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#### 4 Abstract

5 This paper uses cross country regression analysis to try to explain the variation in cross  
6 country cross country intelligence within the framework of an intelligence production function  
7 model. It proposes that average country intelligence is positively related to food security,  
8 healthy security, and education, but negatively related to income inequality. The empirical  
9 findings of the paper tend to provide statistical verification for each of these  
10 contentions. Intellectual ability is critical not just for the operation of modern technologically  
11 sophisticated economy, but is also essential for rapid economic advancement through  
12 innovation, creativity, the development of new and improved products, and the introduction of  
13 new means of production. Intellectual ability, as measured by average country IQ scores,  
14 varies substantially across countries. This paper assumes that the level of intelligence is a  
15 product of a society that can be changed through appropriate changes in environmental,  
16 institutional, and cultural conditions. If this is the case, then it is a potentially highly  
17 profitable to understand the intelligence production process, to identify important variables in  
18 intelligence production function, in society. If the variables can be identified, then policy can  
19 be designed to promote favorable factors and to downplay unfavorable ones so as to enhance  
20 average societal intelligence.

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22 **Index terms**— country intelligence is positively related to food security, healthy security, and education, but  
23 negatively related to income inequality.

24 The Potential Consequences of Food Securiy, Health Security, Income Inequality, and Eduation for the Average  
25 Level of National Intelligence William R Dipietro

26 Abstract-This paper uses cross country regression analysis to try to explain the variation in cross country  
27 cross country intelligence within the framework of an intelligence production function model. It proposes that  
28 average country intelligence is positively related to food security, healthy security, and education, but negatively  
29 related to income inequality. The empirical findings of the paper tend to provide statistical verification for each of  
30 these contentions. Intellectual ability is critical not just for the operation of modern technologically sophisticated  
31 economy, but is also essential for rapid economic advancement through innovation, creativity, the development of  
32 new and improved products, and the introduction of new means of production. Intellectual ability, as measured by  
33 average country IQ scores, varies substantially across countries. As a consequence, countries with lower average  
34 level of intelligence are at a distinct disadvantage with regard to economic growth and development relative to  
35 other countries. This paper assumes that the level of intelligence is a product of a society that can be changed  
36 through appropriate changes in environmental, institutional, and cultural conditions. If this is the case, then it is  
37 a potentially highly profitable to understand the intelligence production process, to identify important variables  
38 in intelligence production function, in society. If the variables can be identified, then policy can be designed to  
39 promote favorable factors and to downplay unfavorable ones so as to enhance average societal intelligence.

40 The central hypothesis of the paper is that conditions, some of which if made known could actually be subject  
41 to conscious policy control, matter, are critical, for the development of the modern intelligence of the people of a  
42 country. Four potential environmentally conditioning variables are considered and are empirically investigated for  
43 possible influence on the production of national intelligence. They are food security, health security, education,  
44 and income inequality.

45 The paper is divided into five sections. The first section reviews a little of the recent literature that focuses  
46 on the reasons and the consequences of the disparity in average IQ across countries. The second section provides  
47 a simple production function style model that essentially considers country intelligence as a product, implicitly

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48 implying that average country IQ depends on favorable conditions for intelligent development in a country,  
49 and on the lessening of conditions that are unfavorable for developing intelligence in a country. The third section  
50 reviews the variables that will be used in the regression analysis and identifies their sources.

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52 The fourth section presents the results of cross country regressions on IQ within the general framework of the  
53 simple model. Finally, the fifth section rounds off the article with a few concluding remarks.

54 I. Some Recent Background Literature ot surprisingly, quantitatively, IQ appears to matter for economic growth.  
55 Using average growth rates for the period 1965-1990 and for the period 1970-1995, Weede and Kampf's cross  
56 country regressions show that average country IQ is important for economic growth, both statistically and in  
57 terms of its overall impact, when controlling for common growth determining variables such as the level of  
58 economic development, the level of investment, literacy, freedom, and the improvement in freedom (Weede and  
59 Kampf 2002). They speculate in their conclusion that there might be a positive virtuous circle between economic  
60 growth and IQ, with higher IQ leading to greater economic growth, and greater economic growth, in turn, through  
61 improved nutrition, leading to higher average country IQ.

62 Meisenberg and Lynn look at the relationship between cognitive ability, as measured alternatively by IQ, school  
63 achievement, and a composite of IQ and school achievement, on a whole host of variables (Meisenberg and Lynn  
64 2011). Their cross country regressions, which adjust for schooling and other variables, indicate that cognitive  
65 ability has a positive effect on economic growth, freedom, democracy, suicide, life expectancy, and fertility, but  
66 a negative effect on corruption, income inequality, and religiosity.

67 Di Pietro uses income inequality as an explanatory variable for explaining differences in cognitive abilities  
68 across countries (Di Pietro 2006). He finds a negative and significant relationship between IQ and Income  
69 inequality in his regressions.

70 Jamieson maintains that although favorable conditions allow a population to function more effectively and  
71 to attain a position closer to its maximum potential level of intelligence that potential intelligence itself is  
72 genetically determined and varies between groups of individuals (Jamieson 2003). He also feels that some societal  
73 organizations are more conducive to selection of greater intelligence than others, and believes that past natural  
74 selection has led to greater intelligence for groups that have been subject to more challenging environments. He  
75 expresses concern over the potential negative impact on future intelligence from, in his view, the current harmful  
76 artificial selection in western culture, in which the less successful members of the population have more children  
77 than the more successful.

78 Meisenberg notes that IQ is highly correlated with race, latitude (higher latitudes being associated with higher  
79 intelligence) and GDP per capita (Meisenberg 2003). He proposes that the Flynn effect, the large increase in  
80 intelligence over the last century in many countries, can be attributed to the positive feedback interaction between  
81 IQ and the standard of living, with higher IQ leading to an increase in the standard of living and a rise in the  
82 standard of living causing an increase in IQ.

83 Eppig, Fincher and Thornhill put forth a parasite stress hypothesis (Eppig, Fincher and Thornhill 2010). It  
84 essentially states that the need to fight off infectious diseases is detrimental to development of cognitive ability  
85 because the need to fight off infection from parasitic diseases uses body energy and resources that could otherwise  
86 be used for brain development. To test their theory, they look at the impact of the intensity of infectious diseases  
87 on cognitive ability across countries around the world and between countries within six major regions of the world,  
88 when controlling, in their regressions, for GDP per capita, education, temperature, and distance from Africa.  
89 They find evidence that infectious diseases have a negative effect on IQ for the world as a whole and for five of the  
90 six regions they consider, and that the intensity of infectious diseases is a strong predictor of intelligence thereby  
91 giving support to the parasitic stress hypothesis. In another more recent study, looking across U.S. States instead  
92 of across countries, they obtain similar results for the importance of parasitic infectious diseases on intelligence,  
93 and for the validity of the parasite stress hypothesis (Eppig, Fincher and Thornhill 2011).

94 Weiss theorizes that progress is not linear, but cyclical, and that both progress and the form of government  
95 depend critically on population characteristics such as population density and population quality (Weiss 2007).  
96 He believes that, whereas before we were in the ascendant phase of the cycle in which higher income people,  
97 people with greater intellectual ability, have a greater number of children than lower income people, thereby  
98 leading to increased average intelligence and a consequent positive feedback effect on economic growth, that, just  
99 when humans are overcrowding the planet and human civilization is in the greatest need for cognitive capacity,  
100 we are now in a dysgenic downward phase in which higher income people have few children, while lower income  
101 groups have many children with a resultant decrease in average intelligence. He can see no political solution to  
102 this human population quality problem but foresees the eventual collapse of human civilization into chaos. In his  
103 view, greater population density leads to more democratic and equalitarian values that prevent any policies, or  
104 even the consideration of policies, that are designed to change the distribution of births in a direction favorable  
105 for intelligence.

106 Barber focuses on the environmental variable education as a determinant of differences in IQ scores between  
107 countries (Barber 2005). In his regressions, he uses birth weight, illiteracy, infant mortality, geographic location,  
108 and GNP as control variables. The regressions show that IQ is positively related to education, but negatively  
109 related to illiteracy and the proportion of workers in agriculture.

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## 110 1 II.

## 111 2 The Production Function Style Model

112 The model between the average level of intelligence of society and key experiential variables in the intelligence  
113 production function consists of single equation with associated partial derivatives. The model's equation is as  
114 follows.  $I = f(F, H, E, Q)$   $\partial I / \partial F > 0$ ,  $\partial I / \partial H > 0$ ,  $\partial I / \partial E > 0$ ,  $\partial I / \partial Q < 0$  In the model equation,  $I$  stands for the  
115 country's average level of intelligence,  $F$  for food security,  $H$  for health security,  $E$  for the average amount of  
116 education, and  $Q$  for the degree of income inequality.

117 A country's average intelligence is expected to be positively related to food security, health security, and the  
118 average amount of education, and negatively related to income inequality.

119 Without proper nutrition for children, and children are likely to be the first to suffer in the absence of food  
120 security, proper child brain development runs a high risk of being impaired or retarded. In addition, the brains  
121 of adults lacking food do not function to capacity, even if their brains are fully developed and lacking any ill  
122 consequences from childhood.

123 For similar reasons, it is anticipated that average intelligence will be positively related to health security. Just  
124 like the absence of food security, bad health retards child mental development, and, just like the lack of food  
125 security, poor health dampens adult physical and mental performance and effectiveness.

126 The third variable, income inequality, is expected to have a negative effect on national

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128 Volume XIV Issue II Version I ( ) B intelligence. Over and above its potential negative effects on the first  
129 two variables, food security and health security, greater income inequality reduces national intelligence for other  
130 reasons. Child mental development depends on parents providing a rich intellectual environment for their children,  
131 and on parents devoting large amounts of time and resources to child development. With greater inequality in  
132 society, fewer and fewer parents are in a position to be able to do this. Greater inequality also diminishes  
133 opportunity for those who are not at pinnacle of society. In the face of reduced opportunity, those at the lower  
134 end of the income distribution do not try to develop socially useful IQ intelligence which provides little or no  
135 future, but rather street smarts that are favorable for survival.

136 Finally, education is viewed as major institutional means to develop intelligence. Just being able to read, mere  
137 literacy, opens up worlds and gives potential access to a wide variety of new perspectives. If nothing else, formal  
138 education at least provides a block of time specifically devoted to mental development.

## 139 4 III. The Variables that are used in the Regression Analysis, 140 Description, and Sources

141 The gauge of average national modern intelligence is the estimated national 2006 average IQ index score from  
142 Richard Lynn and Tatu Vanhanen's book entitled IQ and Global Inequality (Lynn and Vanhanen 2006). Their IQ  
143 index is standardized by setting the U.K. equal to a hundred, is available for one hundred and ninety countries,  
144 and varies from a low value of 59 to a high value of 108.

145 The measure of food security and the measure of health security are, respectively, the food security index and  
146 the health security index from the 2010 Human Security Index data set (Human Security Index 2010). For the  
147 available countries, the food security index ranges from zero to .960 and the health security index from .157 to  
148 .905.

149 Income inequality is the average Gini coefficient for the years 1990 through 2007. The average is calculated  
150 from the annual Gini coefficient numbers of the World Bank (World Bank 2011). In some cases the country  
151 average may be based on one or two years because of missing data. The potential range of the average Gini  
152 coefficient is between zero and a hundred with higher values indicating greater income inequality.

153 The amount of education is captured by using the average number of years of education received by people  
154 aging twenty-five years and older for the year 2010. The education data is taken from the United Nations (United  
155 Nations 2013).

## 156 5 IV. The Cross Country iq Regressions

157 Table ?? shows the cross country regressions of IQ on the four explanatory variables. The table is set up with  
158 the first column listing the explanatory variables. The second through the eighth columns show the results  
159 of a separate regression runs with the regressions numbered in the first row. If a variable enters an equation,  
160 then the top value corresponding to the row of the variable and the column of the equation that it enters is the  
161 estimated coefficient for that variable. Underneath its estimated coefficient is its individual t-statistic. A variable  
162 significant at the one percent level of significance or better in an equation is marked by a single asterisk under  
163 its individual t-statistic, while those that are to last row shows the R squared values, the last row reports the  
164 number of countries entering an equation.

165 The table consists of seven equations. The first four equations are the regressions of average country IQ  
166 separately on each one of the four different explanatory variables. The remaining equations show the results when

## 6 CONCLUSION

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167 the explanatory variables are used together in assorted combinations. The fifth regression equation employs food  
168 security and health security as the two independent variables. The sixth equation adds income inequality, and  
169 the seventh equation uses all four explanatory variables.

170 The results lend strong support for the notion that national intelligence is a produced phenomenon, and that  
171 differences in average intelligence between nations can be ascribed to dissimilarity in intellectual developmental  
172 conditions between nations. In every one of the seven equations in the table, the estimated coefficients on the  
173 variables have their theoretically expected signs, positive signs for food security, health security, and the average  
174 amount of education, and a negative sign for income inequality.

175 Looking at the individual t-statistics for the variables reveals that all the variables are consistently highly  
176 statistically significant. Except for average schooling in equation seven (in which it is significant at the five  
177 percent level or significance or better), each and every one of the variables is significant at the one percent level  
178 of significance or better in every equation in which they appear.

179 The r-squared values, especially for a cross section, are quite good. On its own health security accounts for  
180 over fifty six percent of the total variation in average IQ scores across nations, and, when used in combination  
181 with food security, the two variables together account for over fifty eight percent of the variation. Looking at  
182 equation seven shows that the four variables as a group account for almost eighty percent of the variation in IQ  
183 scores across countries.

184 V.

## 185 6 Conclusion

186 Given intelligence is so important for economic progress and is becoming even more essential with the passage of  
187 time, countries need to focus on the ingredients in the making of national intelligence so as to be able to conduct  
188 informed, intelligent, and effective policy to upgrade national intelligence. The empirical results suggest that if  
189 a country wants to produce a high level of average intelligence in its population, with all its consequent positive  
190 effects on economic growth and development, then it must be sure to design, implement, and maintain policies  
191 that assure food and health security for its population, that provide decent education for all, and that keeps  
192 income inequality within bounds.

193 Food and health security are critical for the optimal intellectual development of youth and for effective  
194 functioning and performance of adults.

195 Education provides the space and the time for children to expand their minds and to improve their mental  
196 abilities. On the other hand, extremely high levels of inequality is likely to reduce the actual opportunities and  
197 the perceived chances of advancement for all but the elite, thereby dampening incentives and motivation for the  
general population, leading to reduced investment in human capital in themselves and in their children.<sup>1</sup>

## 1

198 Inequaltiy, And Average Years Of Eduation  
(1)

Figure 1: Table 1 :

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199 [Lynn and Vanhanen (2006)] *Atlanta: Washington Summit Publishers. The IQ data is downloaded from the*  
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