US once other control variables are added to the analysis.

We aim to investigate the robustness of L&H's claims by analyzing their econometrics. First, we argue that L&V's analysis suffers from three sources of bias, all of which are biased in favour of their hypothesis. We then use L&V's own data to show how a simple correction in one of these sources of bias (adding education to correct for omitted variable bias) completely undermines their conclusion. Using their own data in this way, emphasizes the fragility of L&V's method and the weakness of their argument. We do not aim for a categorical answer on the determinants of economic growth. We find, though, that education (or actual human capital) is a better predictor of income and growth than IQ (or potential human capital).

THREE SOURCES OF BIAS

In the present section we identify three sources of bias which call to question L&V's conclusions.

Error-in-variables Bias

First, the IQ data have a large amount of measurement error, which when coupled with OLS yields errors-in-variables bias. The positive correlation between the estimated value and the measurement error makes the estimated coefficient of IQ biased upward, i.e. higher than the true value, thus making IQ seem statistically significant in L&V's research.

The fact that IQ is a poorly understood concept fraught with measurement errors is reason enough to suspect that L&V's analysis suffers from error-in-variables bias. However, the degree of error in estimation is much larger than this, due to the fact that L&V's dataset relies to a very large degree on interpolated values. In fact, they create IQ data points for 41% of their sample countries. The specifics of their data interpolation will be discussed in the data section. Suffice it for now that L&V do not adjust their inferential statistics to reflect the fact that they do not have independent observations. Thus, not only are their estimates biased upward, but their p-values are biased downward.[1]

Endogeneity Bias

A second source of bias is endogeneity bias. Although L&V admit to the endogenous relationship between IQ and GDP, they do not model it as such. That is, they use a biased estimator—one biased in favor of their results—while their prose suggests they should have known better. L&V admit that the proper relationship between IQ and growth is endogenous, or that there is two-way causation between the two variables:

1 Since L&V use interpolated data, their observations are not independent of each other, so standard inference becomes misleading. An example in a much simpler context is the following. If one were to flip a fair coin 10 times, the probability that it lands on heads ten times is 0.50^{10}. But if one were to flip a coin once, and record its value 10 times, we would have a dataset of 10 observations, but we cannot make the same probabilistic claims as before, because the observations are not independent of each other.

> [we] did not and do not advance a one-way causal relationship from IQ to income. We proposed and continue to propose a reciprocal interaction relationship between IQ and national wealth such that national IQs are a determinant of wealth, while national wealth is a determinant of intelligence. (2006: 269)

Also,

> While we believe it is impossible to avoid the conclusion that genetic factors are partly responsible for the race differences in intelligence that underlie national differences, we also believe that the environmental factors contribute to the national differences in intelligence. (Lynn and Vanhanen 2006: 244)

Certainly the wealth of a country helps determine its social environment (ex: schooling, etc. ...).

Incidentally, the environmental impact on IQ is also recognized by Hanushek and Woessmann (2010) who, while acknowledging the possibility of IQ as an alternative but less effective measurement of cognitive skills, stress the impact of family, schools' institutional structures and quality of teaching on IQ level (p. 51). Such effects are downplayed in the statistics presented by L&V. We argue that the political and educational settings, not IQ, are key determinants of prosperity and economic growth.[2]

When they model the process whereby IQ determines incomes and growth rates, L&H resort to estimating separate bivariate regressions, of the form:

$$\mathrm{GDP} = \beta_0 + \beta_1 * \mathrm{IQ} + e$$

$$\mathrm{IQ} = \gamma_0 + \gamma_1 * \mathrm{GDP} + u$$

Despite their claims to the contrary, this does *not* model IQ and GDP as endogenously determined. In other words, running two independent sets of regression and showing that β_1 and γ_1 are positive and significant, does not model them as endogenous. It simply shows they are correlated. That is, although they claim that IQ is determined endogenously, they model it as exogenous. This implies that their analysis suffers from endogeneity bias.

The fact that IQ and GDP are endogenous—a point that L&V emphasize but do not model—actually advances our argument. The two variables, IQ

2 For a deeper understanding of the political and institutional effects on growth read: Barro (1991, 1997) on the size of government and growth; Mauro (1995), Knack and Keefer (1995) and Knack and Zak (2001) on corruption and investment; De Hann and Sturm (1999), Gwartney *et al*. (2005) and Lim and Decker (2007) on economic freedom and growth.

and GDP, are presumably positively correlated. Thus, when one estimates an equation like (1) above, independently of (2), then the estimate of β_1 is biased upward because it includes both the impact of IQ on GDP and the impact of GDP on itself via IQ. That is β_1 takes on some of the role of γ_1 (see, for example, Stock and Watson 2003). Thus, finding β_1 to be statistically insignificant despite the estimator being biased in favor of finding significance, gives us even more confidence in the fact that L&V's estimate of IQ is insignificant.

Omitted Variables Bias

IQ is essential insofar as it determines the potential human capital and output in a *ceteris paribus* setting. IQ alone is not the determinant of GDP. Rather, the environment—among which economic freedom, economy, and GDP—determines the actual output in a setting where the whole picture has to be taken into consideration. That is, L&V's analysis suffers from omitted-variables bias.

Specifically, we argue that L&V's conclusions are drawn from and based on *bivariate*—not multivariate—regressions that are rather limiting, and ultimately misleading. We will show how simply adding education to the list of regressors makes IQ insignificant, consequently highlighting the weakness of their method and econometrics. By applying a simple econometric change their thesis falls apart and we are able to debunk their claim.

The initial task which we set for ourselves was to model the endogenous determination of IQ and GDP (and growth) in order to expose the weakness in Lynn and Vanhanen's work. Along the way, we discovered that this was not even necessary. To reveal the punch line of the paper: When we include education as an independent variable, along with IQ, in regressions of GDP or GDP-growth, we found that L&V's IQ variable was insignificant.

The rest of the paper is structured as follows. We begin with a brief discussion of the data, its proprieties and its sources. This is followed by our statistical analysis. A concluding section summarizes the findings.

DATA

Data for this research were collected from standard sources: UNESCO, the Economic Freedom of the World annual reports, and the Penn World

Tables. IQ data were taken directly from L&V (2006). The specific sources and definitions of variables are discussed below.

Macroeconomic Data

Macroeconomic data were obtained from the Penn World Tables, Version 6.3 (Heston and Summers 2009). These include real per capita GDP (denoted as GDP in the regression tables), the government share of GDP (G/GDP), and the investment share of GDP (I/GDP). GDP data are reported in US dollars, with a base year of 2005. Government-share and investment-share data are percentages. Observations date from 2007 back to 1950 (for developed countries, and 1970 for all others), with 2005 as the base year. We calculate growth rates by the yearly difference of log(GDP); average growth rates were then computed as the sum of the yearly rates.

IQ Index

Intelligence is generally defined by the American Psychological Association as the global capacity to profit from experience and to go beyond given information about the environment.

The IQ indexes were obtained directly from L&V (2006). Lynn and Vanhanen examined the IQ level of 192 countries with populations over 40,000. The IQ indexes were computed examining test scores in mathematics, science, vocabulary, verbal comprehension, and mental, spatial, and perceptual abilities. A single value was calculated for each country examined. IQ numbers range from 59 to 108.

A common rule of thumb is that persons who score 70 or below were considered mentally retarded (DSM-IV-TR: 49). Lynn and Vanhanen, therefore contend that the average (repeat, the *average*) person in the 34 countries of Table 1 is retarded. (We recognize that this terminology is outdated and, frankly, offensive. We choose to use it in this case because it highlights the outdated, and frankly offensive nature of L&V's argument.) Lynn and Vanhanen seem to believe that the average, repeat average, person in Equatorial Guinea has an IQ of 59. According to L&V, by the standards of the DSM-IV-TR, the average Equatorial Guinean has ‘‘mild mental retardation’’ (DSM-IV-TR).

Table 1. Countries with Supposed Average IQs of Less Than 70

Country	IQ	Country	IQ
Angola	68	Guinea-Bissau	67
Burkina Faso	68	Haiti	67
Burundi	69	Lesotho	67
Cameroon	64	Liberia	67
Central African Republic	64	Malawi	69
Chad	68	Mali	69
Congo, Dem. Rep.	65	Mozambique	64
Congo, Rep. of	64	Niger	69
Cote d'Ivoire	69	Nigeria	69
Djibouti	68	Sao Tome and Principe	67
Dominica	67	Senegal	66
Equatorial Guinea	59	Sierra Leone	64
Eritrea	68	Somalia	68
Ethiopia	64	St. Kitts & Nevis	67
Gabon	64	St. Lucia	62
Gambia	66	Swaziland	68
Guinea	67	Zimbabwe	66

Source: Lynn and Vanhanen (2006).

Estimated IQ Indexes

Of the 192 countries in their sample, the IQ scores of 79 nations were interpolated from neighboring countries' indexes. That is, estimated data accounts for 41% of L&V's sample. The only clear pattern among estimated values is that countries with missing values have a population over 50,000 people. The methods used for the estimation are of two types. First, L&V derive the missing IQs from what they believe to be "the most appropriate neighboring countries" (2002: 72). In the case of more than one neighboring country, the authors average the measured IQs and assign the new value to the country with the missing data. Second, if a country with a missing IQ value is racially mixed, the authors estimate the missing value by weighting the IQs of each race by its relative percentages in the population.

A complication arising from L&V's racially and geographically interpolating missing IQ data, is that the data are not independent of each other. This implies that the inferential statistics that are reported by L&V are likely misleading: the p-values are biased downward, and the test-statistics biased upward. In other words, by neglecting to make adjustments for the fact that their observations are not independent of each other, L&V have relied on methods that are falsely inclined to indicate statistical significance.

Economic Freedom

The Economic Freedom Index is published by the Fraser Institute in their annual *Economic Freedom of the World* publication (Gwartney et al. 2009). Indexes from 1970 to 2000 are reported on a five-year basis, while indexes from 2001 to 2007 are reported yearly.

The Economic Freedom Index ranges from zero to 10, where 10 represents freer countries with less government intrusion. The overall degree of economic freedom was measured by analyzing five areas of interest: size of government; legal structure and protection of property rights; access to sound money; international exchange; and regulation. The five areas measure the country's dependence on personal choice, entrepreneurship, and markets. The latest dataset, the 2009 dataset, measures economic freedom for 137 countries through the year 2007.

Education

Education data for each country was retrieved from UNESCO. In previous research on economic growth, scholars measured "education" using several different metrics (ex: enrollment rates for primary school, secondary school, literacy rates). We considered education to be best represented by the net enrollment ratio for secondary school in each country analyzed. The UNESCO Institute for Statistics defines net enrollment rate to be the "enrollment of the official age group for a given level of education expressed as a percentage of the corresponding population" (UNESCO 2010). This choice is supported by Barro's (1996) observation that including primary education produces little difference in the results.

Mortality Rates

Lynn and Vanhanen argue that there are certain environmental factors that contribute to low IQ scores. These include poor nutrition for children during crucial developmental years. Data on neonatal mortality rates were retrieved from the World Health Organization (2009). The neonatal death rate is defined as the number of deaths during the first 28 days of life per 1,000 live births. Poor nutrition should more clearly be reflected in mortality rates, and therefore provide a useful cross-check to L&V's claims.

RESULTS

Our analysis proceeds in two sections. In the first section, we examine L&V's argument that IQ determines GDP (2002). In the second section, we turn to their argument that IQ determines GDP growth rates (2006). The econometrics has been made as simple and straightforward as possible. There are no econometric tricks here: we use OLS on cross-sections.

It has become increasingly common to exploit the richer information of panel data in either a random-effects or fixed-effects panel model. This, however, is not possible for us as the main variable of interest, IQ, is fixed across time for each country; it is not a panel variable. Panel-data models are usually estimated by taking first-differences, so that fixed-effects are eliminated. First differencing would eliminate all data on IQ since the IQ data do not vary across time, only countries. Put another way, panel-data models have dummy variables for each country (which they usually get rid of by taking first-differences). These dummy variables would be perfectly collinear with the IQ data. That is, IQ is unidentified using panel-data models. Faced with this complication, we take averages of our data and estimate models in cross-sections.[3] This actually makes our analysis much more in-line with earlier macro studies such as Barro's earlier work.

IQ and GDP

Results of OLS regressions of real per capita GDP on IQ and other covariates are reported in Tables 2 and 3. The two tables differ in the years over which they average. Table 2 uses country-wide averages for all available years; these usually range from 1950-2007 for developed countries, and 1970–2007 for developing countries. This difference between developed and developing

3 Given that we estimate regressions in cross-sections, the data are all averaged over time, so that linearly interpolating the missing economic freedom data, from when it was measured in 5-year intervals, would make no material difference to the averaged value and the resulting regression estimates.

Table 2. Determinants of Real Per-Capita GDP in a Cross-Section of Countries (all years). Dependant variable is the log of real per-capita GDP

	(1) lnGDP	(2) lnGDP	(3) lnGDP	(4) lnGDP	(5) lnGDP	(6) lnGDP	(7) lnGDP	(8) lnGDP
IQ	0.06***	0.05***	0.01**	0.01	0.00	0.00	0.00	−0.01
	(0.00)	(0.00)	(0.01)	(0.22)	(0.74)	(0.77)	(0.69)	(0.15)
Education					0.03***	0.03***	0.02***	0.02***
					(0.00)	(0.00)	(0.00)	(0.00)
G/GDP		−0.02***	−0.02***	−0.01		−0.02***	−0.02***	−0.01**
		(0.00)	(0.00)	(0.15)		(0.00)	(0.00)	(0.04)
I/GDP		0.02***	0	0.01		0	0	0.01
		(0.01)	(0.54)	(0.18)		(0.70)	(0.91)	(0.21)
Neonatal			−0.04***	−0.03***			−0.02***	−0.02***
mortality rate			(0.00)	(0.00)			(0.00)	(0.00)
Economic freedom				0.29***				0.29***
				(0.00)				(0.00)
Constant	3.85***	4.76***	8.32***	6.45***	6.4897***	6.99***	8.19***	6.82***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	184	184	180	135	147	147	146	107
R-squared	0.372	0.444	0.611	0.718	0.612	0.651	0.676	0.796

Notes: P-values are in parenthesis. * denotes significance at 10%; ** at 5%; and *** at 1%. All regressions were estimated using OLS on country-wide averages on data for all years in the dataset.

Table 3. Determinants of Real Per-Capita GDP in a Cross-Section of Countries (1999–2007). The dependant variable is the log of real per capita GDP

	(1) lnGDP	(2) lnGDP	(3) lnGDP	(4) lnGDP	(5) lnGDP	(6) lnGDP	(7) lnGDP	(8) lnGDP
IQ	0.07***	0.05***	0.03***	0.02***	0.01	0.01	0.00	−0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.44)	(0.44)	(0.95)	(0.33)
Education					0.03***	0.03***	0.03***	0.02***
					(0.00)	(0.00)	(0.00)	(0.00)
G/GDP		−0.03***	−0.03***	−0.03***		−0.03***	−0.02***	−0.02***
		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
I/GDP		0.02***	0.02***	0.02**		0.01***	0.01***	0.01**
		(0.00)	(0.00)	(0.04)		(0.01)	(0.01)	(0.04)
Neonatal death rate			0.02***	0.03***			0.01*	0.02***
			(0.00)	(0.00)			(0.05)	(0.00)
Economic Freedom				0.35***				0.32***
				(0.00)				(0.00)
Constant	3.20***	4.51***	4.88***	3.36***	6.26***	6.85***	6.97***	5.35***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	184	184	180	135	147	147	146	107
R-squared	0.41	0.53	0.57	0.77	0.63	0.69	0.70	0.83

Notes: P-values are in parenthesis. * denotes significance at 10%; ** at 5%; and *** at 1%. All regressions were estimated using OLS on country-wide averages for the years 1999–2007.

countries actually biases GDP estimates downward for developing countries, minimizes the difference in GDP between developed and developing countries, and consequently makes it more difficult to find statistical relationships between GDP and other variables. The fact that we do find significance makes this result all the more persuasive. Still, for those who are uncomfortable with the systematically different starting years for developing and developed countries, we offer Table 3 (and later Table 5). Table 3 uses only data for the recent past: 1999–2007. The results are consistent regardless of which sub-sample we use. Given the irrelevance of starting date and the redundancy between Tables 2 and 3, we will restrict our comments to Table 2.

All our regressions in Tables 2 and 3 include as independent variables the government and investment shares of GDP, as well as IQ. We always include the first two as they are considered standard variables in the econometric literature. We always include IQ because it is the focus of our study. The first regression regresses ln(real pcGDP) on these three variables. This is admittedly a simple model, however with only three independent variables it is the model most likely to attribute significance to IQ. Not surprisingly, all three variables are statistically significant and take on the expected signs: the governmental share of GDP has a negative effect on GDP; while countries with higher investment shares tend to be richer so the coefficient on I/GDP is positive; and agreeing with L&V, IQ seems to have a positive and significant impact on GDP.

In regressions 2 and 3, we add the neonatal death rate, as L&V had hypothesized that this variable would be correlated with GDP and would also have a positive correlation with IQ since IQ is determined in part by prenatal and childhood nutrition. Predictably, adding the neonatal death rate to the regressions, as we do in regressions 2 and 3 lowers the impact of IQ (since the two are negatively correlated). In regression 3 we also add the Economic Freedom Index to the variables in regression 2. Including this significant variable does not affect the role of IQ by much.

In regressions 4, 5, and 6, we repeat the earlier regressions, but we make sure to include Education as an independent variable. In all these regressions, we are confronted by an inescapable fact: including Education renders IQ statistically and economically insignificant. We therefore conclude that what matters most is a country's actual, not potential human capital: education matters, not supposed IQ.

IQ and Growth

In this section we investigate L&V's 2006 claim that IQ is a determinant of economic growth (2006). We follow the growth literature (and the previous

Table 4. The Determinants of Growth in a Cross-Section of Countries (all years). The dependant variable is the percentage change of real per capita GDP

	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth	(6) Growth	(7) Growth	(8) Growth	(9) Growth	(10) Growth
IQ	0.02***	0.04	0.03***	0.02***	0.01	0.01	0.007	0.01	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.08)	(0.47)	(0.26)	(0.25)	(0.82)	(0.86)
Education						0.01***	0.021***	0.02***	0.02***	0.01***
						(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
ln(initial real pcGDP)		−0.30***	−0.33***	−0.34***	−0.47***		−0.494***	−0.50***	−0.50***	−0.58***
		(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
G/GDP			−0.02***	−0.02***	−0.01**			−0.02***	−0.02***	−0.01***
			(0.00)	(0.00)	(0.04)			(0.00)	(0.00)	(0.01)
I/GDP			0.02***	0.02***	0.02***			0.01**	0.01**	0.01**
			(0.00)	(0.00)	(0.00)			(0.02)	(0.03)	(0.01)
Neonatal death rate				0.02***	0.02***				0.01*	0.02***
				(0.00)	(0.00)				(0.07)	0.00
Economic freedom					0.29***					0.28***
					(0.00)					(0.00)
Constant	−1.10***	0.00	0.92**	1.34***	0.79*	−0.166	2.957***	3.42***	3.55***	2.38***
	(0.001)	(1.00)	(0.045)	(0.004)	(0.057)	(0.749)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	192	184	184	180	135	150	147	147	146	107
R-squared	0.113	0.260	0.365	0.381	0.623	0.139	0.393	0.476	0.482	0.68

Notes: P-values are in parenthesis. * denotes significance at 10%; ** at 5%; and *** at 1%. All regressions were estimated using OLS on country-wide averages on data for all years in the dataset.

Table 5. The Determinants of Growth in a Cross-Section of Countries (1999–2007). The dependant variable is the percentage change of real per capita GDP

	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth	(6) Growth	(7) Growth	(8) Growth	(9) Growth	(10) Growth
IQ	0.004**	0.006***	0.01***	0.01***	0.01***	0.00	0.00	0.00	0.00	0.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.84)	(0.55)	(0.55)	(0.37)	(0.75)
Education						0.00	0.003**	0.00**	0.00***	0.01***
						(0.22)	(0.02)	(0.02)	(0.01)	(0.00)
In(initial real pcGDP)		−0.02	−0.02	−0.01	−0.07**		−0.07**	−0.08***	−0.08**	−0.17***
		(0.34)	(0.27)	(0.58)	(0.05)		(0.02)	(0.01)	(0.02)	(0.00)
G/GDP			0.00	0.00	0.01***			0.00	0.00	0.00
			(0.60)	(0.59)	(0.01)			(0.15)	(0.16)	(0.20)
I/GDP			0.00	0.00	0.00			0.00	0.00	0.00
			(0.74)	(0.76)	(0.72)			(0.90)	(0.93)	(0.83)
Neonatal death rate				0.00	0.00				0.00	0.00
				(0.21)	(0.69)				(0.15)	(0.58)
Economic freedom					0.05*					0.08**
					(0.10)					(0.02)
Constant	−0.09	−0.08	−0.02	−0.11	−0.46*	0.12	0.51**	0.69**	0.64**	0.6
	(0.51)	(0.59)	(0.89)	(0.56)	(0.05)	(0.51)	(0.05)	(0.02)	(0.03)	(0.10)
Observations		184	184	180	135	150	147	147	146	107
R-squared		0.052	0.054	0.061	0.204	0.028	0.065	0.079	0.093	0.269

Notes: P-values are in parenthesis. * denotes significance at 10%; ** at 5%; and *** at 1%. All regressions were estimated using OLS on country-wide averages for the years 1999–2007.

section) and use country-averages of our data, and run regressions of average growth rates on various factors. The set of factors often varies with each paper, but there are some regular variables which are fairly standard in the growth literature. For example, an implication of neoclassical growth models such as Solow's (1956) model is for poor countries to exhibit faster growth. This is commonly known as "convergence" or "conditional convergence" and is broadly supported. To incorporate this, we include the country's initial per-capita real GDP as an independent variable. We also always include G/GDP and I/GDP as it is a common result in the growth literature that government expenditure has a negative effect on growth rates, while investment has a positive effect.

As before, we present our results in two tables, Tables 4 and 5, which differ according to whether the full dataset was used in creating country-averages, or whether we restrict our attention to the years 1999-2007. As before, the results are consistent across sub-samples, so we restrict our attention to Table 4.

As we did in Tables 2 and 3, columns 1–5 represent regressions where IQ is included, but Education is not. As before, and as would be expected, countries with higher IQs have higher growth rates. When one adds Education in columns 6–10, IQ becomes statistically insignificant and economically meaningless. Across all specifications, we find that countries with lower initial incomes have higher rates of growth (that is, we find convergence). Also, countries with smaller governments and higher investment rates have higher growth.

More importantly for this paper, we find that every additional percentage increase in the enrollment in secondary school increases the growth rate by between one and two percent. Having controlled for education, IQ is not found to be significant.

CONCLUSION

Lynn and Vanhanen (2002, 2006) have proposed a controversial but straightforward thesis: the wealth of a country is determined by the IQ of its inhabitants. Our purpose was to investigate the validity of their dismal claim by analyzing their econometrics. We found that their study was deficient on several grounds. First, it relied upon crass estimates of IQ which introduce error-in-variables bias. Second, they did not account for the endogeneity of the relationship between IQ and GDP, thereby introducing endogeneity bias. And third, they relied on bivariate rather than multivariate regressions, thereby introducing omitted-variables bias. Despite the biases which stack the econometric deck in favor of their thesis, we found that their results did not withstand the inclusion of just one common variable: education. In short, we were unable to replicate their findings, and this limits the overall strength and applicability of L&V's thesis. The positive finding of this study is that education is far more important to a country's level of income and growth than IQ. IQ has a significant genetic component that cannot be changed. Fortunately, its effect is insignificant, and can be overcome if a country commits to increasing its level of education.

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