INTELLIGENCE

A Unifying Construct for the Social Sciences

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Published 2012 by
Ulster Institute for Social Research
London NW10 5TH, UK

ISBN 978-0-9568811-9-9

Printed in Great Britain

So it is that the gods do not give all men the gifts of race…neither good looks nor intelligence nor eloquence.

Odysseus, speech to the suitors of Penelope

from Homer’s *Odyssey*.

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Introduction

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The physical sciences are unified by a few common theoretical constructs, such as mass, energy, pressure, atoms, molecules and momentum, that are defined and measured in the same ways and explain a wide range of phenomena in physics, astrophysics, chemistry and biochemistry. This has been beneficial for the development of the physical sciences, because it has allowed the transfer of concepts from one field to others. It has allowed interface subjects like chemical physics and biochemistry to develop their own insights and concepts on the basis of those already developed in their parent fields. Physics is the most basic of the natural sciences, because the phenomena of the others can be explained by the laws of physics. For this reason, physics has been called the queen of the physical sciences.

Hitherto, the social sciences have lacked common unifying constructs of this kind. The disciplines of the social sciences, comprising psychology, economics, political science, demography, sociology, criminology, anthropology and epidemiology are largely isolated from one another, each with their own vocabulary and theoretical constructs.

Psychology can be considered the most basic of the social sciences because it is concerned with differences between individuals, while the other social sciences are principally concerned with differences between groups such as socio-economic classes, ethnic and racial populations, regions within countries, and nations. These groups are aggregates of individuals, so the laws that have been established in psychology should be applicable to the group phenomena that are the concern of the other social sciences.

Our objective in this book is to develop the case that the psychological construct of intelligence can be a unifying explanatory construct for the social sciences. Intelligence is measured by the intelligence test that was constructed by Alfred Binet in 1905. During the succeeding century it has been shown that intelligence, measured as the IQ (the intelligence quotient), is a determinant of many important social phenomena, including educational attainment, earnings, socio-economic status, crime and health. Our theme is that the explanatory value of intelligence that has been established for individuals can be extended to the explanation of the differences between groups, that have been found in the other social sciences, and in particular to the explanation of the differences between nations. Thus, we propose that psychology is potentially the queen of the social sciences, analogous to the position of physics as the queen of the physical sciences.

1. Compartmentalization of the Social Sciences

Although the contribution of intelligence to the understanding of many social phenomena has been known for several decades, such is the compartmentalization of the social sciences that this has rarely been recognized. Thus, in sociology, James Coleman's *Foundations of Social Theory* (1990) has been described as "the most important book in social theory in a long time" by the Nobel prize- winning economist Gary Becker, yet in its 950 pages no mention is made of intelligence. In criminology, the significance of low intelligence as a factor in crime has been largely ignored. Wilson and Herrnstein (1985, p.155) observed a quarter of a century ago "Despite over forty years of confirmation, the correlation between intelligence and crime has yet to penetrate most of the textbooks or the conventional wisdom of criminology". Nothing had changed in the 1,246 page *Oxford Handbook of Criminology* that contains no mention of intelligence (Maguire, Morgan and Reiner, 1994). In epidemiology, numerous studies have shown socio-economic correlates of health such as mortality, obesity, accidents, lung cancer and stroke, but there has been virtually no recognition that much of these can be explained by intelligence until the recent work by a group of psychologists led by Ian Deary (Deary, Whalley and Starr, 2009).

In economics, it is accepted that earnings are significantly determined by *human capital*, a concept that can be defined as "the stock of knowledge and skills that enable people to perform work and produce economic value" (Stroebe, 2010, p. 661). Sometimes this construct includes cognitive ability, but very rarely is any mention made of intelligence. Still less is there any recognition in economics that differences in intelligence might contribute to national differences in economic development. For instance, Douglas North (2005), an economics Nobel prize winner, discusses the factors responsible for economic development and argues that the most important is "adaptive efficiency", defined as "a society's effectiveness in creating institutions that are productive, stable, fair and broadly accepted" but he does not consider the possibility that the intelligence of the population might determine its ability to create these institutions. Occasionally this possibility has been raised by economists but rejected. For example, in a keynote lecture with the title *Why isn't the whole world developed?* given in the 1981 conference of the American Economic History Association, Richard Easterlin stated that "I think we can safely dismiss the view that the failure of modern technological knowledge to spread rapidly was due to significant differences in the native intelligence of their populations. To my knowledge there are no studies that definitively establish differences in, say, basic IQ among the peoples of the world" (1981, p. 5). More recently, the same assertion was made by the economists Erik Hanushek and Dennis Kimbo, who wrote "We assume that the international level of average ability of students does not vary across countries" (Hanushek and Kimbo, 2000, p. 1191).

Furthermore, the occasional attempts that have been to show that intelligence can explain social phenomena have encountered huge resistance from social scientists. This was most strikingly shown in the responses to Richard Herrnstein and Charles Murray's *The Bell Curve*, in which they showed that low intelligence is an important determinant of the social problems of the underclass, consisting of high rates of unemployment, welfare dependency, and teenage motherhood. Whole books appeared attempting to refute this indisputable analysis, such as *The Bell Curve Wars* (Fraser, 1995), *Inequality by Design* (Fischer, Hout and Jankowski, 1996), and *Intelligence, Genes and Success* (Devlin, Fienberg, Resnick and Roeder, 1997).

2. National Intelligence and Economic Development

Ten years ago we began our research program for the investigation of how far differences in intelligence can explain the differences in economic development between nations in our book *IQ and the Wealth of Nations* (2002). Our starting point was that it has been established that intelligence is a determinant of earnings among individuals, and hence that this association should also be present across nations. We searched for studies throughout the world in which intelligence tests had been administered, and found useable data for 81 nations. We calculated the results by setting the IQ in Britain at 100 (standard deviation =15) and the

IQs of other nations were expressed on this metric. The results showed that there are huge differences in the average IQs of nations, ranging from approximately 70 in sub-Saharan Africa, to approximately 100 in most of Europe and the countries colonized by Europeans in the last few centuries (the United States, Canada, Australia, New Zealand, Argentina, Chile and Uruguay), to approximately 110 in China, Japan, Korea, Singapore and Taiwan. We then showed that national IQs were correlated with per capita income (measured as real GDP, gross national product, per capita) at 0.73 (Lynn and Vanhanen, 2002, p. 89). This showed that 53 per cent of the variance in per capita in this group of nations is attributable to differences in intelligence. We then used the measured IQ of the 81 nations to estimate the IQs for a further 104 nations that were ethnically similar to those for which we had measured IQs. For example, we assumed that the IQ in Luxembourg would be the same as in the Netherlands and Belgium. This gave us IQs for all 185 nations in the world with populations over 50,000. We showed that for these 185 nations, IQs were correlated with per capita income (measured as real Gross Domestic Product, per capita) at 0.62. This is lower than the correlation for 81 nations, probably because there was some error in the estimated IQs. Nevertheless, the correlation is highly significant and shows that 38 per cent of the variance in per capita income in the nations of the world is attributable to differences in intelligence. To establish the validity of these national IQs, we showed that they are correlated at 0.88 with national scores on tests of mathematics and at 0.87 with national scores on tests of science.

In 2006 we published further evidence for this theory in our book *JQ and Global Inequality.* In this we presented measured IQs for an additional 32 nations, bringing the total number of nations for which we had measured IQs to 113. We showed that these were correlated with per capita income (measured as real GNI, gross national income) at 0.68 (Lynn and Vanhanen, 2006, p. 102). Following the method in our first study, we used the measured IQ of the 113 nations to estimate the IQs for an additional 79 nations that were ethnically similar to those for which we had measured IQs. This gave us a total of 192 nations, comprising all the nations in the world with populations over 40,000. We found a correlation of0.68 between national IQ and per capita income in the 113 nations for which they had measured IQs, and a correlation of0.60 between national IQ and per capita income in the 192 nations. Once again, the correlation for the 113 nations' measured IQs is a little higher than for the larger 192 nation data set, and probably for the same reason that measured national IQs are more valid than estimated national IQs.

In our 2006 book we extended the analysis beyond economic development and showed that national IQs explain substantial percentages of the variance in national differences a number of other phenomena including literacy, life expectancy, and the presence of democratic institutions.

3. Criticisms of National IQs

We did not expect that our work would be immediately accepted and so it proved. Some of the reactions to it have been well summarized by Juri Allik, professor of psychology at the University of Tartu:

> By analogy with many previous controversial discoveries, it is predictable that the first most typical reaction would be denial. Many critics are not able to tolerate the idea that the mean level of intelligence could systematically vary across countries and world regions. Neither are they ready to accept that from the distribution of mental resources it is possible to predict the wealth of nations. The next predictable phase is acceptance of the facts but denying their interpretation. The simplest strategy is to interpret the results as measurement error. A useful strategy is to discover a few small mistakes declaring that all the results are equally suspicious (2008, p. 707).

As Juri Allik predicted, a number of critics have rejected our work. Susan Barnett and Wendy Williams (2004) have asserted that our national IQs are "virtually meaningless", and Hunt and Sternberg (2006, pp. 133, 136) have described them as "technically inadequate... and meaningless". Others have criticised our national IQs as "highly deficient" (Volken, 2003, p. 411), and similar criticisms have been made by Astrid Ervik (2003, pp. 405-6), who asked "are people in rich countries smarter than those in poorer countries?" and concluded that "the authors fail to present convincing evidence and appear to jump to conclusions", and by Thomas Nechyba (2004, p. 1178) has written of the "relatively weak statistical evidence and dubious presumptions".

The answer to these criticisms is that our national IQs are highly correlated with national scores in tests of mathematics and science, as shown in detail in Chapter 3, as well as with a number of other economic and social variables, as documented throughout this book. If our IQs were meaningless, they would not be highly correlated with a wide range of economic and social phenomena.

4. A Progressive Research Program

Despite these criticisms, a number of social scientists have regarded our national IQs positively. Erich Weede and Sebastian Kampf (2002) have written that "there is one clear and robust result: average IQ does promote growth". Edward Miller (2002) wrote that "the theory helps significantly to explain why some countries are rich and some poor". Michael Palairet (2004) has written that "Lynn and Vanhanen have launched a powerful challenge to economic historians and development economists who prefer not to use IQ as an analytical input". Even Earl Hunt, who initially rejected our national IQs as meaningless, has more recently concluded that "in spite of the weaknesses in several of their data points Lynn and Vanhanen's empirical conclusion was correct" (Hunt and Wittmann, 2008).

More generally, a number of scholars have welcomed our work on national IQs as opening up a new field in the social sciences. Our work has been described by Rindermann and Ceci (2009, p. 551) as

> a new development in the study of cognitive ability: following a century of conceptual and psychometric development in which individual and group (socioeconomic, age, and ethnic) differences were examined, researchers have turned their attention to national and international differences in cognitive competence. The goal is to use cognitive differences to understand and predict national differences in a variety of outcomes: societal development, rate of democratization, population health, productivity, gross domestic product (GDP), and wage inequality.

A number of social scientists who have taken this positive view of our work have advanced this research program by showing that national IQs are significantly and substantially correlated with and contribute to the explanation of a wide range of economic, sociological, demographic and epidemiological phenomena. In the present book we develop this research program further by giving revised and updated measured IQs for 161 nations and territories, comprising all the major nations in the world. We give estimated IQs for an additional 41 smaller nations and territories, giving IQs for all 200 nations and territories in the world with populations over 40,000. These IQ data are given in Chapter 2. In each of the subsequent chapters we begin by summarizing studies of intelligence as a predictor of social phenomena among individuals; we then review studies showing that intelligence also predicts differences in these social phenomena across nations, and finally we present new data and analyses of the explanatory power of intelligence for the understanding of national differences.

Chapter 2

The Measurement of the Intelligence of Nations

1. National IQs Measured by Intelligence Tests. 2. National IQs Measured by Tests of Mathematics, Science, and Reading Comprehension. 3. Calculation of Final IQs. 4. Reliability of National IQs. 5. Validity of National IQs.

1. National IQs Measured by Intelligence Tests

The national IQs that are the basis of our study have been updated by Meisenberg (2012) and are presented in the right hand column of Table 2.1 headed Final IQs. These IQs have been calculated from two sources. The first is from the administration of tests of intelligence and the second from administration of tests of mathematics, science, and reading literacy (comprehension obtained by school students in international assessments, which we adopt as alternative measures of intelligence. The justification for this is given below in Section 2. We regard national IQs as measures of general intelligence defined as the totality of cognitive abilities. These include Spearman's g (the general factor present in all cognitive tasks), and other cognitive abilities that are independent of g. Thus, we do not regard national IQs as necessarily measures of Spearman's g, although some authorities such as Jensen (1998) consider that tests like the Progressive

Matrices, from which many of the studies and national IQs are derived, are excellent measures of g.

The complete list of several hundred studies of national IQ is given in Appendix 1. These have been calculated in relation to a British mean of 100 and standard deviation of 15. IQs have been increasing in all economically developed countries for which information is available from 1918 up to around the year 2000 and also in at least some of the less developed countries including Brazil, Sudan and Dominica (Colom, Flores-Mendoza and Abad, 2006; Khaleefa, Sulman and Lynn, 2009; Meisenberg, Lawless, Lambert and Newton, 2006). These increases have become known as the Flynn effect. We have dealt with this by adjusting national IQs for the year in which they were obtained. The adjustments made for these secular increases in IQ are 3 IQ points per decade calculated for the United States by Flynn (1984) for all tests except the Progressive Matrices, for which they are 2 IQ points per decade reported for Britain for the years 1938-1979 calculated by Lynn and Hampson (1986) and for the years 1979-2008 for children up to the age of 13 years, but not for those older than this, calculated by Lynn (2009). For example, if a study carried out in 1969 with the Progressive Matrices gives a country a British IQ of 90 on the 1979 British standardization, 2 IQ points are added because the British IQ in 1969 was 2 IQ points lower than 1979.

The national IQs given in Table 2.1 are derived from these and give a single IQ for each country and are entered in the second column of Table 2.1. For countries for which there are two studies, the mean of the two is given. For countries for which there are three or more studies, the median is given. The third column gives estimates of the quality of the IQ scores calculated from the number of independent studies available for each country and the total sample size in all the studies combined. The following scores were given for total sample size:

1 <200
2 200-500

3 500-999
4 1000-1999
5 2000-4999
6 5000-9999
7 >10,000

The data are not all of equal quality. To adjust for this, IQ quality scores were calculated by adding this score to the number of independent IQ studies available for the country, with the maximum capped at 25.

2. National IQs Measured by Tests of Mathematics, Science and Reading Comprehension

National IQs have also been calculated from tests of mathematics, science and reading literacy obtained by 13 to 15 year old school students in international assessments known as the TIMSS (The International Math and Science Studies) and the PISA (Program for International Student Assessment) studies. We adopt these as measures of intelligence on a number of grounds. First, IQ and school achievement are closely related. At the individual level within countries, correlations between IQ tests and school achievement tests are typically between 0.5 and 0.8 (Jencks, 1972; Jensen, 1998; Deary, Strand, Smith and Fernandes, 2006). This shows that the two types of test appear to measure identical or closely related constructs identifiable as intelligence.

Second, reading literacy is defined in the PISA studies as "An individual's capacity to understand, use and reflect on written texts". The definitive text on the factors comprising intelligence is Carroll (1993), who lists this ability as "reading comprehension" (pp. 598-599), i.e. the same as PISA's reading literacy. Carroll (1993, p. 524) gives math ability as another component of intelligence, identified as "quantitative reasoning". Carroll gives science understanding as another component of intelligence, identified as "general science information". Other studies have found that science understanding is highly correlated with general intelligence, e.g. at 0.68 in a study by Deary, Strand, Smith and Fernandes (2007).

Because all these educational tests are components of intelligence, there is a high correlation between these and IQs. For instance, Deary et al. (2007) report a correlation of 0.81 between an intelligence test taken by approximately 70,000 British school children at the age of 11 and their educational achievement in examinations taken at age 16. This correlation is the same as that typically present between two intelligence tests. The genetic explanation for the high correlation between IQ tests and educational tests are so highly correlated is that the same genes determine both (Bartels, Rietveld, van Baal and Boomsma, 2002; Petrill and Wilkerson, 2000; Wainwright, Wright, Luciano and Martin, 2005a,b). These are designated "generalist genes" by Kovas, Harlaar, Petrill and Plomin (2005) because they determine many expressions of cognitive ability including IQs, math, reading, science, etc. More recently, Johnson, Deary and Iacono (2008, p. 475) in a study of the high correlation between IQ measured at age 11 and GPA (Grade Point Average) at age 17 conclude that "The genetic correlation between IQ and GPA was both substantial and significant".

We describe now the studies of international school assessments and the methods used for calculating national IQs from them. The major international school assessment studies are TIMSS (Third International Mathematics and Science Study) and PISA (Program for International Student Assesment). TIMSS assessments of 8th graders in mathematics and Science were conducted 1995, 1999, 2003 and 2007, and PISA assessments of 14-15 year-olds were carried out in 2000, 2003, 2006 and 2009. 74 countries participated in at least one TIMSS assessment, and 18 participated in all four. 65 countries participated in at least one PISA assessment, and 30 participated in all four. 47 countries have data for both TIMSS and PISA, and 92 have data for either TIMSS or PISA. Several other international student assessments have been carried out from the 1970s onwards. Together with the TIMSS and PISA assessments, these provide quantitative data for 111 countries.

Because TIMSS and PISA appear to be the most reliable assessments, and because economic behavior in adulthood is expected to be more closely related to cognitive ability at age 14 than at younger ages, we adopted the strategy of calculating the average of PISA and 8th -grade TIMSS scores, for those countries participating in at least one assessment. Missing data were extrapolated into this data set from the other assessments.

TIMSS and PISA

TIMSS is organized by the IEA (International Association for the Evaluation of Educational Achievement), and assessments are carried out in a 4-year cycle. Tests of mathematics and science are administered in grades 4 and 8, generally with a larger number of countries participating in the grade 8 than the grade 4 assessment. The results are publicly available at *http://www.timss.bc.edu/timss2003.html*
and
http://www./nces.ed.gov/timss/tables07.asp.
Further information is available in Gonzalez, Galia, Arora, Erberber and Diaconu (2004), Martin, Mullis, Gonzales and Chrostowski (2004), Martin, Mullis and Foy (2008), Mullis, Martin, Gonzales and Chrostowski (2004), and Mullis, Martin and Foy (2008).

PISA is organized by the OECD in a 3-year cycle. Children aged 13 are tested in mathematics, science and reading. The results are available at
http://www.oecd.org/dataoecd/30/18/39703566.pdf,
http://www.nces.ed.gov/pubs2002/2002116.pdf,
and

http://www.pisacountry.acer.edu.au.

Both TIMSS and PISA are graded with methods based on item response theory, which models student proficiency as a latent variable. In both assessments the results are published separately for each tested subject and are reported on a 500/100 scale. In TIMSS the mean score of 500 is the average of the countries participating in the first TIMSS assessment in 1995, and in PISA it is the average of the participating OECD countries. The individual-level, within country standard deviation is about 85 in TIMSS and 95 in PISA.

Within each assessment the scores of the different subjects were highly correlated at the country level, as expected from the results of earlier studies (Rindermann, 2006, 2007). They were averaged separately for each of the four TIMSS and four PISA assessments. Minor trend adjustments were made based on the countries participating in TIMSS 2007 and PISA 2009, respectively. For example, 27 countries participated both in TIMSS 1995 and TIMSS 2007. The mean and standard deviation of these 27 countries in TIMSS 1995 were adjusted to the same mean and standard deviation that these countries had in TIMSS 2007, and all other countries in TIMSS 1995 were adjusted accordingly. The averaged TIMSS scores and the averaged PISA scores were brought to the same mean and standard deviation of 500±50 for those 47 countries that participated in at least one TIMSS and one PISA assessment. These adjusted scores were averaged based on the number of assessments in which each country participated. Regressions in which the score was predicted by IQ and age at testing (which varied slightly among countries) showed no consistent age-effect in either TIMSS or PISA.

These scores are a somewhat biased measure of human capital because they measure only the proficiency of children who are still in school in grade 8 (TIMSS) or at age 13 (PISA). Large data sets for 8th-grade enrolment are not available, and therefore

8th-grade enrolment was estimated from data on youth literacy (YLit) and the proportion of children entering school who survive to grade 5 (Gr5), available from the Human Development Reports 2004 and 2007/08 (http://hdr.undp.org/en/reports/).

$$\text{Enrolment} = (1/2 \times \text{YLit} + 0.5) \times \text{Gr5}^2$$

The first term in this equation estimates the proportion of children entering school, and the second term estimates the proportion of those entering school who are still in school at age 13 or in grade 8. A conservative adjustment was made by assuming that those in school would score approximately half a (within-country) standard deviation (42.5 points) below those in school. Similar adjustments were done for other assessments that were done at diferent ages or grade levels.

Other assessments scored with methods of item response theory

Several assessments other than TIMSS and PISA were graded with modern methods of item response theory and published on a 500/100 scale. Those used for the extrapolation of data points missing in the original TIMSS/PISA data set were:

TIMSS 2007, 4th grade included Yemen, which did not participate in any of the PISA and 8th-grade TIMSS assessments.

PIRLS Reading, 2001 was organized by the IEA to assess reading literacy of 4th-graders. 34 countries participated. Data are available *at http://www.nces.ed.gov/surveys/pirls*. This study provides data for Belize.

IEA Reading 1991 assessed reading literacy of 9 and 14 year olds in 30 countries. The results are published in Elley (1992). This assessment provided data for Venezuela at age 9 and 14, and Nigeria and Zimbabwe at age 14.

The raw scores were adjusted for age at testing in those assessments that showed non-trivial age effects. This was followed by adjustment for the approximately proportion in school at the age/grade of testing. To make the scores numerically equivalent to the TIMSS/PISA scale, the mean and standard deviation for each assessment were equalized with those of the TIMSS/PISA score for the countries participating in both kinds of assessment.

Older assessments

Some older assessments are available for which the results were published as per cent correct scores:

IAEP Mathematics 1990/91 assessed mathematics in 13-year-olds. 19 countries participated, of which Mozambique did not participate in TIMSS or PISA. Results are published in Lapointe (1992).

The *Second International Science Study 1983/84* tested children from 23 countries at age 14 and from 17 countries at age 10. The age 10 test provided data for Nigeria, and the age 14 test for China, Nigeria, Papua New Guinea and Zimbabwe. The results are published in Keeves (1992).

The *Second International Mathematics Study 1981* was organized by the IEA to assess mathematics in 13-year-olds. 17 countries participated, including Nigeria and Swaziland. The raw scores are published in Medrich and Griffith (1992).

The results of these asessments show strongly nonlinear relationships with IQ and TIMSS-PISA score, and therefore nonlinear model fitting was employed after adjustments for age (if applicable) and proportion in school had been made.

The SACMEQ assessment

The SACMEQ assessments of 1995-98 and 2000/01 tested mathematics and reading of 6th graders in the countries of South and East Africa. The results are available at *http://www.sacmeq.org/indicators.htm*. Data from the 2000/01 assessment are used except for Zimbabwe, which participated only in the 1995-98 assessment. SACMEQ provides data for Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, Swaziland, Tanzania, Uganda, Zambia, Zanzibar and Zimbabwe. Results are published on a 500/100 scale.

Only two of the countries in SACMEQ (Botswana, South Africa) participated also in TIMSS, and none in PISA. For these two countries, the SACMEQ scores were 189 points higher than the TIMSS/PISA scores (weighted by the number of times they participated in TIMSS). SACMEQ scores for all participating countries were adjusted accordingly.

Additional sources

The only two school achievement data for India are from the first International Science Study in 1970 (Comber and Keeves, 1973), and a recent study with a subset of the 2007 TIMSS study in the states of Rajasthan and Orissa (Das and Zajonc, 2010). The school achievement score for India was averaged from these two sources.

Data quality

The data are not all of equal quality. To adjust for the quality of the data of the school achievement scores, coutries were awarded 2 points for each PISA or 8th-grade TIMSS study in which they participated. Those that did not participate in PISA or 8th-grade TIMSS were awarded 1 point for each of the other assessments in which they participated. The maximum score was 16 for countries participating in all four PISA and all four TIMSS studies.

The school achievement data are on an approximate 500/100 scale, as shown in the column labeled SchAch. Two methods were used to convert these scores to the IQ metric. The column labeled SA direct is a direct transformation to the IQ metric that brings the score of the United Kingdom to 100 and its within-country standard deviation to 15. For the 87 countries having both IQ and school achievement scores, the between-countries standard deviation of these direct-transformed scores is 28%

higher than the standard deviation of IQ. This means that school achievement is more "culturally biased" than IQ in the sense that between-country differences, relative to within-country differences, are larger for school achievement than for IQ.

For this reason, school achievement scores scaled directly to the IQ metric are not suitable for creating a combined measure of a Final IQ calculated from school achievement and intelligence test results. Such a measure would give an artifactual advantage to low-scoring countries that have only IQ data relative to low-scoring countries that have only school achievement data.

We therefore scaled the school achievement data to the IQ metric by equalizing mean and standard deviation of school achievement and IQ for those 87 countries that have both measures. The results are shown in the column labeled “SA scaled.”

3. Calculation of Final IQs

The correlation between school achievement scores and IQs given in column 3 of Table 2.1 was 0.907 for the 87 countries having both measures. This confirms previous studies showing that school achievement scores and IQs are measures of the same latent construct of cognitive ability or intelligence. This justifies the combination of the school achievement scores with IQ scores to form the Final IQs given in the right hand column of Table 2.1. For countries having only IQ data or only school achievement data, these scores were used. Measures of Final IQs are available for 160 countries and territories. Data for both school achievement and IQ are available for 87 countries. Data for school achievement but not IQ are available 24 countries. Data for IQ but not school achievement are available for 49 countries.

Table 2.1 also gives estimated Final IQs derived from the measured IQs of neighboring countries with similar populations, culture and economic development, following the procedure in

Lynn and Vanhanen (2002, 2006). For example, the IQ of Andorra is estimated at 97 from the measured IQs of 98.1 in France and 96.6 in Spain.

Regional data were used for the estimation of national IQs in two cases: The estimate for Afghanistan was derived from the measured IQ in the Northwest Frontier Province in Pakistan given in Ahmad, Khanum, Riaz and Lynn (2008), which is inhabited by ethnic Pashtuns living under conditions similar to Pashtuns in Afghanistan; and the estimate for Chad was formed from the average of the neighboring Central African Republic, Cameroon, Nigeria, and the Sudanese province of Darfur (Khaleefa, Lynn, Abulgasim, Dosa and Abdulrati, 2010). These estimates are given in parentheses in the right hand column in Table 2.1.

Table 2.1. Measures of intelligence by country: Measured IQ; IQ data quality; SchAch, scholastic achievement on original TIMSS and PISA scale; SA direct, scholastic achievement by direct scaling to a mean of 100 for the United Kingdom and within-country standard deviation of 15; SA scaled, scholastic achievement scaled to IQ metric by equalizing mean and standard deviation; SA data quality; Final IQ, weighted average of scholastic achievement and IQ (figures in brackets estimated from neighboring countries).

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Afghanistan	-	-	-	-	-	-	(75)
Albania	-	-	385.5	78.7	82	2	82
Algeria	-	-	403.6	81.5	84.2	2	84.2

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Andorra	-	-	-	-	-	-	(97)
Angola	-	-	-	-	-	-	(71)
Antigua/ Barbuda	-	-	-	-	-	-	(74)
Argentina	96	10	407.6	82.1	84.7	4	92.8
Armenia	92	3	485.1	94.1	94.1	4	93.2
Australia	98	12	534.3	101.7	100	16	99.2
Austria	99.5	4	523.7	100.1	98.7	10	99
Azerbaijan	-	-	409	82.3	84.9	4	84.9
Bahamas	-	-	-	-	-	-	(84)
Bahrain	81	2	437.1	86.7	88.3	4	85.9
Bangladesh	81	4	-	-	-	-	81
Barbados	80	3	-	-	-	-	80
Belarus	-	-	-	-	-	-	(95)
Belgium	99	8	530.1	101.1	99.5	14	99.3
Belize	-	-	342.5	72.1	76.8	1	76.8
Benin	-	-	-	-	-	-	(71)
Bermuda	90	4	-	-	-	-	90
Bhutan	-	-	-	-	-	-	(78)
Bolivia	87	6	-	-	-	-	87
Bosnia	94	4	465.5	91.1	91.7	2	83.2

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Botswana	71	2	367.7	76.0	79.9	4	76.9
Brazil	87	13	396.1	80.4	83.3	8	85.6
Brunei	-	-	-	-	-	-	(89)
Bulgaria	92.5	6	481.9	93.6	93.7	12	93.3
Burkina Faso	-	-	-	-	-	-	(70)
Burundi	-	-	-	-	-	-	(72)
Cambodia	-	-	-	-	-	-	(92)
Cameroon	64	2	-	-	-	-	64
Canada	100	9	538.8	102.4	100.6	16	100.4
Cape Verde	-	-	-	-	-	-	(76)
Central African Rep.	64	5	-	-	-	-	64
Chad	-	-	-	-	-	-	(66)
Chile	91	10	437.9	86.8	88.4	8	89.8
China	105.5	16	601.7	112.1	108.2	2	105.8
Tibet	92	2	-	-	-	-	92
Colombia	83.5	7	391.8	79.7	82.8	8	83.1
Comoros	-	-	-	-	-	-	(77)
Congo (Brazzaville)	73	8	-	-	-	-	73
Congo (Zaire)		68	13	-	-	-	68

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Cook Islands	89	2	-	-	-	-	89
Costa Rica	86	2	-	-	-	-	86
Cote d'Ivoire	71	2	-	-	-	-	71
Croatia	99	7	499.1	96.3	95.8	4	97.8
Cuba	85	2	-	-	-	-	85
Cyprus	-	-	466.2	91.2	91.8	8	91.8
CzechRep.	98	7	528.2	100.8	99.3	14	98.9
Denmark	98	5	507.8	97.6	96.8	10	97.2
Djibouti	-	-	-	-	-	-	(75)
Dominica	67	5	-	-	-	-	67
Dominican Republic	82	6	-	-	-	-	82
East Timor	-	-	-	-	-	-	(85)
Ecuador	88	5	-	-	-	-	88
Egypt	81	5	409.4	82.4	84.9	4	82.7
El Salvador	-	-	352.4	73.6	78	2	78
Equatorial Guinea	-	-	-	-	-	-	(69)
Eritrea	75.5	4	-	-	-	-	75.5
Estonia	99	7	539.3	102.5	100.6	6	99.7
Ethiopia	68.5	9	-	-	-	-	68.5
Fiji	85	3	-	-	-	-	85

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Finland	97	5	557.8	105.4	102.9	10	100.9
France	98	10	518.7	99.3	98.1	10	98.1
Gabon	-	-	-	-	-	-	(69)
Gambia	62	6	-	-	-	-	62
Georgia	-	-	424.1	84.7	86.7	2	86.7
Germany	99	17	520.4	99.6	98.3	10	98.8
Ghana	70	10	277.5	62.0	69	4	69.7
Greece	92	10	487.4	94.5	94.4	10	93.2
Greenland	-	-	-	-	-	-	91
Grenada	-	-	-	-	-	-	(74)
Guatemala	79	3	-	-	-	-	79
Guinea	66.5	6	-	-	-	-	66.5
Guinea-Bissau	-	-	-	-	-	-	(69)
Guyana	-	-	-	-	-	-	(81)
Haiti	-	-	-	-	-	-	(67)
Honduras	81	6	-	-	-	-	81
Hong Kong	108	16	559.7	105.6	103.1	14	105.7
Hungary	96.5	8	525.2	100.3	98	16	98.1
Iceland	101	4	514.7	98.7	97.6	10	98.6
India	82	21	419.4	84.0	86.1	1	82.2
Indonesia	87	8	409.7	82.5	85	12	85.8

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Iran	83.5	9	434.7	86.3	88	8	85.6
Iraq	87	5	-	-	-	-	87
Ireland	92.5	18	526.6	100.5	99.1	10	94.9
Israel	95	14	485.3	94.1	94.1	12	94.6
Italy	97	14	495.8	95.8	95.4	16	96.1
Jamaica	71	11	-	-	-	-	71
Japan	105	25	558.8	105.5	103	16	104.2
Jordan	84	8	441.6	87.4	88.8	10	86.7
Kazakhstan	-	-	410	82.5	85	2	85
Kenya	74	12	370.2	76.3	80.2	1	74.5
Kiribati	-	-	-	-	-	-	(85)
Korea: North	-	-	-	-	-	-	(104.6)
Korea: South	106	9	565.7	106.6	103.8	16	104.6
Kuwait	86.5	9	398.9	80.8	83.7	4	85.6
Kyrgyzstan	-	-	325.4	69.4	74.8	4	74.8
Laos	89	2	-	-	-	-	89
Latvia	-	-	500.3	96.5	95.9	14	95.9
Lebanon	82	4	428	85.3	87.2	4	84.6
Lesotho	-	-	257.3	58.9	66.5	1	66.5
Liberia	-	-	-	-	-	-	(68)

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Libya	85	8	-	-	-	-	85
Liechtenstein	-	-	536.2	102.0	100.3	8	100.3
Lithuania	92	7	498.5	96.4	95.7	12	94.3
Luxembourg	-	-	492.9	95.3	95	8	95
Macao	-	-	533.6	101.6	99.9	6	99.9
Macedonia	-	-	455.7	89.6	90.5	4	90.5
Madagascar	82	2	-	-	-	-	82
Malawi	60	3	204.9	50.8	60.2	1	60.1
Malaysia	88.5	8	500.7	96.5	96	6	91.7
Maldives	-	-	-	-	-	-	(81)
Mali	69.5	8	-	-	-	-	69.5
Malta	97	2	480.7	93.4	93.5	2	95.3
Mariana Islands	81	2	-	-	-	-	81
Marshall Islands	84	3	-	-	-	-	84
Mauritania	-	-	-	-	-	-	(74)
Mauritius	89	5	395.5	80.3	83.3	1	88
Mexico	88	8	431.2	85.8	87.6	8	87.8
Micronesia	-	-	-	-	-	-	(84)
Moldova	-	-	468.1	91.5	92	4	92
Mongolia	100	6	-	-	-	-	100
Montenegro	-	-	417.7	83.7	85.9	4	85.9

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Morocco	84	9	369.4	76.2	80.1	6	82.4
Mozambique	64	2	327.2	69.7	75	2	69.5
Myanmar/ Burma	-	-	-	-	-	-	(85)
Namibia	72	2	262.3	59.7	67.1	1	70.4
Nepal	78	4	-	-	-	-	78
Netherlands	100	10	540.7	102.7	100.8	12	100.4
Netherlands Antilles	87	2	-	-	-	-	87
New Caledonia	85	2	-	-	-	-	85
New Zealand	99	1	523.7	100.1	98.7	14	98.9
Nicaragua	-	-	-	-	-	-	(84)
Niger	-	-	-	-	-	-	(70)
Nigeria	71	13	302.6	65.9	72	4	71.2
Norway	100	2	507.3	97.5	96.8	14	97.2
Oman	84.5	8	406.8	82.0	84.6	2	84.5
Pakistan	84	8	-	-	-	-	84
Palestine	86	4	393.3	79.9	83	4	84.5
Panama	-	-	369	75.2	80	2	80
Papua N.G.	82.5	4	428.6	85.4	87.2	1	83.4
Paraguay	84	6	-	-	-	-	84
Peru	85	9	372	76.6	80.4	2	84.2

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Philippines	90	7	363.5	75.3	79.4	4	86.1
Poland	95	13	516	98.9	97.8	8	96.1
Portugal	94.5	6	487	94.4	94.3	10	94.4
Puerto Rico	83.5	8	-	-	-	-	83.5
Qatar	83	6	345.9	-	77.2	6	80.1
Romania	91	6	460	90.2	91	12	91
Russia	96.5	6	506.5	97.4	96.7	16	96.6
Rwanda	76	2	-	-	-	-	76
St Helena	-	-	-	-	-	-	(86)
St Kitts & Nevis	-	-	-	-	-	-	(74)
St Lucia	62	2	-	-	-	-	62
St Vincent	71	2	-	-	-	-	71
Samoa (Western)	88	5	-	-	-	-	88
Sao Tome & Principe	-	-	-	-	-	-	(67)
Saudi Arabia	79	8	376.3	77.3	80.9	4	79.6
Senegal	70.5	5	-	-	-	-	70.5
Serbia & Montenegro	88.5/93	4	459.6	90.2	91	10	90.3/92
Seychelles	-	-	405	81.7	84.4	1	84.4
Sierra Leone	64	3	-	-	-	-	64

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Singapore	108.5	5	586.8	109.8	106.4	10	107.1
Slovakia	98	8	517.1	99.1	97.9	12	98
Slovenia	96	11	526	100.4	99	12	97.6
Solomon Islands	-	-	-	-	-	-	(83)
Somalia	-	-	-	-	-	-	(72)
South Africa	72	16	291.4	64.2	70.7	6	71.6
Spain	97	11	503	96.9	96.2	14	96.6
Sri Lanka	79	2	-	-	-	-	79
Sudan	77.5	19	-	-	-	-	77.5
Suriname	89	4	-	-	-	-	89
Swaziland	-	-	330.7	70.2	75.4	2	75.4
Sweden	99	8	521.1	99.7	98.4	14	98.6
Switzerland	101	6	531.6	101.3	99.7	10	100.2
Syria	80.5	7	427	85.1	87.1	2	82
Taiwan	105	19	565.3	106.5	103.8	10	104.6
Tajikistan	-	-	-	-	-	-	(80)
Tanzania	72.5	9	349.8	73.2	77.7	1	73
Zanzibar	-	-	293.7	64.5	70.9	1	70.9
Thailand	88	8	460.7	90.3	91.1	12	89.9
Togo	-	-	-	-	-	-	(70)

Country	Measured IQ	IQ data quality	SchAch	SA direct	SA scaled	SA data quality	Final IQ
Tonga	86	2	-	-	-	-	86
Trinidad & Tobago	-	-	421.7	84.3	86.4	2	86.4
Tunisia	84	4	417.7	83.7	85.9	12	85.4
Turkey	88.5	9	453.7	89.3	90.3	10	89.4
Turkmenistan	-	-	-	-	-	-	(80)
Uganda	72	9	275.8	61.7	68.8	1	71.7
Ukraine	95	2	481.7	93.6	93.7	2	94.3
United Arab Emirates	83	6	477.5	92.9	93.2	4	87.1
United Kingdom	100	7	523.2	100.0	98.7	14	99.1
England	-	-	524.3	102.2	98.8	8	98.8
Scotland	-	-	502.3	96.8	96.2	6	96.2
USA	98	10	510.6	98.1	97.2	16	97.5
Uruguay	96	2	441.3	87.3	88.8	6	90.6
Uzbekistan	-	-	-	-	-	-	(80)
Vanuatu	-	-	-	-	-	-	(84)
Venezuela	84	6	374.9	77.1	80.8	1	83.5
Vietnam	94	3	-	-	-	-	94
Yemen	83	6	247.8	57.4	65.4	1	80.5
Zambia	75	7	259.6	59.2	66.8	1	74
Zimbabwe	71.5	4	310.6	67.1	73	3	72.1

4. Reliability of National IQs

Several critics of the national IQs given in our previous studies have asserted that the IQs obtained in different studies from the same countries are inconsistent and therefore that the IQ figures have poor reliability. For instance, Astrid Ervik (2003, p. 408) wrote that there are "large disparities in test scores for the same country" and "the authors fail to estabalish the reliability of intelligence (IQ) test scores". A similar criticism has been made by Susan Barnett and Wendy Williams (2004): "When more than one sample is used to estimate a national IQ, it is unsettling how great the variability often is between samples from the same country".

The *reliability* of a psychometric test means the extent to which the score it provides can be replicated in a further study. The reliability of a test is best assessed by making two measurements of an individual or set of individuals and examining the extent to which the two measurements give the same results. Where the two measurements are made on a set of individuals the correlation between the two scores gives a measure of the degree to which they are consistent and is called the *reliability coefficient.*

In our *IQ and the Wealth of Nations* we examined the reliability of the measures by taking 45 countries in which the intelligence of the population has been measured in two or more investigations. This is the same procedure that is used to examine the reliability of tests given to sets of individuals. We reported that the correlation between two measures of national IQs is 0.94, showing that the measures give high consistent results and have high reliability. This reliability coeffcient is closely similar to that of tests of the intelligence of individuals, which typically lies in the range between 0.85 and 0.90 (Mackintosh, 1998, p. 56). In our *IQ and Global Inequality* we examined the consistency of the IQs for 65 countries for which there were two or more scores. The correlation between the two extreme IQs (i.e. the highest and lowest) was 0.93 and is highly statistically significant. This method underestimates the true reliability because it uses the two extreme values. As an alternative method we excluded the two extreme scores and used the next lowest and highest scores. There were 13 countries for which we had five or more IQ scores (China, Congo-Zaire, Germany, Hong Kong, India, Israel, Jamaica, Japan, Kenya, Morocco, South Africa-blacks, South Africa-Indians, and Taiwan). Using this method, the correlation between the two scores was 0.95. These figures established that the national IQs used in our earlier work had high reliability.

To estimate the reliability of the national IQs obtained from intelligence tests and used in present study, we have adopted the following procedure. In the list of national IQs given in Appendix 1, there are 88 countries for which there are two or more IQs. To calculate the reliability coeffcient we have taken the last two studies for each country (in the case of South Africa, blacks, colored and Indians separately, N=90). The correlation between these is 0.876 and represents the reliability coefficient.

To select two IQs for each country from which to calculate the reliability coefficient, the rules adopted are as follows. Where there are two studies, use both; with three studies, use the first and third; with four studies, use second and forth; with five studies, use second and fourth; with six studies, use second and fourth; with seven studies, use third and fifth; with eight studies, use second and fourth; with nine studies, use third and sixth; with ten studies, use third and sixth; with eleven studies, use fourth and eight; with twelve studies, use fourth and eight; with 23 studies, use eight and sixteenth; with 25 studies, use ninth and seventeenth. The correlation between the two studies obtained in this way was was 0.85 and represents the reliability coefficient. An estimate of the reliability of national Final IQs used in present study can be obtained from the correlation between the national IQs obtained from intelligence tests and the school achievement scores treated as alternative measure of national intelligence. The correlation between these is 0.907 for the 87 countries having both measures.

5. Validity of National IQs

Critics have also asserted that our national IQs lack validity. For instance, Ervik (2003) has written that we fail to establish the cross-cultural comparability (i.e. validity) of intelligence and Barnett and Wlliams (2004) who argues that the tests are not valid measures of the intelligence of peoples in many economically developing nations. More recently, Hunt (2011, p. 439) has written that "Lynn and Vanhanen disregard any question about the validity of various intelligence tests across different countries and cultures".

Contrary to these assertions, we have gone to considerable trouble to demonstarate that our national IQs are valid. The validity of an intelligence test is the extent to which it measures what it purports to measure and is established by showing that it is highly correlated with other measures of cognitive ability. Foremost among these is educational attainment. As noted in section 2 above, at the level of individuals, intelligence and educational attainment are typically correlated at between 0.5 and 0.8. We have demonstrated that our national IQs are valid by showing that this association is also present at the national level. In our first book, we showed that our national IQs are correlated with national scores on mathematics at 0.881 and with national scores on science at 0.868 (Lynn and Vanhanen, 2002, p. 71). In our second book, we showed that our national IQs are correlated with national scores on mathematics scores obtained by 15 year old school students in PISA 2000 at 0.876 and with national scores on science obtained in PISA 2000 at 0.833 (Lynn and Vanhanen, 2006, p. 69). We have confirmed these high correlations in subsequent studies with larger data sets and shown the correlations between the results of national IQ tests and scholastic assessments are in the vicinity of 0.9 (Lynn and Mikk, 2007; Lynn, Meisenberg, Mikk and Williams, 2007). These results have been confirmed by Rindermann (2007). In a later study of 108 nations, we have shown that national scores aggregated from the PISA and TIMSS studies are perfectly correlated with national IQs (r=1.0) (Lynn and Meisenberg, 2010).

To examine further the association between national IQs and school achievement scores, the correlation between these (given in Table 2.1) is 0.907 for the 87 countries having both measures, as noted in Section 4. This confirms our numerous previous studies showing that national IQs and school achievement scores are measures of the same latent construct of cognitive ability of intelligence. This justifies the combination of the school achievement scores with IQ scores to form the Final IQs given in the right hand column of Table 2.1.

The validity of intelligence tests is not only demonstrated by a high correlation between IQs and educational achievement. The validity of the tests can also be established by showing that they are correlated with other phenomena that IQs partly determine such as earnings, life expectancy, and (negatively) crime and religious belief. The results of numerous studies showing correlations of this kind are summerized in Chapter 3 and show beyond dispute that our national IQs have high validity.

Chapter 3

Educational and Cognitive Attainment

1. Intelligence and Educational Attainment among Individuals. 2. Intelligence and Educational Attainment across Nations. 3. Intelligence and Cognitive Attainment across Nations. 4. New Global Comparisons. 5. Variables. 6. Educational Attainments. 7. Regression of Tertiary-09 on National IQ. 8. Researchers in R&D. 9. Conclusion

1. Intelligence and Educational Attainment among Individuals

It has been shown in a number of studies that intelligence predicts subsequent educational attainment among individuals at a magnitude of a correlation of around 0.5 to 0.7. The results of a number of major and typical studies are summarized in Table 3.1. The first column gives the country, the second column gives the number in the sample, the third gives the age at which intelligence was measured, the fourth gives the age at which educational attainment was measured, the fifth gives the measure of educational attainment assessed by tests in an academic subject, the years of education or the level reached. The correlations range between 0.41 and 0.72 with a median of 0.62. The sixth gives correlation between intelligence and educational attainment. Note that IQ measured in young children and adolescence predicts the number of years of education. The main reason for this is that children with high IQs do well at school and find school rewarding, so they opt to remain in education longer than those with lower IQs who tend to find school unrewarding.

Table 3.1. Correlations between intelligence and educational attainment

	Country	Number	Age IQ	Age Ed.Att.	Subject	r	Reference
1	England	85	5	16	English	.61	Yale et al, 1982
2	England	85	5	16	Math	.72	Yale et al., 1982
3	Britain	8,699	11	21	Years	70	Thienpont & Verleeye, 2003
4	Britain	20,000	11	16	General	.74	Deary, 2004
5	N. Ireland	451	16	23	General	.40	Cassidy & Lynn, 1991
6	USA	1,680	12	23	Years	.57	Benson, 1942
7	USA	1,943	17	31	Years	.63	Rowe et al., 1998
8	USA-whites	3,484	19	37	Years	.59	Nyborg & Jensen, 2001
9	USA-blacks	493	19	37	Years	.41	Nyborg & Jensen, 2001

Row 1 and 2 give results from a study in England in which IQs were obtained for 85 children at the age of 5 years and were found to be correlated with grades obtained in the public examinations in English (0.61) and mathematics (0.72) taken at the age of 16 years. Row 3 gives a correlation of 0.70 for a British sample for IQs obtained at the age of 11 and education attainment measured as years by age 21. Row 4 gives a correlation of 0.74 for a British sample for IQs obtained at the age of 11 and marks in the public GCSE (General Certificate of Education, consisting of an examination typically in five to nine subjects) in at the age of 16 years. Row 5 gives a correlation of 0.40 for a sample in Northern Ireland for IQs obtained at the age of 16 and education attainment measured as years by age 23. Rows 6, 7, 8 and 9 give similar results from the United States.

It will be seen that all the correlations between intelligence and subsequent educational attainment are substantial and lie in the range between 0.40 and 0.74. The median of the eight studies is 0.61. It has sometimes been argued that the correlation between intelligence and educational attainment is not a causal one but arises through the common effects of the socio-economic status of the family on both intelligence and educational attainment. Thus, middle class families produce children with high intelligence, either through genetic transmission or by providing environmental advantages, or both, and also ensure that their children have a good education. This explanation cannot be correct because the correlation between parental socio-economic status and their children's educational attainment obtained from a meta-analysis of almost 200 studies is only 0.22 (White, 1982). Such a low correlation could not account for much of the higher association between children's IQs and their educational attainment. In addition, it has been found that among pairs of brothers brought up in the same family, there is a correlation of approximately 0.3 between IQ and educational attainment (Jencks, 1972). This shows that, even when family effects are controlled, the correlation between IQ and educational attainment remains, although it is reduced. The only reasonable explanation of the correlations shown in Table 3.1 is that intelligence has a direct causal effect on educational attainment. It does this because IQ determines the efficiency of learning and comprehension of all cognitive tasks. The correlations between IQ and subsequent educational attainment are not perfect because educational attainment is partly determined by motivation, interests, compliance and the effectiveness of teaching.

2. Intelligence and Educational Attainment across Nations

Studies reporting that national IQs are correlated with educational attainment are summarized in Table 3.2. The first two rows show high correlations of 0.88 and 0.87 of national IQs with scores obtained by school students in math and science in the 1999 TIMSS (International Math and Science Study) based on only 38 countries. The next eight rows 3-10 show correlations ranging between of 0.79 and 0.89 of national IQs with scores obtained by school students in math, science and literacy (verbal comprehension) but again these were based on only 27 and 40 countries. Row 11 gives a correlation of 0.81 for national IQs with scores on reading obtained by 10 year old school students in the 2001 PIRLS (Progress in International Reading) study. Rows 12 and 13 give correlations of 0.87 and 0.85 of national IQs with scores obtained by 10 year old school students in math and science in the 2003 TIMSS study. Rows 14 and 15 give correlations of 0.92 and 0.91 of national IQs with scores obtained by 14 year old school students in math and science in the 2003 TIMSS study.

Row 16 gives a correlation of 0.89 between national IQs and science scores of school students obtained in the TIMSS studies averaged for the years 1995-2003 based on 63 nations. Row 17 gives a correlation of 0.84 between national IQs and aggregated math, science and literacy scores of 15 year old school students obtained in the PISA 2006 study and based on 56 nations.

Row18 gives a correlation of 0.90 between national IQs and math and science based on 73 nations and calculated as the average of the standardized scores on the international school achievement tests in math and science from TIMSS (Third

International Mathematics and Science Study) averaged from the 1995, 1999 and 2003 assessments and the PISA (Program for International Student Assessment) 2003 and 2006 assessments. For each country, all available data were computed into a single overall score.

Row 19 gives a correlation of 0.74 between national IQs and the arcsine-transformed average of the 1990 and 2002 adult literacy rates given by the United Nations for 2004, based on the 187 countries for which both measures are available. Row 20 gives a correlation of 0.91 between national IQs and educational attainment scores aggregated from the all PISA and TIMSS studies published hitherto, based on 108 countries. The correlation corrected for attenuation is 1.0. Row 21 gives a correlation of 0.92 between national IQs and educational attainment scores aggregated from all PISA, TIMSS and other studies, based on 82 nations.

Table 3.2. Educational attainment correlates of national IQ

	Variable	**N countries**	**r x IQ**	**Reference**
1	Math: TIMSS 1999	38	.88	Lynn & Vanhanen, 2002
2	Science: TIMSS 1999	38	.87	Lynn & Vanhanen, 2002
3	Math/Science: 1964/86	38	.81	Lynn & Vanhanen, 2006
4	Math: age 10, 1994	27	.86	Lynn & Vanhanen, 2006
5	Science: age 10, 1994	26	.79	Lynn & Vanhanen, 2006
6	Math: age 14, 1994	30	.89	Lynn & Vanhanen, 2006
7	Science: age 14, 1994	37	.81	Lynn & Vanhanen, 2006
8	Math: PISA, 2000	40	.88	Lynn & Vanhanen, 2006

	Variable	N countries	r x IQ	Reference
9	Science: PISA, 2000	40	.83	Lynn & Vanhanen, 2006
10	Math: PISA, 2003	39	.87	Lynn & Vanhanen, 2006
11	Reading: age 10	35	.81	Barber, 2006
12	Math: age 10, 2003	46	.87	Lynn & Mikk, 2007
13	Science: age 10, 2003	46	.85	Lynn & Mikk, 2007
14	Math: age 14, 2003	46	.92	Lynn & Mikk, 2007
15	Science: age 14, 2003	46	.91	Lynn & Mikk, 2007
16	Math, science	63	.89	Rindermann, 2007
17	Math, science, literacy	56	.84	Lynn & Mikk, 2009
18	Math, science	73	.90	Meisenberg, 2009
19	Adult literacy	187	.74	Meisenberg, 2009
20	Math, science, literacy	108	.91	Lynn & Meisenberg, 2010
21	Math, science, literacy	82	.92	Meisenberg & Lynn, 2012

3. Intelligence and Cognitive Attainment across Nations

We now consider the contribution of intelligence to cognitive attainment defined as attainment for which a high IQ is a major necessary condition such as the publication of papers in academic journals, obtaining Nobel prices and so forth. Studies that have examined the relation of national IQs to a variety of measures of cognitive attainment are summarized in Table 3.3. Row 1 gives a correlation of 0.87 between national IQs and academic publications measured as numbers of papers per capita published in academic journals, based on 137 nations. Row 2 gives a correlation of 0.51 between national IQs and the patent index: measured as the number of patents granted in the USA per million population, based on 112 nations. The author of this study adopts the patent index as a measure of a nation's technological achievement, and "technological achievement mediates the relationship between IQ and wealth; in other words, high IQ nations generate more technical knowledge, which in turn leads to more wealth" (Gelade, 2008, p. 712).

Row 3 gives a correlation of 0.63 between national IQs and "intellectual autonomy" based on 63 nations. This construct is defined as follows: "in cultures that emphasise intellectual autonomy individuals are encouraged to create and innovate, and to pursue their own ideals" (Gelade, 2008, p. 172). The author predicted that cultures that value intellectual autonomy should have high production of patents, which in turn promotes economic development. This prediction was confirmed by the correlation of 0.71 between intellectual autonomy and per capita income.

Row 4 gives a correlation of 0.74 between national IQs and STEM, a measure of scientific and technological excellence, based on 90 nations. Row 5 gives a correlation of 0.40 between national IQs and patents per capita granted during 1960-2007, based on 76 nations.

Rows 6, 7 and 8 give the correlation of between national IQs and Nobel prizes awarded per capita (1901-2004) for literature (0.13), peace (0.21) and science (0.34), based on 97 nations. It may be surprising that the correlation with literature is as low as 0.13 and is not statistically significant. The reason for this is that the Nobel Committee has not been good at picking works of literature that have endured. Who now reads or has even heard of the first literature Nobel prizewinners Sully Prudhomme (1901), Theodor Mommsen (1902), Frédéric Mistral (1904) and Giosuè Carducci (1906). Yet remarkably the prize was not awarded to Leo Tolstoy who did not die until 1910.

The correlations with peace and science are statistically significant, although the correlation with science (0.34) may be surprising low. One reason for this is that the nations of Northeast Asia (China, Japan, Korea, Singapore and Hong Kong) have the highest IQs but win few Nobel Prizes. It has been proposed that the explanation for this is that the Northeast Asian peoples have lower creativity than the Europeans, who have won nearly all the Nobel prizes for science (Lynn, 2007).

Row 9 gives a correlation of 0.61 between national IQs and the numbers of scientists and engineers working in research, per capita, based on 51 nations. Row 10 gives a correlation of 0.38 between national IQs and technology exports as percentage of all manufactured exports, 1997, based on 61 nations. Row 11 gives a correlation of 0.36 between national IQs and the cognitive ability of politicians 1990-2009 estimated from their educational qualifications, based on 90 nations.

Table 3.3. Cognitive output variables correlated with national IQ

	Variable	N countries	r x IQ	Reference
1	Academic publications	139	.87	Morse, 2008
2	Patent index	112	.51	Gelade, 2008
3	Intellectual autonomy	63	.63	Gelade, 2008
4	STEM	90	.74	Rindermann et al., 2009
5	Patents: 1960-2007	76	.40	Rindermann et al., 2009
6	Nobel prizes: literature	97	.13	Rindermann et al., 2009
7	Nobel prizes: peace	97	.21	Rindermann et al., 2009
8	Nobel prizes: science	97	.34	Rindermann et al., 2009

9	Scientists, engineers	51	.61	Rindermann et al., 2009
10	Technology exports	61	.38	Rindermann et al., 2009
11	Politicians' ability	90	.36	Rindermann et al., 2009

4. New Global Comparisons

The problem is to find reliable and comparable empirical data on the extent and attainment of education. It is not easy, although the United Nations' and the World Bank's publications include statistical data on various aspects of education. The comparability of such data is in many respects less than satisfactory. Data may not cover all countries, data are based not only on reliable empirical evidence but also on estimates, there may be significant variation in the national definitions of variables, and original data derived from national sources may include various errors. The available data on education indicate quantitative aspects of education, not differences in the quality of education. It would be extremely difficult to find any indicator which measures reliably differences in the quality of education. For example, data on adult literacy rate do not tell anything about the quality of literacy.

In this study, we are going to use available statistical data on education, although they are incomplete and may be faulty in some respects. Our argument is that even incomplete data are enough to indicate whether national IQ is related to indicators of education as hypothesized. It should be noted that we expect clear positive correlations. The results will include a margin of error, but if correlations are strong, they are enough to indicate the direction of the relationship and its approximate strength.

The available statistical databases on education include data on adult literacy rate and gross enrolment ratios. Besides, data on researchers in R&D (Research and Development) indicate differences in the application of education. We hypothesize that national IQ correlates positively with adult literacy rate as well as with other indicators of educational attainment. Strong correlations would imply that significant global disparities in the measured phenomena will most probably continue, whereas zero and weak correlations would indicate that differences in national IQs do not prevent equalization in the phenomena, although some other relevant factors may still support the continuation of global disparities. We do not argue that national IQ is the only significant factor affecting the level of education. We only assume that it is the most important universal explanatory factor.

5. Variables

Adult literacy rate is the most extensively used measure of educational attainment. It indicates the attainment of basic education needed in modern societies. Statistical data on literacy concern in most cases the population aged 15 and over. Data on adult literacy rate (Literacy-08) are published in several sources, especially in the World Bank's *World Development Indicators* (WDI) and *World Development Reports*, in UNDP's *Human Development Reports* (HDR), and in CIA's *The World Factbooks*. Data published in different sources do not differ much from each other. We use in this analysis data published in *Human Development Report 2010* (Table 13). UNDP's data are from the years 2005-2008. Data on literacy are complemented from CIA's *The World Factbook 2011* in the cases of Afghanistan, Andorra, Australia, Austria, the Bahamas, Barbados, Belgium, Belize, Bermuda, Canada, Congo (Republic of), the Cook Islands, the Czech Republic, Denmark, Djibouti, Dominica, Fiji, Finland, France, Germany, Grenada, Guinea, Guyana, Hong Kong, Iceland, Ireland, Israel, Japan, North Korea, South Korea, Liechtenstein, Luxembourg, Macau, the Mariana Islands, the Marshall Islands, Micronesia, the Netherlands, the Netherlands Antilles, New Caledonia, New Zealand, Norway, Puerto Rico, St Helena, St Kitts & Nevis, St

Lucia, St Vincent & the Grenadines, Serbia, Somalia, Sweden, Switzerland, Taiwan, Timor-Leste, the United Kingdom, and the United States. Serbia's percentage is used also for Montenegro. Data cover 197 countries. The fact that the adult literacy rate already approaches 100 percent in most countries diminishes the value of this variable as an indicator of educational disparities.

Data on population with at least secondary education (% ages 25 and over) published in HDR 2010 (Table 13) provide another indicator of achievements in education (Secondary-10) in 2010. Secondary education completes the basic education aiming at laying the foundations for lifelong learning and human development by using more specialized teachers. The fact that definitions of "secondary education" may vary considerably from country to country reduces the comparability of data, but certainly the statistical data given in HDR 2010 reflect the significant national variation in the extent of secondary education. Data on Secondary-10 cover 134 countries.

Data on gross tertiary enrolment ratio (% of tertiary school-age population) provide the third indicator of achievements in education. Tertiary education refers to a wide range of post-secondary education institutions, including technical and vocational colleges and universities that normally require as a minimum condition of admission the successful completion of education at the secondary level (see WDI 2010, p. 87). Data on tertiary enrolment ratio are published in *World Development Indicators* and in *Human Development Reports*. Our data on this variable (Tertiary-09) are derived principally from HDR 2010 (Table 13, N=164). Missing data were complemented from WDI 2010 (Table 2.12) in the case of Malawi and from WDI 2009 (Table 2.12) in the cases of South Africa and Thailand. The estimated gross tertiary enrolment ratio is for nine Caribbean countries (Antigua & Barbuda, the Bahamas, Barbados, Dominica, Grenada, Haiti, Puerto Rico, St Kitts & Nevis, St Vincent & the Grenadines) the same as for St Lucia (15), for two Pacific countries (Kiribati and the Solomon Islands) the same as for the Marshall Islands (17), and for four East Asian countries (North Korea, Macau, Singapore, and Taiwan) the same as for Japan (58). The estimated tertiary enrolment ratios are regional averages for the following countries: Germany and Luxembourg (OECD 71), Syria (Arab States 23), Montenegro and Turkmenistan (Europe and Central Asia 54), Cuba (Latin America and the Caribbean 37), the Maldives, the Seychelles, and Sri Lanka (South Asia 13), and Somalia (Sub-Saharan Africa 6). After these supplements, data cover 192 countries.

Just as in the case of Secondary-10, a part of the variation in Tertiary-09 data is due to differences in national definitions of tertiary education. For example, Cuba's tertiary enrolment ratio 122 (HDR 2010, p. 195) is certainly too high, whereas Luxembourg's 10 is too low compared to its neighbouring countries. In these two cases, data given in HDR 2010 (Table 13) are replaced by estimated data: Cuba 37 (Latin American and the Caribbean average) and Luxembourg 71 (OECD average 71). Significant national differences in the criteria of tertiary education and the use of estimated data in several cases reduce the comparability of data on Tertiary-09.

Finally, we have one variable which measures global differences in the application of education and intelligence to inventions and research: Researchers in research and development per million people in 1990-2003 (R&D). Researchers in R&D refer to people trained to work in any field of science who are engaged in professional research and development activity. Most such jobs require the completion of tertiary education. Empirical data on this variable are from *Human Development Report 2006* (Table 13). It can be hypothesized that more intelligent nations employ relatively more researchers than less intelligent nations. However, data on this variable cover only 97 countries.

These four variables measure different aspects of educational attainments, but they are moderately intercorrelated as can be seen from Table 3.4. The strongest correlation is between Tertiary-09 and R&D variables (0.698) and the weakest correlation between Literacy-08 and R&D (0.415). The covariation between variables is less than 50 per cent in all cases, which implies that the four variables are to a significant extent independent from each other.

Table 3.4. Intercorrelations of the four educational indicators in various samples of countries

Variable	Literacy-08	Secondary-10	Tertiary-09	R&D
Literacy-08	1.000	.691	.602	.415
		N=134	N=191	N=97
Secondary-10		1.000	.655	.503
			N=134	N=84
Tertiary-09			1.000	.698
				N=97
R&D				1.000

We expect national IQ to be positively correlated with all these variables. The results of statistical analyses will disclose to what extent empirical evidence supports the hypothesis on the positive relationship between national IQ and these indicators of education. It would also be interesting to find out whether some other factors could explain a significant part of the variation in these variables independently from national IQ.

6. Educational Attainments

We start by exploring to what extent national IQ is related to the three variables indicating educational attainments (Table 3.5).

Table 3.5. National IQ correlated with Literacy-08, Secondary-10, and Tertiary-09 variables in the three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Adult literacy rate (Literacy-08)	197	.638	.691
Secondary-10	134	.666	.689
Tertiary-09	192	.773	.803
Group of countries (inhabitants > 1 million)			
Adult literacy rate	154	.713	.752
Secondary-10	119	.619	.717
Tertiary-09	154	.796	.825
Group of countries with measured national IQs			
Adult literacy rate	157	.661	.724
Secondary-10	121	.675	.692
Tertiary-09	152	.775	.809

Table 3.5 shows that the three variables are positively correlated with national IQ as hypothesized. All correlations are moderate or strong, and the Spearman rank correlations are slightly stronger than Pearson correlations. The results support strongly the hypothesis on the positive relationship between national IQ and educational attainment.

Adult literacy rate (Literacy-08). During the last decades, adult literacy rate has risen steeply in several countries of low national IQs. The overall correlation between national IQ and adult literacy rate has probably decreased, but, on the other hand, it implies that a low level of national IQ does not prevent the rise of literacy rate. It seems to be possible even for countries at low levels of national IQ to remove illiteracy. Consequently, the correlation between national IQ and Literacy can be expected to decrease in the future. Adult literacy rate is correlated with several other environmental variables, but national IQ remains as the dominant explanatory factor. When national IQ, PPP-GNI-08 and ID-08 are used to explain variation in Literacy-08, the multiple correlation rises to 0.668 (N=187) and the explained part of variation in Literacy-08 rises to 45 per cent, which is 4 percentage points more than what national IQ explains (41%) in the same group of 187 countries. It means that PPP-GNI-08 and ID-08 do not explain more than four percentage points of the variation in Literacy-08 independently from national IQ.

Secondary education. The correlation between national IQ and Secondary-10 is 0.666 in the group of 134 countries and the explained part of variation 44%. When national IQ, PPP-GNI-08, and ID-08 are used to explain variation in Secondary-10, the multiple correlation rises to 0.688 (N=132) and the explained part of variation to 47 per cent. It is three percentage points more than what national IQ explains.

Tertiary enrolment ratio. The correlation between national IQ and Tertiary-09 in the group of 192 countries (0.773) is strong. The explained part of variation rises to 60 per cent, but it leaves still room for the impact of other explanatory variables. The multiple correlation, in which national IQ, PPP-GNI-08, and ID-08 are used to explain variation in Tertiary-09, rises to 0.816 (N=188) and the explained part of variation to 67 per cent. It is 6 percentage points more than what national IQ explains (61%) in the same group of 188 countries. It is clear that per capita income and the level of democratization do not have much impact on the extent of tertiary education independently from national IQ.

Moderate and strong positive correlations between national IQ and the three indicators of educational attainment lead to the conclusion that global disparities in educational attainments are principally due to differences in national IQs, although some environmental variables seem to have had some impact on these indicators independently from national IQ. It is easier to extend education in rich countries than in poor countries and perhaps also easier in democracies than in autocracies as the results of multiple regression analyses imply.

7. Regression of Tertiary-09 on National IQ

It would be useful to see on the basis of regression analyses how well the average relationship between national IQ and the three educational variables applies to single countries and which countries deviate most clearly from the regression line. This regression analysis is limited to Tertiary-09 variable, which is most strongly correlated with national IQ. The results are summarized in Figure 3.1. Detailed results for single countries based on the regression of Tertiary-09 on national IQ in the total group of 192 countries are given in Table 3.6.

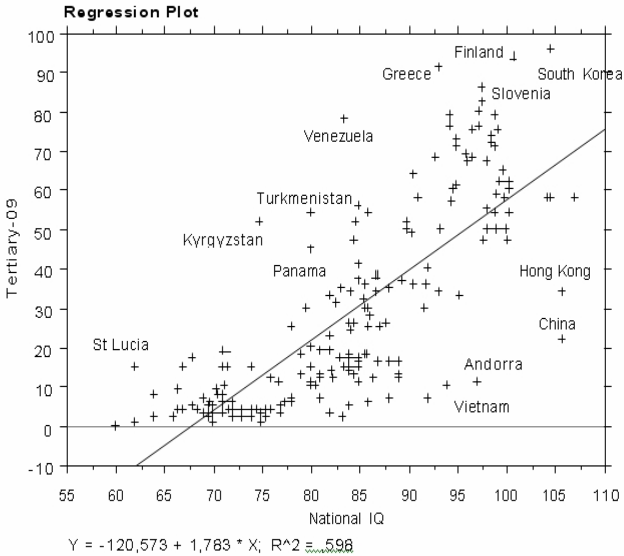

Figure 3.1. The results of regression analysis of Tertiary-09 on national IQ in the group of 192 countries

Figure 3.1 shows that the gross enrolment ratio in tertiary education is low in almost all countries below the national IQ level of 85, whereas it varies greatly above that level. The relationship between national IQ and Tertiary-09 is slightly curvilinear. The pattern of the relationship implies that significant global disparities in tertiary education will most probably continue in the future. It will be difficult for countries with low national IQs to raise the level of tertiary education, whereas it will most probably remain high in the group of countries with high national IQs.

Table 3.6. The results of regression analysis of tertiary gross enrolment ratio (Tertiary-09) on national IQ in the total group of 192 countries

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
1	Afghanistan	75.0	1	-12.1	13.1
2	Albania	82.0	19	-6.6	25.6
2	Algeria	84.2	24	-5.5	29.5
4	Andorra	97.0	11	-41.4	52.4
5	Angola	71.0	3	-3.0	6.0
6	Antigua & Barbuda	74.0	15	3.7	11.3
7	Argentina	92.8	68	23.1	44.9
8	Armenia	93.2	34	-11.6	45.6
9	Australia	99.2	75	18.7	56.3
10	Austria	99.0	50	-5.9	55.9
11	Azerbaijan	84.9	16	-14.8	30.8
12	Bahamas	84.0	15	-14.2	29.2
13	Bahrain	85.9	30	-2.6	32.6
14	Bangladesh	81.0	7	-16.8	23.8
15	Barbados	80.0	15	-7.0	22.0
16	Belarus	95.0	73	24.2	48.8
17	Belgium	99.3	62	5.5	56.5

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
18	Belize	76.8	11	-5.3	16.3
19	Benin	71.0	6	0	6.0
20	Bermuda	90.0	-	-	-
21	Bhutan	78.0	7	-11.5	18.5
22	Bolivia	87.0	38	3.5	34.5
23	Bosnia & Herzegovina	93.2	34	-11.6	45.6
24	Botswana	76.9	5	-11.5	16.5
25	Brazil	85.6	30	-2.0	32.0
26	Brunei	89.0	16	-22.1	38.1
27	Bulgaria	93.3	50	4.2	45.8
28	Burkina Faso	70.0	3	-1.2	4.2
29	Burundi	72.0	2	-5.8	7.8
30	Cambodia	92.0	7	-36.4	43.4
31	Cameroon	64.0	8	14.5	-6.5
32	Canada	100.4	62	3.6	58.4
33	Cape Verde	76.0	12	-2.9	14.9
34	Central African Rep.	64.0	2	8.5	-6.5
35	Chad	66.0	2	4.9	-2.9
36	Chile	89.8	52	12.5	39.5
37	China	105.8	22	-46.0	68.0

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
38	Colombia	83.1	35	7.4	27.6
39	Comoros	77.0	3	-13.7	16.7
40	Congo, Dem. Rep.	68.0	5	4.3	0.7
41	Congo, Rep.	73.0	4	-5.6	9.6
42	Cook Islands	89.0	-	-	-
43	Costa Rica	86.0	25	-7.7	32.7
44	Côte d'Ivoire	71.0	8	2.0	6.0
45	Croatia	97.8	47	-6.8	53.8
46	Cuba	85.0	37	6.0	31.0
47	Cyprus	91.8	36	-7.1	43.1
48	Czech Rep.	98.9	54	-1.7	55.7
49	Denmark	97.2	80	27.3	52.7
50	Djibouti	75.0	3	-10.1	13.1
51	Dominica	67.0	15	16.1	-1.1
52	Dominican Republic	82.0	33	7.4	25.6
53	Ecuador	88.0	35	-1.3	36.3
54	Egypt	82.7	31	4.1	26.9
55	El Salvador	78.0	25	6.5	18.5
56	Equatorial Guinea	69.0	3	0.6	2.4
57	Eritrea	75.5	2	-12.0	14.0

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
58	Estonia	99.7	65	7.8	57.2
59	Ethiopia	68.5	4	2.5	1.5
60	Fiji	85.0	15	-16.0	31.0
61	Finland	100.9	94	34.7	59.3
62	France	98.1	55	0.7	54.3
63	Gabon	69.0	7	4.6	2.4
64	Gambia	62.0	1	11.0	-10.0
65	Georgia	86.7	34	0	34.0
66	Germany	98.8	71	15.4	55.6
67	Ghana	69.7	6	2.3	3.7
68	Greece	93.2	91	45.4	45.6
69	Grenada	74.0	15	3.7	11.3
70	Guatemala	79.0	18	-2.3	20.3
71	Guinea	66.5	9	11.0	-2.0
72	Guinea-Bissau	69.0	3	0.6	2.4
73	Guyana	81.0	12	-11.8	23.8
74	Haiti	67.0	15	16.1	-1.1
75	Honduras	81.0	19	-4.8	23.8
76	Hong Kong	105.7	34	-33.9	67.9
77	Hungary	98.1	67	12.7	54.3
78	Iceland	98.6	72	16.8	55.2

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
79	India	82.2	14	-12.0	26.0
80	Indonesia	85.8	18	-14.4	32.4
81	Iran	85.6	36	4.0	32.0
82	Iraq	87.0	16	-18.5	34.5
83	Ireland	94.9	61	12.4	48.6
84	Israel	94.6	60	11.9	48.1
85	Italy	96.1	67	16.3	50.7
86	Jamaica	71.0	19	13.0	6.0
87	Japan	104.2	58	-7.2	65.2
88	Jordan	86.7	38	4.0	34.0
89	Kazakhstan	85.0	41	10.0	31.0
90	Kenya	74.5	4	-8.2	12.2
91	Kiribati	85.0	17	-14.0	31.0
92	Korea, North	104.6	58	-7.9	65.9
93	Korea, South	104.6	96	30.1	65.9
94	Kuwait	85.6	18	-14.0	32.0
95	Kyrgyzstan	74.8	52	39.2	12.8
96	Laos	89.0	13	-25.1	38.1
97	Latvia	95.9	69	18.6	50.4
98	Lebanon	84.6	52	21.8	30.2
99	Lesotho	66.5	4	6.0	-2.0

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
100	Liberia	68.0	17	16.3	0.7
101	Libya	85.0	56	25.0	31.0
102	Liechtenstein	100.3	54	-4.2	58.2
103	Lithuania	94.3	76	28.5	47.5
104	Luxembourg	95.0	71	22.2	48.8
105	Macao	99.9	58	0.5	57.5
106	Macedonia	90.5	36	-4.8	40.8
107	Madagascar	82.0	3	-22.6	25.6
108	Malawi	60.1	0	13.4	-13.4
109	Malaysia	91.7	0	-12.9	42.9
110	Maldives	81.0	13	-10.8	23.8
111	Mali	69.5	5	1.7	3.3
112	Malta	95.3	33	-16.3	49.3
113	Mariana Islands	81.0	-	-	-
114	Marshall Islands	84.0	17	-12.2	29.2
115	Mauritania	74.0	4	-7.3	11.3
116	Mauritius	88.0	16	-20.3	36.3
117	Mexico	87.8	26	-10.0	36.0
118	Micronesia	84.0	14	-15.2	29.2
119	Moldova	92.0	40	-3.4	43.4
120	Mongolia	100.0	50	-7.7	57.7

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
121	Montenegro	85.9	54	21.4	32.6
122	Morocco	82.4	12	-14.3	26.3
123	Mozambique	69.5	2	-1.3	3.3
124	Myanmar (Burma)	85.0	11	-20.0	31.0
125	Namibia	70.4	9	4.1	4.9
126	Nepal	78.0	6	-12.5	18.5
127	Netherlands	100.4	60	1.6	58.4
128	Netherlands Antilles	87.0	-	-	-
129	New Caledonia	85.0	-	-	-
130	New Zealand	98.9	79	23.3	55.7
131	Nicaragua	84.0	18	-11.2	29.2
132	Niger	70.0	1	-3.2	4.2
133	Nigeria	71.2	10	3.6	6.4
134	Norway	97.2	76	22.2	53.8
135	Oman	84.5	26	-4.1	30.1
136	Pakistan	84.0	5	-24.2	29.2
137	Palestine	84.5	47	16.9	30.1
138	Panama	80.0	45	23.0	22.0
139	Papua New Guinea	83.4	2	-26.1	28.1
140	Paraguay	84.0	26	-3.2	29.2

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
141	Peru	84.2	34	4.5	29.5
142	Philippines	86.1	28	-4.9	32.9
143	Poland	96.1	67	16.3	50.7
144	Portugal	94.4	57	9.3	47.7
145	Puerto Rico	83.5	15	-13.3	28.3
146	Qatar	80.1	11	-11.2	22.2
147	Romania	91.0	58	16.3	41.7
148	Russia	96.6	75	23.4	51.6
149	Rwanda	76.0	4	-10.9	14.9
150	St Helena	86.0	-	-	-
151	St Kitts & Nevis	74.0	15	3.7	11.3
152	St Lucia	62.0	15	25.0	-10.0
153	St Vincent & Grenadines	71.0	15	9.0	6.0
154	Samoa (Western)	88.0	7	-29.3	36.3
155	Sao Tome & Principe	67.0	4	5.1	-1.1
156	Saudi Arabia	79.6	30	8.7	21.3
157	Senegal	70.5	8	2.9	5.1
158	Serbia	90.3	49	8.6	40.4
159	Seychelles	84.4	13	-16.9	29.9
160	Sierra Leone	64.0	2	8.5	-6.5

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
161	Singapore	107.1	58	-12.4	70.4
162	Slovakia	98.0	50	-4.1	54.1
163	Slovenia	97.6	86	32.6	53.4
164	Solomon Islands	83.0	17	-10.4	27.4
165	Somalia	72.0	6	-1.8	7.8
166	South Africa	71.6	15	7.9	7.1
167	Spain	96.6	68	16.4	51.6
168	Sri Lanka	79.0	13	-7.3	20.3
169	Sudan	77.5	6	-11.6	17.6
170	Suriname	89.0	12	-26.1	38.1
171	Swaziland	75.4	4	-9.8	13.8
172	Sweden	98.6	74	18.8	55.2
173	Switzerland	100.2	47	-11.1	58.1
174	Syria	82.0	23	-2.6	25.6
175	Taiwan	104.6	58	-7.9	65.9
176	Tajikistan	80.0	20	-2.0	22.0
177	Tanzania	73.0	2	-7.6	9.6
178	Thailand	89.9	50	10.3	39.7
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	15	-16.0	31.0
181	Togo	70.0	5	0.8	4.2

	Country	National IQ	Tertiarty-09	Residual Tertiary-09	Fitted Tertiary-09
182	Tonga	86.0	6	-26.7	32.7
183	Trinidad & Tobago	86.4	12	-21.5	33.5
184	Tunisia	85.4	32	0.3	31.7
185	Turkey	89.4	37	-1.8	38.8
186	Turkmenistan	80.0	54	32.0	22.0
187	Uganda	71.7	4	-3.2	7.2
188	Ukraine	94.3	79	31.5	47.5
189	United Arab Emirates	87.1	25	-9.7	34.7
190	United Kingdom	99.1	59	2.9	56.1
191	United States	97.5	82	28.8	53.2
192	Uruguay	90.6	64	23.1	40.9
193	Uzbekistan	80.0	10	-12.0	22.0
194	Vanuatu	84.0	5	-24.2	29.2
195	Venezuela	83.5	78	49.7	28.3
196	Vietnam	94.0	10	-37.0	47.0
197	Yemen	80.5	10	-12.9	22.9
198	Zambia	74.0	2	-9.3	11.3
199	Zimbabwe	72.1	4	-4.0	8.0

Table 3.6 shows that the extent of tertiary education varies considerably in the world and that many countries deviate greatly

from the regression line in positive or negative direction. However, there are serious shortages in the comparability of data in several cases. Some large deviations may be more due to significant differences in the criteria of tertiary education than to real differences in the extent of tertiary education. For example, it is highly improbable that tertiary education is two times more extensive in Greece (95%) than in Switzerland (46%). Unfortunately national differences in the criteria of tertiary education and the use of estimated data weaken the reliability of data on Tertiary-09. Any way, despite obvious shortcomings in the comparability of data, it is interesting to see which countries deviate most from the regression line and to explore whether there are any systematic differences between large positive and negative outliers. Some of the most extremely deviating countries are named in Figure 3.1. Let us use residuals ±18.0 or higher to separate the most extremely deviating countries from countries which deviate less from the regression line (one standard deviation of residual Tertiary-09 is 16.1).

The group of large positive outliers (residual +18.0 or higher) includes the following 25 countries: Argentina, Australia, Belarus, Denmark, Finland, Greece, South Korea, Kyrgyzstan, Lebanon, Libya, Lithuania, Luxembourg, Montenegro, New Zealand, Norway, Panama, Russia, St. Lucia, Slovenia, Sweden, Turkmenistan, Ukraine, the United States, Uruguay and Venezuela.

Large positive outliers are not equally distributed around the world. Nine of them are old European and European offshoot democracies (Australia, Denmark, Finland, Greece, Luxembourg, New Zealand, Norway, Sweden and the United States). Argentina and Uruguay are also principally European offshoot countries. South Korea as an economically highly developed democracy belongs to the same category. Eight former socialist countries (Belarus, Kyrgyzstan, Lithuania, Montenegro, Russia, Slovenia, Turkmenistan and Ukraine) constitute another coherent group. Six of them are European countries. For 17 of these 20 countries, national IQ is above 90. The other five countries (Lebanon, Libya, Panama, St Lucia and Venezuela) are dispersed around the world without any common characteristics.

The group of large negative outliers (residual -18.0 or higher) includes the following 17 countries: Andorra, Brunei, Cambodia, China, Hong Kong, Iraq, Laos, Madagascar, Mauritius, Myanmar, Pakistan, Papua New Guinea, Samoa, Suriname, Tonga, Vanuatu and Vietnam.

Asian and Oceanian countries (12) dominate in the group of large negative outliers as clearly as European countries in the group of large positive outliers. Another clear difference between the two groups of large outliers is that for most positive outliers national IQ is higher than 90, whereas national IQ varies between 80 and 90 for most negative outliers. National IQ level of 90 seems to constitute a threshold above which tertiary education starts to rise. Three of these 17 countries are socialist or former socialist countries (China, Laos and Vietnam). China has the highest negative residual in the world (-46.0), which implies that human potential for the extension of tertiary education is enormous in China. Cambodia, Iraq, Myanmar and Pakistan have suffered from serious civil wars. The small size of population and/or isolated geographical position may have hampered the extension of tertiary education in countries like Andorra, Brunei, Mauritius, Samoa, Suriname, Tonga and Vanuatu. It is more difficult for very small countries to provide tertiary education than for more populous countries. This concerns particularly isolated small island states. Papua New Guinea and Madagascar are also island states.

In general, most countries with large negative residuals are much poorer and less democratized than countries with large positive residuals. On the basis of national IQ, we should expect a significant decrease of tertiary enrolment ratio in large positive outliers and a significant rise in the countries with large negative residuals, but differences in other explanatory variables (for example, in PPP-GNI-08 and ID-08) may support the continuation of extensive discrepancies. Besides, some of the large residuals may be due to measurement errors. Anyway, the results of regression analysis lead to the conclusion that great differences in the extent of tertiary education can be expected to continue in the world.

8. Researchers in R&D

We have one variable, researchers in research and development per million people in 1990-2003 (R&D), which measures the application of education and intelligence to research work. It is hypothesized that this variable is positively correlated with national IQ. Unfortunately data on R&D are available only from 97 countries, and countries with low national IQs (below 80) are underrepresented in the sample.

The Pearson correlation between national IQ and R&D is 0.666 (N=97) and Spearman rank correlation considerably higher (0.828). Empirical evidence supports the hypothesis strongly. However, national IQ does not need to be the only factor which explains variation in the R&D variable. It can be assumed that per capita income, democratization, and the level of tertiary education are able to raise the explained part of variation in R&D independently from national IQ. When national IQ, PPP-GNI-08, ID-08, and Tertiary-9 are used to explain variation in R&D, the multiple correlation rises to 0.795 (N=96) and the explained part of variation to 63 per cent, which is 19 percentage points more than national IQ explains (44%). National IQ remains as the dominant explanatory factor, but the three environmental variables raise the explained part of variation significantly. The results of the regression analysis of R&D on national IQ given in Figure 3.2 clarify the relationship between the two variables at the level of single countries.

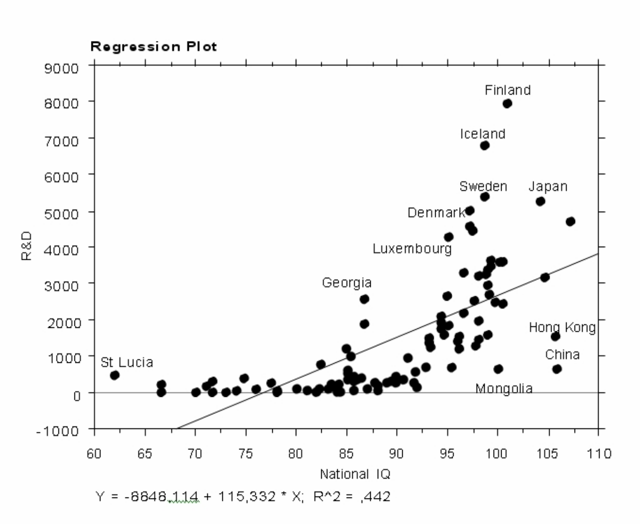

Figure 3.2. The results of regression analysis of R&D on national IQ in the group of 97 countries

Figure 3.2 shows that the relationship between national IQ and R&D is extremely curvilinear. The value of R&D remains low for almost all countries below the national IQ level of 90 and also for some countries above this national IQ level, but it has risen steeply in most countries above this IQ level. This is an interesting finding. It seems to imply that a national IQ level of 90 is needed to extend research activities significantly. It is worthwhile to compare the groups of the most extremely deviating countries. Let us use R&D residual ±1300 (one standard deviation is 1261) to separate large outliers from the less deviating countries.

The group of large positive outliers includes the following 11 countries: Denmark, Finland, Georgia, Guinea, Iceland, Japan, Luxembourg, Norway, St Lucia, Sweden and the United States. Large positive residuals for Guinea and St Lucia are due to the fact that because of the linear regression equation, their predicted R&D values are negative. The other nine countries are real positive outliers. Eight of them are European and European offshoot countries (Australia, Denmark, Finland, Iceland, Luxembourg, Norway, Sweden and the United States), and Japan is the first East Asian country which adopted modern science and technology that evolved in Europe.

The group of large negative outliers (residual -1300 or higher) includes only six countries: China, Hong Kong, Malaysia, Malta, Moldova and Mongolia. This group does not include any sub- Saharan African country. It would be technically impossible because the predicted values of R&D are negative for all countries below the national IQ level of 77 (see Figure 3.2). The linear regression line does not take into account the curvilinearity of the actual relationship. The national IQs of all large negative outliers are above 90, and three of these countries are socialist or former socialist countries. Malta is a small European island country, and Moldova is one of the poorest European countries. Modern science and research incubated and evolved in Europe, and some centuries later started to spread to other parts of the world, but it has been a slow process. Large negative residuals imply that these countries and especially China have great human potential to increase the number of researchers in R&D.

9. Conclusion

The examination of global disparities in educational achievements has shown that national IQ constitutes a background factor which explains more of the variation in educational variables than any other explanatory variable. Significant differences in the average intelligence of nations provide an explanation for the fact that global disparities in education are still extensive and that the equalization of educational levels and especially the quality of education does not seem to be possible, although disparities in literacy and primary education may decrease significantly. The fact that the level of adult literacy already approaches 100 percent in some countries with low national IQ implies that universal or nearly universal adult literacy should be ultimately possible to achieve, although adult literacy rate is still moderately correlated with national IQ. However, even if adult literacy rate and primary gross enrolment ratio approach 100 percent in all countries in the future, qualitative differences in functional literacy and primary education might still remain extensive and strongly correlated with national IQ.

National differences in tertiary enrolment ratios are so extensive and so strongly correlated with national IQ that it does not seem ever possible to achieve global equality in these fields of education. Such disparities reflect principally human diversity and especially national differences in the average intelligence of nations, although they are also related to some other explanatory variables.

Finally, the R&D variable indicates that more intelligent nations have been much more effective in the application of education and intellectual resources to inventions and research activities than less intelligent nations. A national IQ level of 90 seems to constitute a threshold above which the relative number of researchers in R&D starts to rise. The creation of new productive technologies and research work is concentrated nearly completely to countries of relatively high national IQs. It is plausible to assume that this relationship will remain more or less similar in the future.

The impact of other possible explanatory factors on the variation in educational variables was explored by multiple regression analyses. The purpose was to see how much some relevant environmental variables were able to explain of the variation in dependent variables independently from national IQ. It should be noted that we do not regard environmental variables to be causally equal with national IQ as explanatory variables for the reason that practically all of them are more or less dependent on national IQ. Therefore we take into account only the part of the variation in a dependent variable which they explain independently from national IQ. In the following, the results of correlation and multiple regression analyses are summarized on the basis of our socio-biological research formula (y = (b+e) + x), in which y = a problem in need of explanation, b = a variable indicating the evolutionary roots of the problem, e = relevant environmental factors, and x= the unexplained part of the problem.

Literacy-08 (N=187) = (national IQ 41% + PPP-GNI-08, ID-08 4%) + unexplained variation 55%.

Secondary-10 (N=132) = (national IQ 44% + PPP-GNI-08, ID-08 3%) + unexplained variation 53%.

Tertiary-09 (N=188) = (national IQ 61% + PPP-GNI-08, ID-08 6%) + unexplained variation 33%.

Researchers in R&D per million people (N=96) = (national IQ 44% + PPP-GNI-08, ID-08, Tertiary-09 19%) + unexplained variation 37%.

National IQ explains more than 40 per cent of the variation in all dependent variables, and two or three environmental variables increase the explained part of variation in dependent variables from 3 to 19 percentage points independently from national IQ. These results support our argument that national IQ is the principal causal factor responsible for the educational input and output variables.

Chapter 4

Economics: Per Capita Income, Poverty, Inequality

1. Effects of Intelligence on Earnings. 2. Economists' Studies of Effects of IQ on Earnings. 3. Intelligence and Per Capita Income across Nations. 4. National IQs and Economic Growth. 5. National IQs and other Economic Variables. 6. New Global Comparisons. 7. Variables. 8. National IQ and Per Capita Income 2008. 9. Measures of Poverty. 10. Income Inequality. 11. Historical Analysis Based on Maddison's Estimates. 12. Unemployment. 13. Summary.

1. Effects of Intelligence on Earnings

There is a large research literature showing the positive effect of intelligence on earnings among individuals. The classical study is Christopher Jencks' *Inequality* (1972) in which he synthesized American research and estimated that the correlation between intelligence and earnings is 0.31 (corrected for attenuation to 0.35). He also estimated that IQ has a heritability of about 50 per cent, and therefore that genetic factors contribute to income differences. Jencks' estimate has proved remarkably accurate in the light of later studies reported for a number of countries and summarized in Table 4.1. This gives the ages at which the IQs were measured and the age at which the earnings were obtained. Thus, the first two rows give the results for Britain for a national sample whose intelligence was measured at the age of 8 years and whose income was obtained at the age of 43 years. The correlations between IQ and income were 0.37 for men and 0.32 for women. These results are typical of the rest of the studies. It will be noted that the correlation in the British study is a little lower for women than for men, and this is also present in the Netherlands given in rows 3 and 5, where the correlation is 0.17 for men and 0.03 for women. The explanation for this is probably that a number of high IQ women take out time to rear children and this reduces their earnings. It will also be noted that the correlations are lower for those in their twenties, for which the median is 0.21, than for those aged thirty and over, for which the median is 0.33. The explanation for this is that those with high IQs frequently do not earn much more in their twenties than those with low IQs, but from their thirties their earnings' advantage increases. The last row gives the results of a meta-analysis of studies in the United States, Britain, Norway, New Zealand, Australia, Estonia, Sweden and the Netherlands, and reports a correlation of 0.23 between IQ and subsequent earnings.

Table 4.1. Correlations between IQ and earnings

	Country	N	Sex	Age IQ	Age Earnings	r	Reference
1	Britain	1,280	M	8	43	.37	Irving & Lynn, 2006
2	Britain	1,085	F	8	43	.32	Irwing & Lynn, 2006
3	Germany	433	M	40	40	.32	Anger & Heineck, 2011
4	Netherlands	835	M	12	43	.17	Dronkers, 1999

	Country	N	Sex	Age IQ	Age Earnings	r	Reference
5	Netherlands	819	M	12	53	.19	Dronkers, 1999
6	Netherlands	350	F	12	43	.03	Dronkers, 1999
7	Netherlands	237	F	12	53	.19	Dronkers, 1999
8	Norway	1,082	M/F	18	-	.33	Tambs et al., 1989
9	Sweden	346	M	10	25	.08	Fagerlind, 1975
10	Sweden	460	M	10	30	.22	Fagerlind, 1975
11	Sweden	631	M	10	35	.34	Fagerlind, 1975
12	Sweden	707	M	10	43	.40	Fagerlind, 1975
13	Sweden	312	M	20	25	.10	Fagerlind, 1975
14	Sweden	410	M	20	30	.22	Fagerlind, 1975
15	Sweden	532	M	20	35	.43	Fagerlind, 1975
16	Sweden	585	M	20	43	.50	Fagerlind, 1975
17	USA	-	M	45	45	.31	Duncan, 1968
18	USA	345	M		19	.15	Hause, 1971
19	USA	345	M		24	.29	Hause, 1971
20	USA	345	M		29	.46	Hause, 1971
21	USA	345	M		34	.49	Hause, 1971
22	USA	4,388	M	17	25	.26	Hauser et al., 1973

	Country	N	Sex	Age IQ	Age Earnings	r	Reference
23	USA-whites	24,812	M	18	30	.24	Brown & Reynolds 1975
24	USA-whites	24,812	M	18	36	.33	Brown & Reynolds 1975
25	USA-blacks	4,008	M	18	30	.08	Brown & Reynolds 1975
26	USA-blacks	4,008	M	18	36	.13	Brown & Reynolds 1975
27	USA-whites		M	17	28	.20	Jencks, 1979
28	USA	12,686	M/F	18	30	.37	Murray, 1998
29	USA	1,943	M/F	18	30	.35	Rowe et al., 1998
30	USA	-	M	12	45	.53	Judge et al., 1999
31	USA-whites	3,484	M	19	37	.36	Nyborg & Jensen, 2001
32	USA-blacks	493	M	19	37	.37	Nyborg & Jensen, 2001
33	USA	1,448	M	17	27	.22	Mrnane et al, 2001
34	International	29,152	M/F	-	-	.23	Strenze, 2007

It is apparent that all of the studies show positive correlations between IQs obtained in childhood or adolescence and earnings in adulthood. These studies show that IQ is a determinant of income because IQs are established quite early in childhood (Jensen, 1998), so the direction of causation must be from IQ to income in adulthood. It might be supposed that the family environment is the common cause of children's intelligence and their subsequent adult earnings, but this is improbable because it has been shown by Duncan, Featherman and Duncan (1972) and by Jencks (1972) that the positive relation between childhood IQ and adult income is present when parental socio-economic status is controlled. Furthermore, among pairs of brothers who have been raised in the same family and have experienced the same environment, the brother with the higher IQ in childhood has the greater earnings in adulthood (Jencks, 1972; Murray, 1998; Waller, 1971).

2. Economists' Studies of Effects of IQ on Earnings

The studies summarized in Table 4.1 have been largely conducted by psychologists and sociologists. The effects of intelligence on earnings have also been studied by economists who typically use the terms like *cognitive ability* (Crawley, Heckman and Vytlactil, 2001) or *intellectual capacity* (Zax and Rees, 2002). Economists do not normally express the relationship between *cognitive ability* or *intellectual capacity* as a correlation coefficient. They generally prefer to express it as the effect of an increase of one standard deviation of intelligence on the percentage increase in earnings. The results of nine studies are summarized in Table 4.2. Row 1 gives data for a sample in Kalamazoo whose IQs were obtained in sixth grade between 1928 and 1952, and whose earnings were obtained as adults of various ages. His estimate was that an increase of one standard deviation of intelligence produces a 15 percentage increase in earnings. It will be seen that the effect of intelligence on earnings is greater among older people. For instance, rows 3 and 4 give the results of a national sample of the NLSY (National Longitudinal Study of Youth) that was born between 1961 and 1964 and intelligence tested between the ages of 15-18 with the AFQT (Armed Forces Qualification Test). The results show that a one standard deviation advantage in IQ produces a 17 per cent increase in earnings for men at the age of 19 to 32 and 23 per cent increase in earnings of women. The data given in rows 6 and

7 confirm those shown in Table 4.1 that intelligence has a greater positive effect on earnings among older people. The results show that a one standard deviation advantage in IQ produces an 11 per cent increase in earnings for men at the age of 35 and a 22 per cent increase in earnings at the age of 53.

Table 4.2. Effects of IQ on earnings

	Country	**Number**	**Sex**	**Age IQ**	**Age earnings**	**% effect IQ on earnings**	**Reference**
1	USA	692	M	12	-	15	Crouse, 1979
2	USA	1,774	M	25-64	25-64	19	Bishop, 1989
3	USA	1,593	M	15-18	19-32	17	Neal & Johnson, 1996
4	USA	1,446	F	15-18	19-32	23	Neal & Johnson, 1996
5	USA	1,448	M	17	27	19	Murnane et al, 2001
6	USA	2,959	M	17	35	11	Zax & Rees, 2002
7	USA	2,264	M	17	53	21	Zax & Rees, 2002

There are two principal explanations for the positive association between IQ and earnings. The first of these is that people with high IQs typically obtain advanced education in which they acquire more complex skills, such as those required for professional and executive occupations, that command higher earnings. This has been shown by Hunter and Hunter (1984) in a meta-analysis of 425 American studies through in which jobs were categorized into high, medium and low complexity. The results were that intelligence is correlated with trainability for high complexity occupations at 0.58, for medium complexity occupations at -0.40, and for low complexity occupations at 0.25. These results have been confirmed in a meta-analysis of 69 European studies by Salgado et al. (2003) that reported that intelligence is correlated more highly with trainability for high and medium complexity occupations (0.29) than for low complexity occupations (0.23), although the correlations in the European studies are rather lower than in the United States.

The second explanation for the positive association between IQ and earnings is that people with high IQs work more proficiently than those with low IQs. This makes them more productive and able to secure higher earnings. This has been shown by Ghiselli (1966) and by Hunter and Hunter (1984) in their meta-analysis of 425 American studies. In more recent work, Schmidt and Hunter (1998) have published a synthesis of American studies reported from the 1920s through the mid-1990s showing an overall correlation of 0.51 between IQ and job proficiency. They conclude that "the conclusion from this research is that for hiring employees without previous experience in the job the most valid predictor of future performance is general mental ability". Similar results have been reported in a meta-analysis of 69 European studies by Salgado et al. (2003) who conclude that intelligence is positively correlated at 0.25 with job proficiency.

3. Intelligence and Per Capita Income across Nations

From these studies showing that intelligence is positively and causally related to earnings among individuals, it can be predicted that this association should also be present across nations. The earnings of nations are generally expressed as per capita income. The results of studies confirming that national IQs are positively related to per capita income are summarized in Table 4.3.

Table 4.3. Correlations between national IQ and per capita income

	Variable	N countries	r x IQ	Reference
1	GNP per capita, 1998	81	.66	Lynn & Vanhanen, 2002
2	GDP per capita, 1996	81	.66	Lynn & Vanhanen, 2002
3	Real GDP per capita, 1998	81	.73	Lynn & Vanhanen, 2002
4	GNP-PPP per capita, 1998	65	.77	Lynn & Vanhanen, 2002
5	GNP per capita, 1998	185	.57	Lynn & Vanhanen, 2002
6	Real GDP per capita, 1998	185	.62	Lynn & Vanhanen, 2002
7	GDP per capita, 1996	185	.62	Lynn & Vanhanen, 2002
8	GNP-PPP per capita, 1998	141	.70	Lynn & Vanhanen, 2002
9	GNI-PPP per capita, 2002	113	.68	Lynn & Vanhanen, 2002
10	GNI-PPP per capita, 2002	192	.60	Lynn & Vanhanen, 2002
11	Log GDP, 1975-2003	81	.82	Meisenberg, 2004
12	GNP per capita, 1976: linear	81	.54	Barber, 2005
13	GDP per capita: linear	81	.73	Dickerson, 2006
14	GDP per capita: linear	185	.62	Dickerson, 2006
15	GDP per capita: quadratic	81	.78	Dickerson, 2006
16	GDP per capita: quadratic	185	.67	Dickerson, 2006
17	GDP per capita: exponential	81	.84	Dickerson, 2006
18	GDP per capita: exponential	185	.69	Dickerson, 2006
19	GDP per capita, PPP, 1992	70	.89	Jones & Schneider, 2006

	Variable	N countries	r x IQ	Reference
20	GDP per capita, 2002: quadratic	185	.65	Whetzel & McDaniel, 2006
21	GDP per capita	98	.51	Ram, 2007
22	Log GDP	57	.74	Lynn et al., 2007
23	GDP per capita	185	.63	Rindermann, 2008a
24	Log GDP per capita	185	.78	Rindermann, 2008a
25	GDP per capita, 1998	17	.78	Rindermann, 2008b
26	GDP per capita, 2004	152	.76	Morse, 2008
27	GDP per capita, 2003-5	112	.56	Gelade, 2008
28	Log GDP per capita, 2003-5	112	.71	Gelade, 2008
29	GDP per capita	129	.61	Templer, 2008
30	GDP per capita, 1998	77	.72	Hunt & Wittmann, 2008
31	Log GDP per capita, 1998	77	.82	Hunt & Wittmann, 2008
32	Log GDP per capita, 2005	35	.79	Saadat, 2008
33	GNI-PPP per capita, 2002	113	.58	Rushton & Templer, 2009
34	Log GDP-PPP, 1990-2005	170	.69	Meisenberg, 2009
35	GDP per capita, 2003	84	.61	Rindermann et al., 2009
36	Log GDP-PPP, 1975-2005	126	.73	Meisenberg, 2011
37	Log GDP, 1995-2005	82	.74	Meisenberg & Lynn, 2011
38	Log GDP	192	.65	Dama, 2011

Rows 1 through 4 summarize the results of our first study of the correlations between national IQs and measures of national per capita income based on the 81 nations for which we had measured IQs, or in the case of the data given in row 4, the 65 nations for which there were data for measured IQs and GNP at PPP (Gross National Income at Purchasing Power Parity) per capita, 1998. The correlations between national IQs and these measures of national per capita income are in the range between 0.66 and 0.73. Rows 5 through 8 give correlations between national IQs and various measures of national per capita income based on the 1985 nation data set consisting of the 81 nations for which they had measured IQs and a further 104 nations for which they had IQs estimated from neighboring countries whose populations were culturally and racially similar. The correlations range between 0.57 and 0.70 and are consistently a little lower than those on the 81 nation data set. The likely reason for this is that measured national IQs are more valid than estimated national IQs.

Rows 9 and 10 give correlations between national IQs and per capita income reported in Lynn & Vanhanen (2006). Row 9 gives a correlation of 0.68 based on the 113 nations for which they had measured IQs, and row10 gives a correlation of 0.60 based on the 192 nations for which they had measured IQs and estimated national IQs. Once again, the correlation for the measured 113 nation IQs is a little higher than for that for the larger 192 nation data set, probably for the reason that measured national IQs are more valid than estimated national IQs.

Row 11 gives the first confirmation of a substantial correlation between national IQ and per capita income measured as log GDP (averaged 1975-2003). The author used log GDP on the grounds that this equates the effect of a doubling of GDP in low and high GDP countries. He showed that the use of log GDP increases the correlation with national IQ to 0.82, based on 81 countries, higher than any of the correlations previously reported. Row 12 gives the second confirmation of a positive correlation between national IQ and per capita income, which is a little lower than the others at 0.54 but is statistically significant.

Rows 13 through 18 give six correlations between national IQs and various measures of per capita income reported. The author analyzed further the relationship by fitting linear, quadratic and exponential curves to the data for 81 and 185 nations and found that fitting exponential curves gave the best results. His interpretation was that "a given increment in IQ, anywhere along the IQ scale, results in a given *percentage* in GDP, rather than a given dollar increase as linear fitting would predict" (Dickerson, 2006, p. 291). He suggests that

> exponential fitting of GDP to IQ is logically meaningful as well as mathematically valid. It is inherently reasonable that a given increment of IQ should improve GDP by the same proportional ratio, not the same number of dollars. An increase of GDP from $500 to $600 is a much more significant change than is a linear increase from $20,000 to $20,100. The same proportional change would increase $20,000 to $24,000. These data tell us that the influence of increasing IQ is a proportional effect, not an absolute one (p. 294).

The author noted that his correlations were consistently higher for the 81 nation sample than for the 185 nation sample and suggested that this is attributable to more errors in the 1985 nation sample.

Row 19 gives the highest correlation (0.89) between national IQ and per capita income measured as GDP per capita PPP, 1992. The study is based on 70 countries, used on the grounds that 11 of the national IQs given in Lynn and Vanhanen data set are sub-optimal.

Row 20 gives a correlation between national IQ and per capita income (GDP, 2002) of 0.65 in a study that assumed that the lowest national IQ is 90 on the grounds that the IQs of a number of countries with IQs lower than this could be too low and inaccurate. The restriction of range entailed by this assumption makes little difference to the magnitude of the correlation. Row 21 gives a correlation of 0.51 between national IQ and per capita income measured as GDP per capita per working-age person, rather than for the total population.

Rows 22 through 38 give the results of further studies all showing substantial and significant correlations between national IQs and various measures of per capita income, based on different years, different numbers of nations, and different measures of national per capita income, including log GDP, and different statistical analyses including quadratic and exponential correlations. These refinements have generally given higher correlations with national IQs than those reported by Lynn and Vanhanen (2002, 2006). The last row gives a correlation between national IQ and log GDP of 0.65 based on all 192 countries in the world with populations in excess of 40,000 and the largest number of countries examined hitherto.

4. National IQs and Economic Growth

Because national IQs are substantially correlated with per capita income, it can be assumed that national IQs must be associated with economic growth at some time in the past. To examine this prediction, the correlations of national IQ with economic growth for various time periods are given in Table 4.4.

Table 4.4. Economic growth correlates of national IQ

	Economic growth variables	**N Countries**	**r x IQ**	**Reference**
1	GNP per capita, 1998	81	.66	Lynn & Vanhanen, 2002
2	GDP per capita, 1820-1992	26	.73	Lynn & Vanhanen, 2002

	Economic growth variables	N Countries	r x IQ	Reference
3	GDP per capita, 1890-1910	28	.21	Lynn & Vanhanen, 2002
4	GDP per capita, 1910-1992	47	.53	Lynn & Vanhanen, 2002
5	GDP per capita, 1950-1990	166	.45	Lynn & Vanhanen, 2002
6	GNP per capita, 1976-1998	148	.45	Lynn & Vanhanen, 2002
7	GDP per capita, 1983-1996	181	.28	Lynn & Vanhanen, 2002
8	GDP per capita, 1987-1998	127	-.01	Lynn & Vanhanen, 2002
9	GNP per capita, 1995-1998	123	-.01	Lynn & Vanhanen, 2002
10	GDP per capita, 1500-2000	109	.71	Lynn & Vanhanen, 2006
11	GDP per capita %, 1950-2001	132	.39	Lynn & Vanhanen, 2006
12	GDP per capita$, 1950-2001	132	.75	Lynn & Vanhanen, 2006
13	GDP per capita, 1990-2002	145	-.06	Lynn & Vanhanen, 2006
14	Economic growth, 1950-1990	185	.44	Rindermann, 2008
15	Economic growth, 1975-2005	126	.37	Meisenberg, 2011
16	Economic growth, 1975-2005	71	.47	Meisenberg & Lynn, 2011

The first nine rows in the table give the correlates of national IQs with economic growth for different time periods that we gave in Lynn and Vanhanen (2002, p. 116). It will be noted that over the long time periods in the first seven rows, the correlations are all positive, and the correlation is highest 0.73 for the longest time period 1820-1992. For the last two short time periods 1987-1998 and 1995-1998 the correlations are zero.

We updated these figures for economic growth rates in Lynn and Vanhanen (2006, pp. 188-189), and are given in rows 10 through13. Row 10 gives the highest correlation of 0.71 for the very long time period 1500-2000. Rows 11 and 12 give two correlations for national IQs and economic growth rates over the period 1950-2001. The first (0.39) is the average annual per capita growth rate in percentage points, and the second (0.75) is the average annual per capita growth rate in dollars. The explanation for this difference is that countries may have the same annual growth rate in percentage points, but in dollars the annual growth rate may be many times higher in rich countries than in poor countries. This is why the two correlations with national IQ differ so much from each other. The percentage growth rate is only weakly correlated with national IQ (0.39), whereas the growth rate in dollars is strongly correlated with national IQ (0.75). Row 13 gives a correlation of -0.06 (effectively zero) between national IQs and economic GDP per capita, 1990-2002, and confirms the results in rows 8 and 9 showing that for recent short time periods 1987-1998 and 1995-1998 the correlation between national IQ and economic growth is zero.

Row 14 gives a correlation of 0.44 between national IQs and economic growth for 185 countries, the largest number hitherto reported and comprising virtually all nations in the world. Rows 15 and 16 summarize results of two further studies confirming a positive correlation between national IQs and economic growth for 1975-2005.

The principal conclusion to be drawn from these studies is that national IQs predict economic growth rates over very long periods, such as 1500-2000 given in row 10, for which the correlation is 0. 71. Over shorter time periods such as 1950-1990 given in row 14, the correlation is lower at 0.44. Over very short time periods such as 1990-2002 the correlation is zero (-0.06). The explanation for this is that various shocks such wars, large increases in the price of oil and so on, reduce the growth rate of some countries in the sort term, but over the long term these have little effect and national IQ emerges as the major determinant of economic growth rates.

This conclusion may be surprising to economists because theoretically it would be expected that low IQ countries would have faster economic growth rates than high IQ countries because of what Weede and Kämpf (2002) call "the advantage of backwardness". This advantage should be present because of the potential of poor countries to adopt the technologies and management practices of wealthier countries, whereas wealthier countries depend on innovation. However, the studies summarized in this section show that this is not so, and that the correlation between national IQs and economic growth over the long period is positive. Meisenberg (2011) discuss this question and suggests that the explanation may be that a high IQ population is more likely to establish effective economic institutions that favor economic growth.

5. National IQs and other Economic Variables

A number of studies have reported other economic variables that are correlated with national IQs. These are summarized in Table 4.5.

Table 4.5. Correlations between national IQ and other economic variables

	Economic Growth Variables	N countries	r x IQ	Reference
1	Economic freedom	59	.76	Meisenberg, 2004
2	Economic freedom	123	.61	Lynn & Vanhanen, 2006
3	Economic freedom, 1960-2000	165	.52	Meisenberg, 2011
4	Economic freedom	126	.53	Meisenberg, 2011

	Economic Growth Variables	N countries	r x IQ	Reference
5	Economic freedom	82	.56	Lynn & Meisenberg, 2011
6	Incomes in US	59	.47	Jones & Schneider, 2010
7	Employment: % Agriculture	81	-.71	Barber, 2005
8	Employment: % Agriculture	170	-.70	Meisenberg, 2009
9	Investment: GDP	98	.61	Ram, 2007
10	Income equality: Gini index	51	-.60	Meisenberg, 2004
11	Income inequality: Gini index	146	-.54	Lynn & Vanhanen, 2006
12	Income inequality: Gini index	52	-.52	Lynn et al., 2007
13	Income inequality: Gini index	148	-.51	Rindermann, 2008a
14	Income inequality: Gini index	127	-.51	Kanazawa, 2009
15	Income inequality: Gini index	126	-.58	Meisenberg, 2011
16	Poverty: %	96	-.63	Lynn & Vanhanen, 2006
17	Savings	129	.48	Jones & Podemska, 2010
18	Self-employment	117	.49	Vinogradov & Kolvereid, 2010
19	Undernourishment	124	-.50	Lynn & Vanhanen, 2006

Rows 1 through 5 give positive correlations ranging between national IQs and economic freedom. Row 1 gives the highest correlation (0.76) with economic freedom defined and measured as the extent of personal choice, voluntary exchange, freedom of economic competition, and the rule of law providing legal protection of the person and property. Row 2 confirms this correlation (0.61) with economic freedom measured as the EFR (Economic Freedom in the World) index calculated from the size of government, legal security of property rights, sound money, free trade across countries, and regulation of credit, labor and business. Row 3 provides further confirmation of this correlation (0.52) with economic freedom defined as "mainly the extent of bureaucracy and red tape faced by business people". Rows 4 and 5 give similar positive correlations of 0.53 and 0.56. These positive correlations indicate that countries with higher IQs have better developed market economies and greater restrictions on the power of bureaucrats. This is one of the ways by which higher IQ countries achieve higher rates of economic growth.

Row 6 gives a correlation of 0.47 between national IQs and the incomes of immigrants of from these nations in the United States. The explanation suggested by the authors is that the immigrants have the same average IQs as the countries from which they come, so those who come from countries with higher IQs have higher incomes in US.

Rows 7 and 8 give negative correlations of -0.71 and -0.72 between national IQs and the percentage of the labor force engaged in agriculture. The author suggests "the most parsimonious explanation is that the lower level of education received in agricultural societies means that there is less opportunity for academic ability to develop. As countries become economically developed and as the importance of agricultural labor declines, parents produce fewer offspring and invest more in their education and cognitive development" (Barber, 2005, p. 280). It may be doubted whether this is the correct explanation because of the weight of evidence indicating that family size has no causal relation to IQ (Abdel-Khalek and Lynn, 2008; Rogers, Cleveland,van den Ord and Rowe, 2000). Row 9 gives a correlation of 0.61 between national IQs and investments as the average ratio of investment to GDP over the years 1960-85.

Rows 10 through 15 give five studies showing negative correlations of -0.51 to -0.60 between national IQs and income inequality measured with the Gini index, the values of which range from zero (perfect equality of incomes) to 1 (one person earns all). The negative correlations show that high IQ countries have less income inequality. The explanation proposed by Meisenberg (2011) is that a more-or-less equal income distribution leads to the greatest happiness of the greatest number. We can expect that societies whose members are capable of reasoning at this level will develop mechanisms to restrain the exploitation of the weak by the strong and to redistribute wealth from the rich to the poor.

The negative correlations between national IQs and income inequality is predictable from studies showing that among individuals, intelligence is associated with liberalism defined as genuine concern for the welfare of genetically unrelated others and the willingness to contribute larger proportions of private resources for the welfare of such others. In the modern political and economic context, this willingness usually translates into paying higher taxes toward government and its welfare programs (Kanazawa, 2010, p. 286). It has been shown that those who identify themselves as very liberal in early adulthood had a childhood IQ of 106.4, while those who identify themselves as very conservative in early adulthood had a childhood IQ of 94.8 (Kanazawa, 2010, p. 286). It follows from this that national populations with high IQs would be more liberal and favor greater equality of incomes.

Row 16 gives a correlation of -0.63 between national IQs and the percentage of the population in poverty measured as having an income below $2 a day. The negative correlation indicates that higher IQ countries have smaller percentages of the population in poverty. This reflects their higher per capita incomes.

Row 17 gives a correlation of 0.48 between national IQs and the savings rate calculated from the ratio of the holdings of US treasury bonds to nominal GDP over the years 1980-2005. The authors argue that this is predictable from the positive association of IQ with a lower time preference and a greater propensity to postpone immediate gratification for future benefits among individuals.

Row 18 gives a correlation of 0.49 between national IQs and the rate of self-employment among 117 immigrant groups in Norway. The author notes that this is consistent with results at the individual level showing that the self-employed have above average IQs reported by De Wit and Winden (1989).

Row 19 gives a negative correlation of -0.50 between national IQs and the percentage of the population undernourished 1999-2002. The negative correlation indicates that higher IQ countries have smaller percentages of the population undernourished. This reflects their higher per capita incomes, but we believe there is also a positive feedback loop such that undernourishment reduces the IQ as well as a low IQ producing undernourishment.

6. New Global Comparisons

In our previous books we showed that national IQs and per capita income are correlated at around 0.6 and 0.8, and hence that national IQs explain approximately 50 percent of the variation in national per capita income. In this section we present updated data using our updated national IQs given in Chapter 2 and per capita income measured as PPP-GNI for 2008 and some measures of poverty and economic inequality.

In this chapter, we start our survey of human conditions related to national IQ by exploring to what extent differences in economic circumstances are related to national IQ. We focus on indicators of per capita income, poverty, and economic inequality. We assume that people use their intelligence to improve their living conditions. Consequently, it is reasonable to hypothesize that per capita income tends to be positively correlated with national IQ and that the extent of poverty is negatively correlated with national IQ. Economic inequality is a more problematic phenomenon. The emergence of economic inequalities can be assumed to be, at least partly, a consequence of the fact that intelligence among people varies greatly in all countries. More intelligent people tend to become more prosperous than less intelligent people. However, the level of economic inequality is not constant across countries. It is reasonable to hypothesize that when the average national IQ rises, the level of inequality decreases, because in countries with higher national IQs there are more people able to improve their living conditions than in countries of lower national IQs.

Besides, it is justifiable to assume that the hypothesized positive relationship between national IQ and per capita income has existed also in earlier periods of human history. It is difficult to test this hypothesis by empirical evidence because we have only contemporary data on national IQs. However, historical data and estimates of per capita income published in Angus Maddison's books make it possible to test the relationship between contemporary national IQs and historical estimates of per capita income over the period AD 1 - 2030.

7. Variables

There are various measures of per capita income, poverty, and inequality. We focus on some indicators on which statistical data are available principally from the World Bank publications and from UNDP's *Human Development Reports.* Unfortunately those data are not available for all countries of the world, which means that the results of statistical analyses to some extent vary depending on the sample of countries.

Only one indicator will be used to measure the global variation in per capita income: purchasing power parity gross national income in U.S. dollars 2008 (PPP-GNI-08). Most data on this variable are from the World Bank's *World Development Indicators 2010* (WDI-10, Tables 1.1 and 1.6). Data were complemented by data on GDP-per capita (PPP) given in CIA's

The World Factbook 2009 in the following cases: Andorra, the Bahamas, Barbados, Bermuda, the Cook Islands, Cuba, Haiti, Iraq, North Korea, Liechtenstein, the Mariana Islands, the Marshall Islands, Myanmar (Burma), the Netherlands Antilles, New Caledonia, Puerto Rico, Qatar, St Helena, Somalia, Taiwan, the United Arab Emirates and Zimbabwe. Our data cover 197 of the 199 countries of this study (data are missing from Palestine and Tibet).

Two indicators will be used to measure the variation in the extent of poverty rates at international poverty lines: Population below $1.25 a day % (Below 1.25) and Population below $2 a day % (Below 2). Data on these indicators are from WDI-10 (Table 2.8) and they cover 101 countries. Data are lacking for nearly all economically highly developed countries, which to some extent weakens correlations between national IQ and the two indicators of poverty. Further, UNDP's Multidimensional Poverty Index (MPI-00-08) complements money-based measures by considering multiple deprivations and their overlap. It identifies deprivations across the same three dimensions as the HDI (health, education, and income). Data are derived from household surveys. "Each person in a given household is classified as poor or nonpoor depending on the number of deprivations his or her household experiences. These data are then aggregated into the national measure of poverty" (*Human Development Report 2010*, pp. 7, 221). Data on MPI 2000-2008 are from HDR 2010 (Table 5) and they cover 100 countries.

Finally, two indicators will be used to measure the variation in income inequality: Gini index (Gini) and the percentage share of income or consumption, highest 20% (Highest 20%). "Gini index measures the extent to which the distribution of income (or consumption expenditure) among individuals or households within an economy deviates from the perfectly equal distribution" (WDI-10, p. 97). Data on these indicators are from WDI-10 (Table 2.9), and they cover 147 countries. Unfortunately data are missing from many countries, but the two samples cover countries from all levels of national IQ and from all continents. The intercorrelations of the six indicators are given in Table 4.6.

Table 4.6. Intercorrelations of the six indicators of per capita income, poverty, and economic inequality in various samples of countries

Variable	**PPP-GNI 2008**	**Below $1.25**	**Below $2.0**	**MPI 00-08**	**Gini**	**Highest 20%**
PPP-GNI-08	1.000	-.635	.737	-.608	-.372	.360
		N=101	N=101	N=100	N=147	N=147
Below $1.25		1.000	.950	.862	.153	.183
			N=101	N=81	N=100	N=100
Below $2.0			1.000	.880	.135	.171
				N=81	N=100	N=100
MPI-2000-08				1.000	.163	.156
					N=97	N=97
Gini index					1.000	.985
						N=147
Highest 20%						1.000

The correlations between the six indicators of per capita income, poverty, and economic inequality vary greatly. The three measures of poverty (Below 1.25, Below 2, and MPI-00-08) are strongly correlated with each other as well as two measures of inequality (Gini and Highest 20%). Most of the other intercorrelations are weak. The correlations between PPP-GNI-08 and the three measures of poverty are moderate, whereas its correlations with two measures of inequality (Gini and Highest 20%) are weak (-0.372 and -0.360). The correlations between the three measures of poverty and two measures of inequality (Gini and Highest 20%) are near zero. It is remarkable that per capita income is almost independent from the two measures of economic inequality and that it is only moderately correlated with the measures of poverty.

Hypotheses will be tested in three groups of countries: in the total group of 199 countries, in the smaller group of 155 countries whose population in 2008 was at least one million inhabitants, and in the group of countries with measured national IQs (N=158) because it was found in our previous studies (Lynn and Vanhanen, 2002, 2006) that correlations were somewhat stronger in the group of countries with measured national IQs than in the total group of countries.

Maddison's historical data and estimates of per capita GDP (1990 international dollars) for regions and single countries over the period 1 - 2030 AD are derived from many tables of his latest book *Contours of the World Economy, 1-2030 AD. Essays in Macro-Economic History* (2007). Data and estimates cover 155 countries. Most data for single countries, especially for African countries, are regional averages based on Maddison's estimates. Besides, any of the contemporary countries did not exist in AD 1 or in 1000. The use of regional averages is problematic because there may have been and still is significant variation in the level of per capita income within regional groups.

8. National IQ and Per Capita Income 2008

Table 4.7. National IQ correlated with PPP-GNI-08 in the three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries PPI-GNI per capita, US dollars 2008	197	.592	.709
Group of countries (inhabitants > 1 million) PPI-GNI per capita, US dollars 2008	153	.695	.787
Group of countries with measured national IQs PPI-GNI per capita, US dollars 2008	156	.602	.735

Correlations between national IQ and PPP-GNI-08 confirm previous studies on the positive relationship between national IQ and per capita income. All correlations are moderate or strong, and the explained part of variation varies from 35 to 62 per cent. Spearman rank correlations are clearly stronger than Pearson correlations because rank orders decrease the impact of extremely deviating cases. It is interesting to note that correlations in the group of large countries (population over one million) are higher than in the total group of countries. It is obvious that the group of small countries includes more highly deviating cases than the category of more populous countries. Correlations in the group of countries with measured national IQs are only slightly higher than in the total group of countries.

Regression analysis is used to show how well the average relationship between national IQ and PPP-GNI-08 applies to single countries and which countries deviate most from the regression line and contradict the hypothesis (Table 4.8).

Table 4.8. The results of regression analysis of PPP-GNI-08 on national IQ in the group of 197 countries

	Country	**National IQ**	**PPP-GNI-O8 (US$)**	**Residual PPP-GNI-08**	**Fitted PPP-GNI-08**
1	Afghanistan	75.0	1,100	-4.669	5,768
2	Albania	82.0	7,520	-3,940	11.460
3	Algeria	84.2	7,880	-5,369	13,249
4	Andorra	97.0	38,800	15,144	23,656
5	Angola	71.0	4,820	2,303	2,517
6	Antigua & Barbuda	74.0	19,650	14,694	4,956
7	Argentina	92.8	13,990	-6,251	20,241
8	Armenia	93.2	6,310	-14,256	20,566
9	Australia	99.2	37,250	11,806	25,444
10	Austria	99.0	37,360	12,078	25,282
11	Azerbaijan	84.9	7,770	-6,048	13,818
12	Bahamas	84.0	25,000	11,914	13,086
13	Bahrain	85.9	33,400	18,769	14,631
14	Bangladesh	81.0	1,450	-9,197	10,647

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
15	Barbados	80.0	19,300	9,466	9,834
16	Belarus	95.0	12,110	-9,920	22,030
17	Belgium	99.3	35,380	9,854	25,526
18	Belize	76.8	5,940	-1,292	7,232
19	Benin	71.0	1,470	-1,047	2,517
20	Bermuda	90.0	69,900	51,936	17,964
21	Bhutan	78.0	4,820	-3,388	8,208
22	Bolivia	87.0	4,140	-11,385	15,525
23	Bosnia & Herzegovina	93.2	8,360	-12,208	20,566
24	Botswana	76.9	13,300	5,986	7,314
25	Brazil	85.6	10,070	-4,317	14,387
26	Brunei	89.0	50,770	33,619	17,151
27	Bulgaria	93.3	11,370	-9,277	20,647
28	Burkina Faso	70.0	1,160	-544	1,704
29	Burundi	72.0	380	-2,950	3,330
30	Cambodia	92.0	1,860	-17,731	19,591
31	Cameroon	64.0	2,170	5,345	-3,175
32	Canada	100.4	38,710	12,290	26,420
33	Cape Verde	76.0	3,080	3,502	6,582
34	Central African Rep.	64.0	730	3,905	-3,175
35	Chad	66.0	1,070	2,619	-1,549

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
36	Chile	89.8	13,240	-4,562	17,802
37	China	105.8	6,010	-24,801	30,811
38	Colombia	83.1	8,430	-3,924	12,354
39	Comoros	77.0	1,170	-6,225	7,395
40	Congo, Dem. Rep	68.0	280	202	78
41	Congo, Rep.	73.0	2,800	-1,343	4,143
42	Cook Islands	89.0	9,100	-8,051	17,151
43	Costa Rica	86.0	10,950	-3,762	14,712
44	Côte d'Ivoire	71.0	1,580	-937	2,517
45	Croatia	97.8	17,070	-7,236	24,306
46	Cuba	85.0	4,500	-9,399	13,899
47	Cyprus	91.8	24,980	5,552	19,428
48	Czech Rep.	98.9	22,890	-2,311	25,201
49	Denmark	97.2	37,530	13,712	23,818
50	Djibouti	75.0	2,320	-3,449	5,769
51	Dominica	67.0	8,290	9,025	-735
52	Dominican Republic	82.0	7,800	-3,660	11,460
53	Ecuador	88.0	7,770	-8,568	16,338
54	Egypt	82.7	5,470	-6,559	12,029
55	El Salvador	78.0	6,630	-1,578	8,208
56	Equatorial Guinea	69.0	21,700	20,809	891

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
57	Eritrea	75.5	640	-5,535	6,175
58	Estonia	99.7	19,320	-6,531	25,851
59	Ethiopia	68.5	870	386	484
60	Fiji	85.0	4,320	-9,579	13,899
61	Finland	100.9	35,940	9,113	26,827
62	France	98.1	33,280	8,730	24,550
63	Gabon	69.0	12,390	11,499	891
64	Gambia	62.0	1,280	6,081	-4,801
65	Georgia	86.7	4,920	-10,361	15,281
66	Germany	98.8	35,950	10,831	25,119
67	Ghana	69.7	1,320	-140	1,460
68	Greece	93.2	28,300	7,734	20,566
69	Grenada	74.0	8,430	3,474	4,956
70	Guatemala	79.0	4,690	-4,331	9,021
71	Guinea	66.5	970	2,112	-1,142
72	Guinea-Bissau	69.0	520	-371	891
73	Guyana	81.0	3,020	-7,627	10,647
74	Haiti	67.0	1,300	2,035	-735
75	Honduras	81.0	3,830	-6,817	10,647
76	Hong Kong	105.7	43,960	13,231	30,729
77	Hungary	98.1	18,210	-6,340	24,550

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
78	Iceland	98.6	25,300	343	24,957
79	India	82.2	2,930	-8,693	11,623
80	Indonesia	85.8	3,590	-10,960	14,550
81	Iran	85.6	10,840	-3,547	14,387
82	Iraq	87.0	3,600	-11,925	15,525
83	Ireland	94.9	35,710	13,762	21,948
84	Israel	94.6	27,450	5,746	21,704
85	Italy	96.1	30,800	7,876	22,924
86	Jamaica	71.0	7,360	4,843	2,517
87	Japan	104.2	35,190	5,680	29,510
88	Jordan	86.7	5,710	-9,571	15,281
89	Kazakhstan	85.0	9,710	-4,189	13,899
90	Kenya	74.5	1,550	-3,812	5,362
91	Kiribati	85.0	3,619	-10,289	13,899
92	Korea, North	104.6	1,900	-27,935	29,835
93	Korea, South	104.6	27,840	-1,995	29,835
94	Kuwait	85.6	53,430	39,043	14,387
95	Kyrgyzstan	74.8	2,150	-3,456	5,606
96	Laos	89.0	2,050	-15,101	17,151
97	Latvia	95.9	16,010	-6,751	22,761
98	Lebanon	84.6	11,740	1,834	13,574

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
99	Lesotho	66.5	1,970	3,112	-1,142
100	Liberia	68.0	310	232	78
101	Libya	85.0	16,260	2,361	13,899
102	Liechtenstein	100.3	25,000	-1,339	26,339
103	Lithuania	94.3	17,170	-4,291	21,461
104	Luxembourg	95.0	52,770	30,740	22,030
105	Macao	99.9	52,260	26,246	26,014
106	Macedonia	90.5	9,250	-9,121	18,371
107	Madagascar	82.0	1,050	-10,410	11,460
108	Malawi	60.1	810	-7,155	-6,435
109	Malaysia	91.7	13,730	-5,617	19,347
110	Maldives	81.0	5,290	-5,357	10,647
111	Mali	69.5	1,090	-207	1,297
112	Malta	95.3	20,580	-1,694	22,274
113	Mariana Islands	81.0	12,500	1,853	10,647
114	Marshall Islands	84.0	2,900	-10,186	13,086
115	Mauritania	74.0	1,990	-2,966	4,956
116	Mauritius	88.0	12,570	-3,768	16,338
117	Mexico	87.8	14,340	-1,836	16,176
118	Micronesia	84.0	3,270	-9,816	13,086

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
119	Moldova	92.0	3,270	-16,321	19,591
120	Mongolia	100.0	3,470	-22,625	26,095
121	Montenegro	85.9	13,420	-1,211	14,631
122	Morocco	82.4	4,180	-7,605	11,785
123	Mozambique	69.5	770	-527	1,297
124	Myanmar (Burma)	85.0	1,900	-11,999	13,899
125	Namibia	70.4	6,240	4,211	2,029
126	Nepal	78.0	1,110	-7,098	8,208
127	Netherlands	100.4	40,620	14,200	26,420
128	Netherlands Antilles	87.0	16,000	475	15,525
129	New Caledonia	85.0	15,000	1,101	13,899
130	New Zealand	98.9	25,200	-1	25,201
131	Nicaragua	84.0	2,620	-10,466	13,086
132	Niger	70.0	680	-1,124	1,704
133	Nigeria	71.2	1,980	-699	2,679
134	Norway	97.2	59,250	34,944	24,306
135	Oman	84.5	22,150	8,657	13,493
136	Pakistan	84.0	2,590	-10,496	13,086
137	Palestine	84.5	-	-	-
138	Panama	80.0	12,620	2,786	9,834
139	Papua N.G.	83.4	2,030	-10,568	12,598

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
140	Paraguay	84.0	4,660	-8,426	13,086
141	Peru	84.2	7,940	-5,309	13,249
142	Philippines	86.1	3,900	-10,894	14,794
143	Poland	96.1	16,710	-6,214	22,924
144	Portugal	94.4	22,330	788	21,542
145	Puerto Rico	83.5	19,600	6,920	12,680
146	Qatar	80.1	80,900	70,985	9,915
147	Romania	91.0	13,380	-5,398	18,778
148	Russia	96.6	15,440	-7,891	23,331
149	Rwanda	76.0	1,110	-5,472	6,582
150	St Helena	86.0	2,500	-12,212	14,712
151	St Kitts & Nevis	74.0	15,480	10,524	4,956
152	St Lucia	62.0	9,020	13,821	-4,801
153	St Vincent & Grenadines	71.0	8,560	6,043	2,517
154	Samoa (Western)	88.0	4,410	-11,928	16,338
155	Sao Tome & Principe	67.0	1,790	2,525	-735
156	Saudi Arabia	79.6	24,490	14,981	9,509
157	Senegal	70.5	1,780	-330	2,110
158	Serbia	90.3	10,380	-7,828	18,208
159	Seychelles	84.4	19,630	6,219	13,411

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
160	Sierra Leone	64.0	770	3,945	-3,175
161	Singapore	107.1	47,940	16,073	31,867
162	Slovakia	98.0	21,460	-3,009	24,469
163	Slovenia	97.6	27,160	3,016	24,144
164	Solomon Islands	83.0	2,130	-10,143	12,273
165	Somalia	72.0	600	-2,730	3,330
166	South Africa	71.6	9,780	6,776	3,004
167	Spain	96.6	30,830	7,499	23,331
168	Sri Lanka	79.0	4,460	-4,561	9,021
169	Sudan	77.5	1,920	-5,881	7,801
170	Suriname	89.0	6,680	-10,471	17,151
171	Swaziland	75.4	5,000	-1,094	6,094
172	Sweden	98.6	37,780	12,823	24,957
173	Switzerland	100.2	39,210	12,953	26,257
174	Syria	82.0	4,490	-6,970	11,460
175	Taiwan	104.6	30,100	265	29,835
176	Tajikistan	80.0	1,860	-7,974	9,834
177	Tanzania	73.0	1,260	-2,883	4,143
178	Thailand	89.9	7,760	-10,123	17,883
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	4,690	-9,209	13,899

	Country	National IQ	PPP-GNI-O8 (US$)	Residual PPP-GNI-08	Fitted PPP-GNI-08
181	Togo	70.0	830	-874	1,704
182	Tonga	86.0	3,980	-10,732	14,712
183	Trinidad & Tobago	86.4	24,230	9,192	15,038
184	Tunisia	85.4	7,450	-6,774	14,224
185	Turkey	89.4	13,420	-4,057	17,477
186	Turkmenistan	80.0	6,120	-3,714	9,834
187	Uganda	71.7	1,140	-1,946	3,086
188	Ukraine	94.3	7,210	-14,251	21,461
189	United Arab Emirates	87.1	37,300	21,693	15,607
190	United Kingdom	99.1	36,240	10,877	25,363
191	United States	97.5	48,430	24,368	24,062
192	Uruguay	90.6	12,540	-5,912	18,452
193	Uzbekistan	80.0	2,660	-7,174	9,834
194	Vanuatu	84.0	3,480	-9,606	13,086
195	Venezuela	83.5	12,840	160	12,680
196	Vietnam	94.0	2,690	-18,527	21,217
197	Yemen	80.5	2,220	-8,021	10,241
198	Zambia	74.0	1,230	-3,726	4,956
199	Zimbabwe	72.1	200	-3,211	3,411

National IQ explains statistically 35 per cent of the variation in

PPP-GNI-08 in the total group of 197 countries, which means that 65 per cent of the global variation is due to other factors. In the group of 153 countries of more than one million inhabitants, the explained part of variation in PPP- GNI-08 rises to 48 per cent and on the basis of Spearman rank correlation to 50 per cent. Those other factors may include differences in natural resources; geographical factors; the variation in the impact of foreign investments, technologies, and management; differences in the nature of economic systems, as well as many kinds of other local and temporary factors. It would be difficult to quantify and to get global statistical data for any of those other factors. We focus on the impact of national IQ, which explains probably more of the global variation of PPP-GNI-08 than any other explanatory factor, but we can try to find out what those other factors might be in particular cases. From this perspective, it is useful to pay attention to the most deviating countries. They can be roughly separated from less deviating ones by classifying the countries with residuals larger than ±12,000 into the category of large outliers (one standard deviation is 12,017). It is reasonable to assume that large outliers disclose some impact of other explanatory factors more clearly than countries closer to the regression line. It is useful to compare the two opposite categories of the most deviating countries to examine whether there are any systematic differences in the nature of large positive and large negative outliers.

The category of large positive outliers includes the following 24 countries: Andorra, Antigua & Barbuda, Austria, Bahrain, Bermuda, Brunei, Canada, Denmark, Equatorial Guinea, Hong Kong, Ireland, Kuwait, Luxembourg, Macao, the Netherlands, Norway, Qatar, St Lucia, Saudi Arabia, Singapore, Sweden, Switzerland, the United Arab Emirates and the United States.

There are significant differences in the nature of these 24 countries. European and European offshoot countries (11) constitute the largest coherent group within this category. They are economically highly developed democracies and market economies in which the level of per capita income has risen much higher than expected on the basis of their high national IQ values. They constitute a geographically coherent group of countries in Western Europe and North America and they have a long tradition as market economies and democracies. Hong Kong, Macao, and Singapore as economically highly developed East Asian countries belong to the same category. The outlying position of these 14 countries has made the relationship between national IQ and PPP-GNI-08 slightly curvilinear. When national IQ rises above 90, the level of PPP-GNI-08 starts to rise steeply in most countries, although not in all of them.

Antigua & Barbuda, Bermuda and St Lucia are Caribbean countries whose geographical location has favored the development of tourist industries. The growth of tourist industries has been based on extensive foreign investments and management. These factors provide a local explanation for the much higher than expected level of per capita income in the Caribbean tourist countries.

Bahrain, Brunei, Equatorial Guinea, Kuwait, Qatar, Saudi Arabia and the United Arab Emirates are oil exporting countries in which the level of per capita income has risen much higher than expected on the basis of their national IQs. In these countries foreign investments, technologies, and management have had a crucial role in their oil industries and these explain the exceptionally high level of per capita income in these countries. The fact that residuals are negative for most neighboring countries without significant oil resources supports this conclusion. Our interpretation is that the existence of exceptional natural resources combined with western technologies has raised per capita income in these eight countries much higher than expected.

The category of large negative outliers includes the following 11 countries: Armenia, Bosnia & Herzegovina, Cambodia, China, North Korea, Laos, Moldova, Mongolia, St Helena, Ukraine and Vietnam.

Large negative outliers differ from large positive ones in many respects. It is remarkable that nine of these countries are contemporary or former socialist countries (Armenia, Bosnia & Herzegovina, China, North Korea, Laos, Moldova, Mongolia, Ukraine and Vietnam). Residuals are clearly negative also for several other former socialist countries (see Table 4.8). It is obvious that the communist economic and political system has been much less beneficial for economic development than a market economy combined with a democratic political system. However, their high national IQ values and large negative residuals predict a significant future rise of per capita income in all these countries.

Cambodia is an Asian country, which has suffered from serious civil wars. This exceptional local factor has certainly hampered economic development. St Helena is an isolated island country. Its geographical isolation may have hampered economic development.

Figure 4.1 summarizes the results of the regression analysis and indicates that the relationship between variables is positive as hypothesized but to some extent curvilinear. Most of the largest positive outliers are oil producing countries and Caribbean tourist countries, but the group includes also some socio-economically highly developed Western and East Asian countries. The largest negative outliers are socialist and former socialist Asian countries.

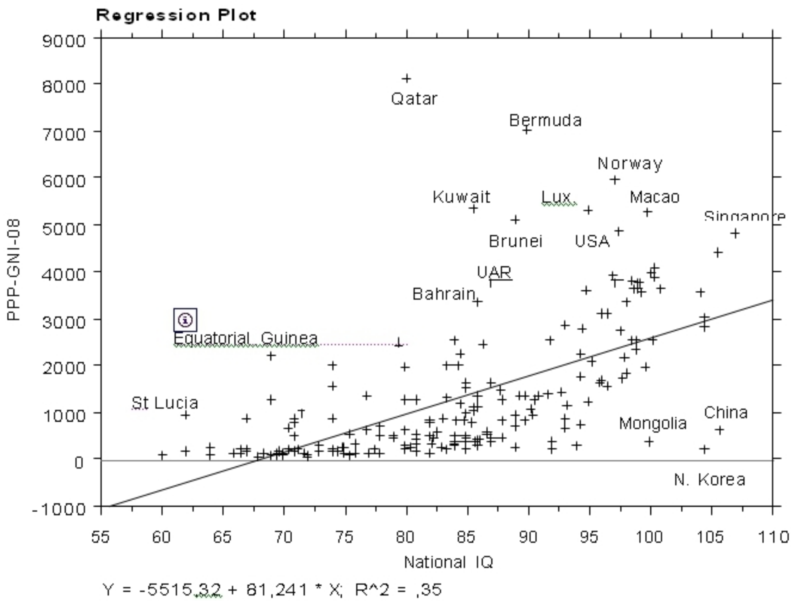

Figure 4.1. The results of regression analysis of PPP-GNI-08 on national IQ in the group of 197 countries

The comparison of countries with large positive and negative residuals has disclosed that particular local circumstances are connected with nearly all large outliers and that they may explain a significant part of the large deviations from the regression line. It is important to note that the focus is on particular local factors and that their impact is restricted to limited groups of countries. They are not universal factors which could be used to explain the variation in per capita income in all countries of the world.

(1) The significance of the economic system (market economy versus socialist command economy) seems to be limited to the group of countries with high national IQ (90 and over). In the market economies (nearly always connected with a

democratic political system), the level of per capita income has risen much higher than expected on the basis of the regression equation, and in the socialist economic systems (and former socialist systems) at the same level of national IQ, the level of per capita income tends to be much lower than expected.

(2) The contrast between the Caribbean tourist islands with large positive residuals and a group of Oceanian island states without important tourist industries and with large negative residuals illustrates the significance of foreign investments and technologies as well as of geographical factors. Because the Caribbean islands are relatively close to potential tourists in the North America and Europe, they have attracted extensive foreign investments in tourism, whereas remote Oceanian island states have not been attractive places for extensive foreign investments in tourist industries. This difference may explain why the Caribbean tourist islands have been economically more successful than the Oceanian island states, although national IQ is for most Caribbean island countries lower than for Oceanian island countries.

(3) The contrast between Asian and African countries with significant oil industries and their neighboring countries without significant oil and gas resources illustrates the potential importance of natural resources. Countries with oil or other significant natural resources have attracted foreign investments and technologies from countries of higher national IQs, which has raised the level of per capita income much higher (in some cases many times higher) than expected on the basis of the regression equation, whereas in the countries without attractive natural resources it has remained at the expected level or, in some cases, it has been lower than expected on the basis of national IQ. Countries like Bahrain, Brunei, Equatorial Guinea, Kuwait, Qatar, Saudi Arabia and the United Arab Emirates with extremely large positive residuals are dominated by oil industries.

(4) The contrast between the countries ravaged by ethnic civil wars or other wars and with large negative residuals and the

countries which have been able to maintain internal peace illustrates the negative impact of violent strife on economic development. Wars and civil wars have hampered economic development and caused the emergence of large negative residuals in several cases. So this is one of the exceptional local factors that affects the level of per capita income independently from national IQ.

(5) To some extent, geographical factors may hamper economic development independently from national IQ. This concerns especially isolated landlocked states. Laos, Moldova and Mongolia are such countries in the group of large negative outliers. The actual level of per capita income is in all of them much lower than expected on the basis of national IQ. It can be inferred that not only the former socialist system but also their geographical isolation has hampered economic development in these countries. However, in some cases favorable geographical location may have furthered economic development. This concerns especially Luxembourg and Switzerland, which have benefitted from their proximity to France and Germany.

It is important to note that the impact of exceptional factors discussed above is limited to particular groups of countries and that it is difficult to measure their impact by empirical evidence. Large positive and negative outliers indicate that national IQ is not the only factor affecting the variation in per capita income, but it may be the only systematic causal factor that is relevant across all cultural and geographical boundaries. The level of per capita income tends to be higher in countries with high national IQ than in countries with low national IQ. Depending on the sample of countries and of the type of correlation, national IQ explains from 35 to 62 per cent of the variation in PPP-GNI-08. Because a part of the variation may be due to measurement errors and accidental factors, it is not necessary to pay attention to relatively small deviations from the regression line.

Some other indicators of socioeconomic development are moderately or strongly related to the level of per capita income, but because their causal relations may be reciprocal and because they tend to be as strongly related to national IQ as the indicators of per capita income, their ability to explain the variation in per capita income is quite limited. For example, adult literacy rate (see Chapter 3) is moderately correlated with PPP-GNI-08 (0.482, N=196), but when national IQ and Literacy-08 are used together to explain variation in PPP-GNI-08, the multiple correlation (0.608) is only slightly higher than the simple correlation between national IQ and PPP-GNI-08 (0.592). In other words, Literacy-08 raises the explained part of variation in PPP-GNI-08 only by two percentage points independently from national IQ.

9. Measures of Poverty

Global variation in the extent of poverty will be measured by three indicators of international poverty criteria, population below $1.25 a day % and population below $2 a day %. Data on these variables are for the period 1993-2008. The extent of poverty is, of course, negatively related to the level of per capita income (see Table 4.6). Our third measure of poverty is UNDP's Multidimensional Poverty Index (MPI-00-08). It is also negatively correlated with PPP-GNI-08. The level of poverty can be expected to be much lower in wealthy countries than in poor countries, but it is also reasonable to expect that the level of poverty will tend to decrease when the level of national IQ rises because more intelligent people are better able to take care of themselves and to defend their interests than less intelligent people. Therefore, we focus on the explanatory power of national IQ. The results of correlation analyses are given in Table 4.9.

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Table 4.9. Correlations between national IQ and the three indicators of poverty in various groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Population below $1.25 a day	101	-.667	-.713
Population below $2 a day	101	-.710	-.746
MPI-00-08	100	-.729	-.772
Group of countries (inhabitants > 1 million)			
Population below $1.25 a day	97	-.673	-.720
Population below $2 a day	97	-.717	-.756
MPI-00-08	93	-.743	-.784
Group of countries with measured national IQs			
Population below $1.25 a day	88	-.658	-.693
Population below $2 a day	88	-.709	-.742
MPI-00-08	80	-.742	-.769

All correlations are negative as hypothesized and relatively strong. They are almost the same in the three groups of countries, and Spearman rank correlations are only slightly stronger than Pearson correlations. National IQ explains 43-61 per cent of the variation in the three measures of poverty. Approximately half or nearly half of the variation seems to be due to other explanatory factors, including measurement errors.

Let us use PPP-GNI-08 and Literacy-08 to illustrate the impact of other explanatory factors. Taken together national IQ, PPP-GNI-08, and Literacy-08 explain 58 per cent of the variation in Below $1.25 a day variable (multiple correlation 0.762) and 70 per cent of the variation in Population below $2 a day (multiple correlation 0.835) in the group of 101 countries. Further, they explain 79 per cent of the variation in MPI-00-08 (multiple correlation 0.889) in the group of 100 countries. This means that PPP-GNI-08 and Literacy variables are able to explain independently from national IQ 14 percentage points of the variation in the first, 20 percentage points of the variation in the second, and 26 percentage points of the third indicator of poverty. It is evident that the level of poverty in single countries depends not only on differences in national IQ but also on some environmental factors. However, national IQ seems to be the dominant explanatory factor.

We come to the conclusion that national IQ explains more of the level of poverty than any other explanatory factor. The level of poverty tends to decrease when the level of national IQ rises. It is true that PPP-GNI-08 and Literacy-08 explain a significant part of the variation in the level of poverty independently from national IQ, although the explanations provided by PPP-GNI-08 and Literacy-08 are for the most part overlapping with the explanation provided by national IQ.

10. Income Inequality

Two indicators are used to measure differences in the level of economic inequality within countries: Gini index and the percentage share of income or consumption of the highest 20% (Highest 20%). Our hypothesis is that national IQ should correlate negatively with Gini index and Highest 20%. This hypothesis is based on the assumption that more intelligent people are able to establish more equal economic conditions than less intelligent people. Consequently, when the average level of national IQ rises, Gini index points and the percentages of Highest 20% are assumed to decrease. The results of correlation analysis presented in Table 4.10 show to what extent empirical evidence supports this hypothesis.

Table 4.10. National IQ correlated with the two indicators of economic inequality in the three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Gini	147	-.466	-.505
Highest 20%	147	-.470	-.518
Group of countries (inhabitants > 1 million)			
Gini	135	-.467	-.506
Highest 20%	135	-.470	-.502
Group of countries with measured national IQs			
Gini	122	-.498	-.554
Highest 20%	122	-.516	-.578

Gini and Highest 20% are negatively correlated with national IQ as hypothesized, but correlations are relatively weak. Spearman rank order correlations are clearly stronger than Pearson correlations. The explained part of variation does not rise higher than 22 to 33 percent. National IQ is clearly related to the level of economic inequality, but the relationship is not strong. Most of the variation in Gini index and Highest 20% is due to some other factors. The question arises whether any other variable could explain as much or more of the variation in the indicators of economic inequality. It is reasonable to assume that the level of per capita income, literacy, and also the degree of democracy might be other significant explanatory variables.

Taken together national IQ, PPP-GNI-08, Literacy-08, and ID-08 explain only a little more of the variation in Gini and Highest 20% variables than national IQ alone. The multiple correlations are 0.524 and 0.529 in the total group of 146 countries, and the explained part of variation rises to 27 and 28%. It is 5-6 percentage points more than what national IQ explains. It is evident that most of the variation in Gini and Highest 20% variables remains unexplained. It may be due to various accidental, local, and regional factors, and probably also to measurement errors. For example, Latin American and some other multi-racial societies are characterized by a high level of economic inequality, whereas inequality tends to remain relatively low in European democracies and former socialist countries as well as in most racially homogeneous African countries.

11. Historical Analysis Based on Maddison's Estimates

As noted earlier, Maddison's historical estimates of per capita GDP (1990 international dollars) make it possible to measure to what extent contemporary national IQs are related to estimates of per capita income since AD 1. Let us first see Maddison's data and estimates of per capita income for single countries and regions since AD 1 and the way we have complemented his database by giving regional averages for countries whose per capita income Maddison did not estimate. Maddison's data and estimates presented in his book *Contours* *of the World Economy, 1-2030 AD* (2007) concern the years AD 1, 1000, 1500, 1600, 1700, 1820, 1870, 1913, 1950, 1973, 1990, 2003, and 2030. Our statistical analysis covers all these years, but in Appendix 2, which illustrates Maddison's data and estimates and our complementary estimates for single countries, the database is limited to the years AD 1, 1500, 1820, 1913, 1990, and 2030. In Appendix 2, Maddison's regional estimates, which are not used in statistical analysis, are printed in bold, and our estimates for single countries are given in brackets.

Appendix 2 shows the countries for which data on per capita income are derived from Maddison's tables (without brackets) and the countries for which data are regional averages (in brackets) given in Maddison's tables. For Western Europe and West Asia, most data for single countries are derived from Maddison's tables, whereas for other regional groups most data for single countries are regional averages; in the case of Africa, nearly all data are regional averages. As noted earlier, the use of regional averages is problematic because the actual level of per capita income may vary considerably around the regional average (Appendix 2). For 2030, Maddison estimated per capita income for 20 countries. For the other countries, data (in brackets) are based on Maddison's estimated regional averages. The use of regional averages for 2030 has produced some extremely anomalous estimates of per capita income for single countries. In some cases, per capita income for 1990 is higher than the estimated regional average for 2030. For example, per capita income for Hong Kong in 1990 is 17,541 dollars, but the regional average for 2030 (Other Asia) is not more than 8,292 dollars. It is highly improbable that Hong Kong's per capita income would decrease so much from 1990 to 2030. Therefore, this and some other extremely anomalous estimates for 2030 based on regional averages will not be taken into account in statistical analysis. For this reason, per capita estimates for 2030 based on regional averages will be excluded in the cases of Estonia, Latvia, Lithuania, Hong Kong, Singapore, Arabia, Israel, the United

Arab Emirates, Puerto Rico, and Trinidad & Tobago (see Appendix 2).

Further, because national IQs are based on contemporary national populations, it would not be justified to extend statistical analysis to years when the racial composition of a country's population differed significantly from the contemporary one. For this reason, western offshoots Canada and the United States are taken into account in statistical analysis only since 1700 and Australia and New Zealand since 1820; Latin American countries are taken into account since 1700 and Singapore and Mauritius since 1870.

The hypothesis is tested by correlating data and estimates of per capita GDP with contemporary national IQs. The results are given in Table 4.11.

Table 4.11. Correlations between national IQ and per capita GDP (1990 international dollars) in various groups of countries over the period 1-2030 AD

Year	**N**	**Pearson correlation**	**Spearman rank correlation**
AD1	120	.240	.557
1000	120	.098	.292
1500	120	.684	.763
1600	120	.663	.778
1700	145	.578	.781
1820	147	.629	.721
1870	149	.554	.743

Year	N	Pearson correlation	Spearman rank correlation
1913	149	.570	.640
1950	152	.258	.533
1973	152	.495	.663
1990	153	.698	.701
2003	154	.711	.761
2030	144	.746	.801

Pearson correlations between national IQ and per capita GDP are only slightly positive for AD 1 and 1000, but since 1500 positive correlations have been moderately strong and they have remained nearly stable. Spearman rank correlations are considerably stronger than Pearson correlations because extremely deviating cases do not affect Spearman rank correlations as much as they affect Pearson correlations. For 1950 and 1973, Pearson correlations are quite low, but these deviations are principally due to the exceptionally high per capita income for 1950 and 1973 in Kuwait, Qatar, and the United Arab Emirates. Without these three countries, Pearson correlation would be 0.541 (N=149) for 1950 and 0.653 (N=149) for 1973.

It is remarkable that the relationship between national IQ and per capita GDP has remained practically the same since 1500 and that, on the basis of Maddison's per capita estimates for 2030, the situation will not change. National IQ seems to explain nearly half of the global variation in per capita income and, on the basis of Spearman rank correlations, even more than half.

Diego A. Comin, William Easterly and Erick Cong (2008) argue in their working paper "Was the Wealth of Nations

Determined in 1000 B.C.?" that today's national development outcomes can be traced to some extent to very old history of technology adoption in 1000 B.C., 0 A.D., and 1500 A.D. Their argument is that significant differences in technology adoption existed already in 1000 B.C. and that the persistence of those differences provides an explanation for later differences in per capita income and in other aspects of economic development. Their argument is highly interesting from the perspective of our study. On the basis of Maddison's historical estimations of per capita income, we have traced the clearly positive correlation between national IQ and per capita income to 1500 A.D. and weaker correlations to 1000 A.D. and 0 A.D. Our results are in harmony with Comin et al.'s empirical evidence based on differences in technology adoption. It is quite possible that their measures of technology adoption would correlate positively with national IQs. In other words, it might be possible to trace the original emergence of differences in technology adoption to even older evolved differences in national IQs.

12. Unemployment

The relationship between national IQ and rates of unemployment has not been examined hitherto and is considered in this section. At the individual, within-country level, several studies have shown a robust association between low intelligence and unemployment. Toppen (1971) reported a sample of the unemployed in the United States had an average IQ of 81, more than a standard deviation (15 IQ points) below the U.S. mean IQ of approximately 100. Lynn, Hampson and Magee (1984) reported that a sample of the unemployed in Northern Ireland had an average IQ of 92, again below the national mean. Herrnstein and Murray (1994) reported that in a sample in the United States, 14 per cent of those with IQs below 74 had been unemployed for one month or longer during the preceding year, and the percentages of the unemployed declined in successively higher IQ groups to 4 per cent among those with IQs above 126. Thus, low-IQ individuals make up a disproportionate share of unemployed. Mroz and Savage (2006), using the National Longitudinal Survey of Youth, found that lower IQ predicted higher probability of unemployment within the last year, higher average weeks of unemployment, and higher probability of job change, even after controlling for years of education, ethnicity, parental education, whether the person's childhood home received periodicals, and a rich variety of additional covariates. Thus, both the rate of job destruction and the length of job search are higher for workers with lower IQ.

To examine the relationship between national IQ and rates of unemployment, we take the data for national rates of unemployment from the Central Intelligence Agency (CIA) Yearbook (2003, 2008). This gives the official unemployment figure and an estimate for underemployment for a few nations. In these cases we have used the official estimate and disregarded the estimate of underemployment. The general effect of this decision is to reduce the degree of unemployment of mainly low IQ countries and therefore underestimate the true size of the relationship between IQ and unemployment.

The CIA Yearbook figures are not always for a single calendar year. For a number of nations the Yearbook gives the most recent estimate at the time of publication. Some of these are up to five years old. Taking this into account we have defined two periods encompassing a range of dates. The first period is from 1996 to 2002 (93.6% of the unemployment figures are within the range 1999 to 2002). The median year is 2001. The second period is from 2003 to 2009 (92.8% of the unemployment figures are within the range 2005 to 2008). The median year is 2008.

The first period (median year 2001) has unemployment data for 141 nations for which national IQ data exist. The median unemployment figure was 10.2% and the mean 14.3%. The standard deviation was 12.3% and first and third quartiles 5.4%

and 18.25% respectively. The second period (median year 2008) has unemployment data for 128 nations for which national IQ data exist. The median unemployment figure was 6.8% and the mean 11.1%. The standard deviation was 13.89% and first and third quartiles 4% and 11.8% respectively. The average of the two periods yielded unemployment data for 107 nations for which national IQ data exist. The correlation between the unemployment estimate based on this equation and national IQ is -0.66 (107 nations) and therefore national IQ explains 43.5% of the variance in unemployment. The negative correlations show that unemployment is lower in high IQ nations. The correlation can be corrected for unreliability of both variables. The reliability of the average unemployment figures taken as the correlation between the unemployment figures in the two periods is 0.81. The reliability of national IQs given in Chapter 2 is 0.91. Corrected for unreliability, the correlation between national IQ and unemployment is -0.76 and 57 per cent of variance in the rate of unemployment across nations is explained by national IQ. Thus the relationship between low IQ and high rates of unemployment that is present among individuals also holds across nations.

The principal explanation for the association between low IQ and high rates of unemployment among individuals within countries is that those with low IQs normally perform poorly at school and do not acquire educational credentials. Employers typically select employees on the basis of educational qualifications and are reluctant to employ those without educational qualifications. If those with low IQs do secure jobs, they typically perform poorly, since numerous studies have shown that intelligence is positively related to the efficiency of performance. This has been reported in the United States (Ghiselli, 1966; Hunter and Hunter, 1984; Schmidt and Hunter, 1998) and in Europe (Salgado, Anderson, Moscoso, et al., 2003). When those with low IQs perform poorly in employment, they are typically dismissed. They acquire a poor work history, and this makes employers reluctant to employ them. The principal explanation for the association between low IQ and high rates of unemployment across countries is likely that the population of low IQ countries are not able to produce goods and services so efficiently for sale international markets, as compared with the populations of high IQ countries.

13. Summary

The analysis of economic conditions measured by some indicators of per capita income, poverty, and income inequality shows that national IQ explains nearly half or at least more than any other available variable of the global variation in these indicators. This relationship has been present at least since 1500. This suggests that human possibilities to equalize economic conditions seem to be quite limited.

It has been difficult to equalize per capita income between countries whose national IQs differ significantly from each other. It would be much easier to equalize per capita income between countries whose national IQs are approximately at the same level. However, some geographical or other local factors may be enough to maintain economic differences even in these groups of countries with more or less equal IQs. It is remarkable that factors that are related to large deviations from the regression line seem to be exceptional local factors. It was not possible to find any universal environmental factor that could explain a significant part of the global variation in per capita income independently from national IQ. The socio-biological research formula (y = (b+e) + x), in which y = a problem in need of explanation, b = a variable indicating the evolutionary roots of the problem, e = relevant environmental factors, and x = the unexplained part of the problem, summarizes the results of statistical analyses in the total group of countries as follows:

PPP-GNI-08 = (national IQ 35% + Literacy-08 2 %) + unexplained variation 63%.

Below $ 1.25 a day = (national IQ 44% + PPP-GNI-08, Literacy-08 14%) + unexplained variation 42% (N=101),

Below $ 2 a day = (national IQ 50% + PPP-GNI-08, Literacy-08 20%) + unexplained variation 30% (N=101),

MPI-00-08 = (national IQ 53% + PPP-GNI-08, Literacy-08 26%) + unexplained variation 21% (N=100),

Gini = (national IQ 22% + PPP-GNI-08, Literacy-08, ID-08 5%) + unexplained variation 73% (N=146),

Highest 20% = (national IQ 22% + PPP-GNI-08, Literacy-08, ID-08 6%) + unexplained variation 72% (N=146).

National IQ explains more than one third of the global variation in per capita income, but more than 60 percent remains unexplained. National IQ explains approximately half of the global variation in poverty measures, but poverty is also related to the level of per capita income and literacy. Because the measures of poverty are strongly related to national IQ, it is reasonable to expect that significant global differences in the level of poverty will continue indefinitely. Human efforts can be increased to diminish global differences in the level of poverty, but the possibilities of reducing these disparities are limited. The continual struggle for scarce resources maintains global differences in poverty, and high IQ nations tend to be more successful in this struggle than low IQ nations.

National IQ does not explain more than 22 percent of the variation in Gini index and Highest 20% variables, but it may be more than what any other measurable factor could explain. The differences in income inequality seem to be significantly related to some regional and cultural factors and to the racial homogeneity of populations. Latin America is a region of exceptionally high level of economic inequality, which may be partly due to the racial heterogeneity of Latin American populations. The same factor appears also in other parts of the world. European and most African countries, in which income inequality tends to be much lower, are racially relatively homogeneous. It can be anticipated that economic inequalities within countries will continue indefinitely. The impacts of national IQ and regional and racial factors on economic inequality are unlikely to disappear, although it is certainly possible to reduce inequality in particular countries by appropriate social and institutional reforms.

Our point is that evolved human diversity, which we have measured by national IQ, is a permanent factor behind global economic inequalities. It provides the most powerful theoretical explanation for many kinds of global inequalities in human conditions and explains their persistence. A more extensive analysis of the impact of other environmental variables would certainly raise the explained part of variation to some extent, but we have focused on the explanatory power of national IQ. We do not try to find complete explanations for economic disparities and inequalities.

Chapter 5

Political Institutions

1. National IQs and Political Institutions. 2. New Global Comparisons. 3. Variables. 4. Democratization. 5. Women's Representation and Gender Inequality. 6. Corruption. 7. Conclusion

The political institutions considered in this chapter include the extent of political freedom and the constitution of government. Nations can be ordered on a scale of political freedom in which free societies are characterized by an absence of corruption, democracy, efficient bureaucracies, property rights, and the rule of law. We have argued that populations require a certain level of intelligence to sustain a free and democratic society because "people in countries with low national IQs are not as able to organize themselves, to take part in national politics, and to defend their rights against those in power as people in countries with higher national IQs" (Vanhanen, 2009, p. 270).

1. National IQs and Political Institutions

Studies of the correlations of national IQ and political institutions are summarized in Table 5.1. Row 1 gives a correlation of -0.47 between national IQs and "big government" defined as government expenditure as percentage of GDP, 1980-89. The negative correlation indicates that high IQ nations have less "big government".

Row 2 gives a correlation of 0.64 between national IQ and the efficiency of bureaucracy measured as quality and speed of decisions made by public officials.

Rows 3 through 10 give eight negative correlations ranging from -0.27 to -0.68 between national IQs and the amount of corruption measured as the Corruption Perception Index (CPI). The negative correlations show that there is less corruption in high IQ countries. The explanation for this proposed by Potrafke (2012, p. 109) is that "intelligent people have longer time horizons" and can understand that corruption is likely to have negative effects over the long term.

Rows 11 through 16 give six correlations ranging from 0.53 to 0.79 between national IQs and the amount of democracy measured as the extent to which countries have established democracies. We have proposed that the explanation for this is that "people in countries with low national IQs are not as able to organize themselves, to take part in national politics, and to defend their rights against those in power as people in countries with higher national IQs" (Vanhanen, 2009, p. 270).

Rows 17 and 18 confirm these positive correlations (0.57 and 0.58) using a different measure of democracy defined as the averaged scores of political rights and civil liberties and based on 126 and 82 nations.

Row 19 gives a correlation of -0.58 between national IQs and the Failed State Index, a measure of state vulnerability to political breakdown.

Row 20 gives a correlation of 0.72 between national IQs and institutional quality measured by the Doing Business Index, a measure of the easy of conducting business transactions in 21 Asian countries.

Rows 21 through 25 give five correlations ranging from 0.49 to 0.77 between national IQs and the amount of political freedom and citizens' legal rights.

Row 26 gives a correlation of 0.75 between national IQs and

"Power Resources" defined as an index of the equality of the distribution of important intellectual and economic power resources. The positive correlation shows that countries with higher IQs have a more equal distribution of this power. Row 27 gives a correlation of 0.17 between national IQs and property rights measured as security of property rights and includes efficiency of government bureaucracy. The correlation is quite low and only statistically significant at p<.10.

Rows 28 through 30 give correlations ranging from 0.62 to 0.82 between national IQs and the rule of law defined as an index of the independence of the judiciary and the ability of the citizen to enforce contracts in courts of law.

Table 5.1. Political institution correlates of national IQ

	Variable	**N Countries**	**r x IQ**	**Reference**
1	Big government	138	-.47	Rindermann, 2008
2	Bureaucracy: quality	140	.64	Rindermann, 2008a
3	Corruption, 1999-2003	81	-.68	Meisenberg, 2004
4	Corruption, 1999-2003	126	-.54	Meisenberg, 2004
5	Corruption: 2003	132	-.59	Lynn & Vanhanen, 2006
6	Corruption, 1999-2005	55	-.62	Lynn et al., 2007
7	Corruption, 1980-2003	132	-.60	Rindermann, 2008a
8	Corruption, 2006	125	-.64	Potrafke, 2012
9	Corruption, 1996	120	-.27	Meisenberg, 2012a
10	Corruption, 1990-2000	120	-.67	Meisenberg, 2012a

	Variable	N Countries	r x IQ	Reference
11	Democracy, 2002	192	.53	Lynn & Vanhanen, 2006
12	Democracy, 1950-2004	183	.56	Rindermann, 2008a
13	Democracy, 1996-2000	17	.79	Rindermann, 2008b
14	Democracy	170	.65	Meisenberg, 2009
15	Democracy	172	.58	Vanhanen, 2009
16	Democracy, 1950-2004	84	.60	Rindermann et al., 2009
17	Democracy/Freedom	126	.57	Meisenberg, 2011
18	Democracy/Freedom	82	.58	Meisenberg, 2011
19	Failed state index	117	-.58	Voracek, 2011
20	Institutional quality	21	.70	Jones, 2011
21	Political freedom	81	.65	Meisenberg, 2004
22	Political freedom	55	.61	Lynn et al., 2007
23	Political freedom/rights	17	.77	Rindermann, 2008b
24	Political freedom	170	.49	Meisenberg, 2009
25	Political freedom, 1997	86	.62	Rindermann et al., 2009
26	Power Resources	172	.75	Vanhanen, 2009
27	Property rights	98	.17	Ram, 2007
28	Rule of law, 1970-2000	131	.64	Rindermann,2008a
29	Rule of law, 2000	17	.82	Rindermann, 2008b
30	Rule of law, 1970-2000	84	.62	Rindermann et al., 2009

2. New Global Comparisons

Because modern democracy is a relatively recent phenomenon and because the level of democracy is certainly related also to many other factors, including social structures, it would be unrealistic to expect a high correlation between national IQ and the level of democratization. It is interesting to see to what extent national IQ is related to the level of democratization and to what extent some other factors, independently from national IQ, are related to the variation in the level of democratization. If the level of democratization is related to national IQ to a significant extent, it would mean that we should expect differences in the level of democracy to continue indefinitely because differences in the average intelligence of nations are persistent and change only slowly.

Our measurement is limited to the general level of democratization. Because democratic power sharing may take place through different governmental institutions, for example, through parliamentary or presidential systems, through proportional or majoritarian electoral systems, and through unitary or federal state systems, we do not pay attention to such institutional differences. The adoption of particular institutional structures is probably due to various local factors and historical legacies. Besides, it is relatively easy to change particular governmental institutions, whereas it is much more difficult to change the general level of democratization, for example, to change a democratic system into an autocracy, or vice versa.

Women's representation in parliaments measures one aspect of democratization from the perspective of gender equality. In the contemporary world, women's representation in parliaments varies greatly from zero to nearly 50 percent. A political system in which women's representation is high is more democratic than a political system in which women's representation is low, although the general level of democratization cannot be measured by the degree of women's representation. It is interesting to see whether the global variation in women's representation is related to national IQ to any significant extent. Because women's extensive representation in parliaments is an even more recent phenomenon than democratization, we cannot expect any strong correlations. The variation in women's representation may be principally due to various cultural, local, institutional, and accidental factors, but it is justified to assume that gradually the correlation between national IQ and women's representation will become stronger because sexual equality in politics can be regarded as an important dimension of democracy.

According to the Transparency International's corruption perceptions index, the extent of corruption varies greatly in the world. The problem is why corruption varies so much. We hypothesize that the extent of corruption is negatively related to the level of national IQ because more intelligent nations may have better capabilities than less intelligent nations to exclude corruption from the functions of their political institutions, or at least to diminish its extent. It would also be interesting to see whether some other factors, for example, the level of democratization or per capita income are able to explain more of the variation in the level of corruption than national IQ. A strong relationship between national IQ and corruption perceptions index would predict the continuation of large differences in the level of corruption. Democratization, women's representation in parliaments, and corruption represent political phenomena whose variation is certainly under human control. Therefore, it is useful to see to what extent national IQ is related to the level of these phenomena. If the relationship is strong, or at least significant, it would indicate that human chances to decrease the variation in these phenomena are seriously limited. It would be much more easier to decrease the variation in these phenomena if they were not related to national IQ to any significant extent.

3. Variables

Three variables will be used to measure the level of democratization (for measures of democracy, see Bernhagen, 2009; Munck, 2009): Tatu Vanhanen's Index of Democratization 2008 (ID-08), Freedom House's combined ratings of political rights and civil liberties 2008 (FH-08), and Polity IV project's scores on authority characteristics. They measure democracy from quite different perspectives, but because the three variables are strongly intercorrelated, they can be assumed to measure the same phenomenon.

The Index of Democratization (ID) is intended to measure two crucial dimensions of democracy: Competition and Participation. The value of the Competition variable is calculated by subtracting the percentage of votes won by the largest party or the percentage of the seats in parliament won by the largest party from 100. The value of the Participation variable is the percentage of the total population who voted in the election. These calculations are based on parliamentary and/or executive elections, or on both of them. Besides, the impact of referendums is added to the Participation variable in such a way that each national referendum adds the degree of participation by 5 points and each state referendum by 1 point for the year when the referendum took place. The impact of referendums is limited to 30 points for a year because it should not rise higher than the degree of electoral participation, and the combined score of electoral participation and referendums is limited to 70. The same 70 per cent upper limit is used in the case of Competition. The use of these two basic variables is based on the idea that there cannot be democracy without legally allowed competition for the highest positions of power and that it would not be appropriate to speak of democracy without extensive popular participation in elections. Consequently, both two dimensions are necessary for democracy.

The two basic variables are combined into an Index of Democratization (ID) by multiplying the two scores and by dividing the product by 100. This method means that ID can reach a high value only if the values of both variables are high. The lack of Competition will reduce the value of ID to zero, although the value of Participation were high, and vice versa. So the method of multiplication cancels the misleading information provided by Competition or Participation in such cases by producing a low ID value for such countries. The two basic variables and their composite index are defined and described in greater details in Vanhanen's books (Vanhanen, 2003, 2009). Empirical data on ID-08 are derived from *FSD1289 Measures of Democracy 1810-2008* (Finnish Social Science Data Archive) dataset, and they cover 187 independent countries and Taiwan. Liechtenstein's ID value for 2008 (21.5) was calculated separately for this study.

Freedom House's combined ratings of political rights and civil liberties (FH-08) constitute an alternative indicator of democracy (see *Freedom in the World 2010)*. The Freedom House's Survey rates political rights and civil liberties separately on a seven category scale, 1 representing the most free and 7 the least free country. The rates are based on responses to the checklists and judgements of the Survey team. For the purposes of this study, the two ratings were first added from 2 to 14, after which the ratings were inverted to extend from the least free 2 to the most free 14. A country is regarded to be the more democratized, the higher the combined rating is. Countries with ratings 1-5 are generally considered to be "not free", countries with ratings 6-10 "partly free", and countries with ratings 11-14 "free". Data on FH-08 are derived from *Freedom in the World 2009* report and they cover 192 states and territories.

Polity IV Project (see Marshall, 2010) measures authority characteristics of all independent states whose population is 500,000 inhabitants or more. A spectrum of governing authority extends from fully institutionalized autocracies through mixed authority regimes (termed "anocracy") to fully institutionalized democracies. A 21-point scale ranges from -10 (hereditary monarchy) to +10 (consolidated democracy). The Polity scheme includes six component measures that record key qualities of executive recruitment, constraints on executive authority, and political competition. For the purposes of this study, negative and positive scores were added and transformed positive ones extending from 1 to 21 in such a way that 1 represents -10 (hereditary monarchy) and 21 +10 (consolidated democracy). The countries with Polity scores 1-5 are autocracies, countries with Polity scores 6-16 are semi-democracies, and countries with Polity scores 17-21 are democracies. Data from Polity scores for 2008 were derived from Marshall and Jaggers' *Polity IV Country Reports 2008* (2010). The dataset covers 163 countries.

Women's percentage share of seats in parliament in 2008 (Women-08) is used to indicate differences in women's representation in politics. Empirical data on women's parliamentary representation used in this study are derived from the Finnish Social Science Data Archive's dataset *FSD2183 Women's Representation in National Parliaments 1970-2008.* Vanhanen collected data for this dataset principally from Inter-Parliamentary Union's *Chronicle of Parliamentary Elections* (1969-2009). The dataset covers nearly all countries of the world for the year 2008. Liechtenstein's data are from *Chronicle of Parliamentary Elections 2005* (2006).

UNDP's Gender Inequality Index (GII-08) is a composite index reflecting women's disadvantage in three dimensions - reproductive health, empowerment and the labor market. It shows the loss in human development (HDI) due to inequality between female and male achievements in these three dimensions. "It ranges from 0, which indicates that women and men fare equally, to 1, which indicates that women fare as poorly as possible in all measured dimensions" (*Human Development Report 2010,* pp. 219, 224). Data on GII-08 are derived from HDR 2010, Table 4, and they cover 136 countries.

Transparency International has published an annual Corruption Perceptions Index (CPI) since 1995. It defines corruption as the abuse of public office for private gain and measures the degree to which corruption is perceived to exist among a country's public officials and politicians. The index scores vary from 0.1 to 10.0. A high score means less (perceived) corruption. The index is not perfect, but it certainly reflects significant differences between countries in the extent of corruption. Data on the 2009 Corruption Perceptions Index are from Transparency International 2010 report. The intercorrelations of the six indicators of democracy, women's representation, Gender Inequality Index, and Corruption Perceptions Index are presented in Table 5.2.

Table 5.2. Intercorrelations of the six indicators of democracy, women's participation, Gender-Inequality Index, and Corruption Perceptions Index in various samples of countries

Variable	ID-08	FH-08	Polity-08	Women-08	GII-08	CPI-09
ID08	1.000	.797	.793	.358	-.693	.585
		N=188	N=157	N=187	N=136	N=177
FH-08		1.000	.871	.262	-.627	.641
			N=157	N=187	N=136	N=179
Polity-08			1.000	.277	-.414	.395
				N=156	N=128	N=155
Women-08				1.000	-.430	.346
					N=136	N=176
GII-08					1.000	-.790
						N=135
CPI-09						1.000

Table 5.2 shows that the three measures of democracy are strongly correlated with each other as well as GII-08 and CPI-09, whereas the other correlations are only moderate or weak. The weakest correlations are between Women-08 and the other five variables. In the next sections, the hypothesis of the impact of national IQ is tested by correlating each of these variables with national IQ. The results show to what extent differences in national IQs are able to explain the global variation in these six variables.

4. Democratization

The three measures of democracy (ID-08, FH-08, and Polity-08) are strongly intercorrelated as indicated in Table 5.2, but the unexplained part of variation leaves a lot of room for different measurement results in particular cases. The correlations between national IQ and the three measures of democracy are given in Table 5.3.

Table 5.3. National IQ correlated with the three measures of democracy in the three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
ID-08	188	.508	.501
FH-08	192	.371	.415
Polity-08	157	.312	.485
Group of countries (inhabitants > 1 million)			
ID-08	151	.577	.575
FH-08	155	.447	.488
Polity-08	146	.312	.492
Group of countries with measured national IQs			
ID-08	148	.568	.599
FH-08	152	.419	.497
Polity-08	131	.360	.555

Table 5.3 shows that the three measures of democracy are only moderately correlated with national IQ in the total group of countries, but correlations are slightly stronger in the two smaller groups of countries. ID-08 is clearly more strongly related to national IQ than FH-08 and Polity-08. Most of the variation in the level of democratization seems to be due to some other factors, not to the level of national IQ. What might those other

factors be?

According to Vanhanen's resource distribution theory of democratization, the level of democratization depends crucially on the distribution of resources used as sanctions in the struggle for power. It must be so because people tend to use all available resources in the continual struggle for power and scarce resources. The Darwinian theory of evolution by natural selection explains why the struggle for existence is inevitable and incessant in nature. As a consequence, where relevant power resources are concentrated in the hands of the few, political power also tends to be concentrated in the hands of the few, and in societies where important power resources are widely distributed, political power tends to become widely distributed. Briefly stated, the concentration of power resources leads to autocracy, and the distribution of power resources among the many leads to democracy (for this theory, see Vanhanen 2003, pp. 25-29; 2009, pp. 27-36). Vanhanen has used his Index of Power Resources (IPR) to measure the distribution of economic and intellectual power resources. IPR is a combination of four basic indicators: (1) tertiary gross enrollment ratio, (2) percentage of adult literacy, (3) family farms, and (4) the estimated degree of decentralization of economic power resources. These variables are defined and described in greater detail and empirical data on them and IPR are given and documented in Vanhanen's book *The Limits of Democratization* (2009). Empirical data on IPR cover 172 contemporary countries whose population in 2000 was more than 200,000 inhabitants. Most data on IPR are from the first years of this century. It is interesting to see how much IPR is able to explain of the variation in ID-08, FH-08, and Polity-08 independently from national IQ.

When national IQ and IPR are taken together to explain the variation in ID-08, the multiple correlation rises to 0.801 (N=172) and the explained part of variation to 64 percent. In the same group of 172 countries, the correlation between national IQ and

ID-08 is 0.574 and the explained part of variation 33 percent. This means that IPR explains 31 percent of the variation in ID-08 independently from national IQ. Because the correlation between IPR and ID-08 is 0.774 in this group of 172 countries, it means that the impact of national IQ on ID-08 takes place principally through IPR.

In the case of FH-08, the corresponding multiple correlation is 0.728 in the group of 172 countries and the explained part of variation 53 percent. The correlation between national IQ and FH-08 is 0.462 (explained part of variation 21 percent). In other words, IPR explains 32 percent of the variation in FH-08 independently from national IQ. In the case of Polity-08, the corresponding multiple correlation is 0.593 in the group of 157 countries and the explained part of variation 35 percent. Because the correlation between national IQ and Polity-08 is 0.312 (explained part of variation 10.0 percent), IPR explains 25 percent of the variation in Polity-08 independently from national IQ.

In these cases an environmental variable (IPR) is able to explain independently from national IQ as much or more of the variation in the measures of democracy than national IQ. It should be noted that correlations between national IQ and ID-08 and FH-08 are in this group of 172 countries slightly higher than in the total group of countries (Table 5.3).

The level of democratization is indeed very strongly related to the degree of resource distribution, and national IQ is the most important background factor in this relationship. National IQ explains statistically 60 percent of the variation in IPR (correlation 0.774, N=172). The value of IPR tends to rise with the level of national IQ. Because national IQ is an important background factor of democratization via IPR, it is useful to see on the basis of regression analysis how well national IQ explains the variation in ID-08 at the level of single countries and which countries deviate most clearly from the regression line to positive or negative direction in the total group of 188 countries (Table 5.4).

Table 5.4. The results of regression analysis of ID-08 on national IQ in the group of 188 countries

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
1	Afghanistan	75.0	12.0	0.1	11.9
2	Albania	82.0	26.3	10.6	15.7
3	Algeria	84.3	9.8	-7.1	16.9
4	Andorra	97.0	6.9	-17.0	23.9
5	Angola	71.0	2.4	-7.3	9.7
6	Antigua & Barbuda	74.0	25.8	14.4	11.4
7	Argentina	92.8	24.8	3.2	21.6
8	Armenia	93.2	24.3	2.4	21.9
9	Australia	99.2	28.2	3.1	25.1
10	Austria	99.0	41.7	16.7	25.0
11	Azerbaijan	84.9	8.9	-8.4	17.3
12	Bahamas	84.0	22.9	6.1	16.8
13	Bahrain	85.9	1.1	-16.8	17.9
14	Bangladesh	81.0	10.6	-4.6	15.2
15	Barbados	80.0	24.6	10.0	14.6
16	Belarus	95.0	11.1	-11.7	22.8
17	Belgium	99.3	44.9	19.7	25.2
18	Belize	76.8	18.6	5.7	12.9
19	Benin	71.0	13.6	3.9	9.7

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
20	Bermuda	90.0	-	-	-
21	Bhutan	78.0	3.1	-10.4	13.5
22	Bolivia	87.0	16.5	-2.0	18.5
23	Bosnia & Herzegovina	93.2	27.8	5.9	21.9
24	Botswana	76.9	12.1	-0.8	12.9
25	Brazil	85.6	28.1	10.4	17.7
26	Brunei	89.0	0	-19.6	19.6
27	Bulgaria	93.3	32.3	10.4	21.9
28	Burkina Faso	70.0	4.1	-5.1	9.2
29	Burundi	72.0	16.5	6.2	10.3
30	Cambodia	92.0	11.3	-9.9	21.2
31	Cameroon	64.0	6.6	0.7	5.9
32	Canada	100.4	26.0	0.2	25.8
33	Cape Verde	76.0	19.3	6.8	12.5
34	Central African Republic	64.0	7.6	1.7	5.9
35	Chad	66.0	10.7	3.7	7.0
36	Chile	89.8	19.7	-0.3	20.0
37	China	105.8	0	-28.7	28.7
38	Colombia	83.1	9.9	-6.4	16.3
39	Comoros	77.0	8.9	-4.1	13.0
40	Congo, Dem. Republic	68.0	14.5	6.4	8.1

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
41	Congo, Republic	73.0	4.1	-6.7	10.8
42	Cook Islands	89.0	-	-	-
43	Costa Rica	86.0	19.8	1.9	17.9
44	Côte d'Ivoire	71.0	0	-9.7	9.7
45	Croatia	97.8	26.4	2.0	24.4
46	Cuba	85.0	0	-17.4	17.4
47	Cyprus	91.8	38.6	17.5	21.1
48	Czech Republic	98.9	33.9	8.9	25.0
49	Denmark	97.2	44.9	20.9	24.0
50	Djibouti	75.0	1.3	-10.6	11.9
51	Dominica	67.0	18.2	10.7	7.5
52	Dominican Republic	82.0	19.9	4.2	15.7
53	Ecuador	88.0	22.2	3.2	19.0
54	Egypt	82.7	1.0	-15.1	16.1
55	El Salvador	78.0	18.0	4.5	13.5
56	Equatorial Guinea	69.0	2.3	-6.3	8.6
57	Eritrea	75.5	0	-12.2	12.2
58	Estonia	99.7	29.6	4.2	25.4
59	Ethiopia	68.5	11.8	3.4	8.4
60	Fiji	85.0	0	-17.4	17.4
61	Finland	100.9	37.2	11.1	26.1

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
62	France	98.1	26.4	1.9	24.5
63	Gabon	69.0	5.1	-3.5	8.6
64	Gambia	62.0	4.7	-0.1	4.8
65	Georgia	86.7	15.4	-2.9	18.3
66	Germany	98.9	37.0	12.1	24.9
67	Ghana	69.7	18.7	9.7	9.0
68	Greece	93.2	38.9	17.0	21.9
69	Grenada	74.0	30.6	19.2	11.4
70	Guatemala	79.0	10.0	-4.1	14.1
71	Guinea	66.7	0	-7.3	7.3
72	Guinea-Bissau	69.0	14.2	5.6	8.6
73	Guyana	81.0	18.7	3.5	15.2
74	Haiti	67.0	11.3	3.8	7.5
75	Honduras	81.0	13.2	-2.0	15.2
76	Hong Kong	105.7	-	-	-
77	Hungary	98.1	27.0	2.5	24.5
78	Iceland	98.6	37.2	12.4	24.8
79	India	82.2	25.6	9.8	15.8
80	Indonesia	85.8	28.7	10.9	17.8
81	Iran	85.6	2.4	-15.3	17.7
82	Iraq	87.0	4.9	-13.6	18.5
83	Ireland	94.9	28.4	6.6	22.8

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
84	Israel	94.6	31.9	9.3	22.6
85	Italy	96.1	34.8	11.4	23.4
86	Jamaica	71.0	14.9	5.2	9.7
87	Japan	104.2	32.8	4.9	27.9
88	Jordan	86.7	0.3	-18.0	18.3
89	Kazakhstan	85.0	4.0	-13.4	17.4
90	Kenya	74.5	14.1	2.5	11.6
91	Kiribati	85.0	8.0	-9.4	17.4
92	Korea, North	104.6	0	-28.1	28.1
93	Korea, South	104.6	20.7	-7.4	28.1
94	Kuwait	85.6	1.2	-16.5	17.7
95	Kyrgyzstan	74.8	4.1	-7.7	11.8
96	Laos	89.0	0.7	-18.9	19.6
97	Latvia	95.6	27.4	4.1	23.3
98	Lebanon	84.6	21.5	4.3	17.2
99	Lesotho	66.5	10.9	3.6	7.3
100	Liberia	68.0	13.7	5.6	8.1
101	Libya	85.0	0	-17.4	17.4
102	Liechtenstein	100.3	21.5	-4.2	25.7
103	Lithuania	94.3	27.8	5.3	22.5
104	Luxembourg	95.0	26.2	3.4	22.8
105	Macao	99.9	-	-	-

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
106	Macedonia	90.5	19.9	-0.5	20.4
107	Madagascar	82.0	11.6	-4.1	15.7
108	Malawi	60.1	17.1	13.3	3.8
109	Malaysia	91.7	15.5	-5.5	21.0
110	Maldives	81.0	22.2	7.0	15.2
111	Mali	69.5	5.4	-3.5	8.9
112	Malta	95.3	35.5	12.5	23.0
113	Mariana Islands	81.0	-	-	-
114	Marshall Islands	84.0	13.9	-2.9	16.8
115	Mauritania	74.0	0	-11.4	11.4
116	Mauritius	88.0	22.1	3.1	19.0
117	Mexico	87.8	23.1	4.2	18.9
118	Micronesia	84.0	30.9	14.1	16.8
119	Moldova	92.0	20.0	-1.2	21.2
120	Mongolia	100.0	15.2	-10.4	25.6
121	Montenegro	85.9	24.3	6.4	17.9
122	Morocco	82.4	3.4	-12.6	16.0
123	Mozambique	69.5	6.1	-2.8	8.9
124	Myanmar (Burma)	85.0	0	-17.4	17.4
125	Namibia	70.4	10.0	0.6	9.4
126	Nepal	78.0	22.5	9.0	13.5

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
127	Netherlands	100.4	42.0	16.2	25.8
128	Netherlands Antilles	87.0	-	-	-
129	New Caledonia	85.0	-	-	-
130	New Zealand	98.9	31.0	6.0	25.0
131	Nicaragua	84.0	24.8	8.0	16.8
132	Niger	70.0	7.1	-2.1	9.2
133	Nigeria	71.2	7.8	-2.0	9.8
134	Norway	97.2	38.6	14.2	24.4
135	Oman	84.5	0	-17.1	17.1
136	Pakistan	84.0	12.9	-3.9	16.8
137	Palestine	84.5	-	-	-
138	Panama	80.0	26.7	12.1	14.6
139	Papua New Guinea	83.4	27.8	11.3	16.5
140	Paraguay	84.0	15.0	-1.8	16.8
141	Peru	84.2	22.8	5.9	16.9
142	Philippines	86.1	22.8	4.8	18.0
143	Poland	96.1	21.6	-1.8	23.4
144	Portugal	94.4	27.2	4.7	22.5
145	Puerto Rico	83.5	-	-	-
146	Qatar	80.1	0	-14.7	14.7
147	Romania	91.0	22.1	1.4	20.7

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
148	Russia	96.6	16.6	-7.1	23.7
149	Rwanda	76.0	5.9	-6.6	12.5
150	St Helena	86.0	-	-	-
151	St Kitts & Nevis	74.0	22.3	10.9	11.4
152	St Lucia	62.0	18.3	13.5	4.8
153	St Vincent & Grenadines	71.0	25.7	16.0	9.7
154	Samoa (Western)	88.0	11.5	-7.5	19.0
155	Sao Tome & Principe	67.0	14.2	6.7	7.5
156	Saudi Arabia	79.6	0	-14.4	14.4
157	Senegal	70.5	12.6	3.2	9.4
158	Serbia	90.3	24.3	4.0	20.3
159	Seychelles	84.4	29.9	12.9	17.0
160	Sierra Leone	64.0	14.3	8.4	5.9
161	Singapore	107.1	9.0	-20.5	29.5
162	Slovakia	98.0	20.9	-3.6	24.5
163	Slovenia	97.6	26.0	1.7	24.3
164	Solomon Islands	83.0	15.3	-1.0	16.3
165	Somalia	72.0	0	-10.3	10.3
166	South Africa	71.6	10.8	0.8	10.0
167	Spain	96.6	34.6	10.9	23.7
168	Sri Lanka	79.0	25.3	11.2	14.1

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
169	Sudan	77.5	0	-13.3	13.3
170	Suriname	89.0	21.2	1.6	19.6
171	Swaziland	75.4	0	-12.1	12.1
172	Sweden	98.6	40.1	15.3	24.8
173	Switzerland	100.2	43.0	17.3	25.7
174	Syria	82.0	6.8	-8.9	15.7
175	Taiwan	104.6	27.1	-1.0	28.1
176	Tajikistan	80.0	12.1	-2.5	14.6
177	Tanzania	73.0	4.8	-6.0	10.8
178	Thailand	89.9	16.4	-3.7	20.1
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	18.1	0.7	17.4
181	Togo	70.0	15.7	6.5	9.2
182	Tonga	86.0	2.2	-15.7	17.9
183	Trinidad & Tobago	86.4	30.0	11.9	18.1
184	Tunisia	85.4	5.5	-12.1	17.6
185	Turkey	89.4	17.5	-2.3	19.8
186	Turkmenistan	80.0	5.6	-9.0	14.6
187	Uganda	71.7	10.9	0.8	10.1
188	Ukraine	94.3	30.7	8.2	22.5
189	United Arab Emirates	87.1	0	-18.5	18.5

	Country	National IQ	ID-08	Residual ID-08	Fitted ID-08
190	United Kingdom	99.1	29.5	4.4	25.1
191	United States	97.5	32.9	8.7	24.2
192	Uruguay	90.6	31.8	11.4	20.4
193	Uzbekistan	80.0	6.5	-8.1	14.6
194	Vanuatu	84.0	34.2	17.4	16.8
195	Venezuela	83.5	16.1	-0.5	16.6
196	Vietnam	94.0	5.8	-16.5	22.3
197	Yemen	80.5	6.4	-8.5	14.9
198	Zambia	74.0	11.3	-0.1	11.4
199	Zimbabwe	72.1	6.6	-3.7	10.3

Table 5.4 shows that the actual value of ID-08 deviates in many cases extensively from the predicted value (regression line) to positive or negative direction. In the countries with large positive residuals the level of democratization is much higher than expected on the basis of the regression equation, and in the countries with large negative residuals it is much lower than expected. Figure 5.1 summarizes the results of regression analysis given in Table 5.4. It shows that the relationship between variables is linear but weak. In fact, 74 percent of the variation in ID-08 seems to be due to some other factors. As noted earlier, IPR together with national IQ explains 64 percent of the variation in ID-08 in the group of 172 countries, but it still leaves 36 percent of the variation unexplained. Many large negative outliers are clustered at the national IQ level 80-90. It is a kind of transition level above which most countries are democracies.

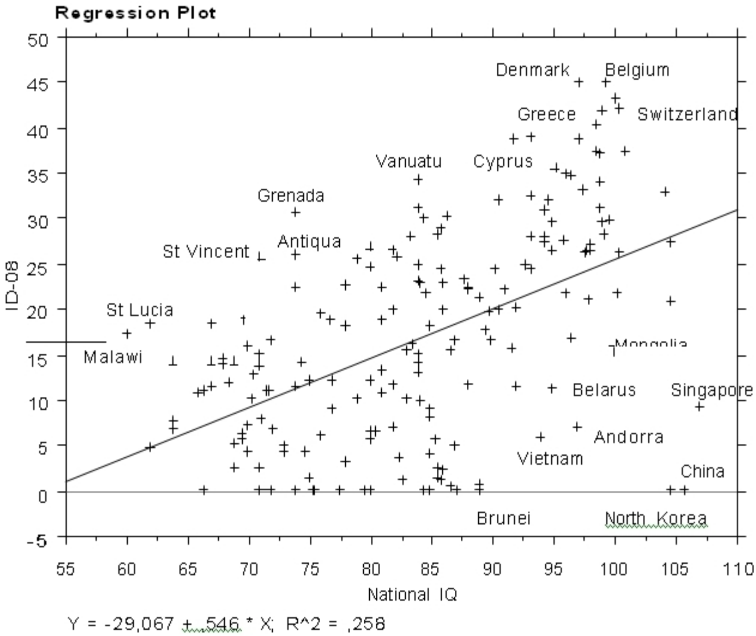

Figure 5.1. The results of regression analysis of ID-08 on national IQ in the group of 188 countries

Because many countries deviate greatly from the regression line, it can be assumed that some environmental factors affect the level of democratization independently from national IQ, but the problem is what those environmental factors might be. As indicated above, IPR together with national IQ explains 64 percent of the variation in ID-08, but even then 36 percent of the variation remains unexplained. The comparison of large positive and negative outliers provides some hints about the nature of those other factors. Let us define as large outliers countries whose residuals are ±11.0 or higher (one standard deviation is ±10.1).

The group of large positive outliers (residual +11.0 or higher) includes the following 27 countries: Antigua & Barbuda, Austria, Belgium, Cyprus, Denmark, Finland, Germany, Greece, Grenada, Iceland, Italy, Malawi, Malta, Micronesia, the Netherlands, Norway, Panama, Papua New Guinea, St Lucia, Saint Vincent & the Grenadines, the Seychelles, Sri Lanka, Sweden, Switzerland, Trinidad & Tobago, Uruguay and Vanuatu.

It is remarkable that 14 of these 27 positive outliers are economically highly developed European democracies with high national IQs. On the basis of Vanhanen's Index of Power Resources (IPR), most of these countries are not large positive outliers because their high level of resource distribution (IPR) predicts a high level of democratization (see Vanhanen 2009, pp. 98-111). In other words, their high level of democratization is more or less in balance with IPR. Antigua & Barbuda, Grenada, St Lucia, Saint Vincent & the Grenadines and Trinidad & Tobago are Caribbean tourist countries in which the level of democratization is much higher than expected on the basis of national IQ. In some way their dependence on Western tourism is related to the success of democracy. The Seychelles is a similar small island state at the Indian Ocean depending on tourism. Micronesia's high level of democratization is in some way related to its close association with the United States. Papua New Guinea's high level of democratization is principally due to its extremely heterogeneous ethnic structure, which has prevented the emergence of large political parties. Vanuatu's exceptionally high positive residual (17.4) is due to the party fragmentation in the 2008 parliamentary elections. We do not have any special explanations for higher than expected levels of democracy in Malawi, Panama, Sri Lanka and Uruguay. However, for all of them positive residuals are only slightly above 11.0.
The survival of democratic institutions in Sri Lanka despite its long ethnic civil war is a remarkable achievement. Large positive residuals predict a decrease in the level of ID, but it does not need to happen if there are exceptional local factors that support the survival of a higher than expected level of democratization.

The group of large negative outliers (residual -11.0 or higher) includes the following 31 countries: Andorra, Bahrain, Belarus, Brunei, China, Cuba, Egypt, Eritrea, Fiji, Iran, Iraq, Jordan, Kazakhstan, North Korea, Kuwait, Laos, Libya, Mauritania, Morocco, Myanmar, Oman, Qatar, Saudi Arabia, Singapore, Sudan, Swaziland, Tonga, Tunisia, the United Arab Emirates and Vietnam.

This group of large negative outliers includes only one economically highly developed European democracy (Andorra). Its large negative residual is completely due to the fact that citizens of other countries, who cannot vote in Andorra, constitute more than half of its population. The group includes only one Latin American country (Cuba), no Caribbean country, and four sub-Saharan African countries (Eritrea, Mauritania, Sudan and Swaziland). Nearly all of the large negative outliers are Asian and North African countries whose national IQs vary between 80 and 90. Arab and other Middle Eastern Muslim countries (Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Libya, Morocco, Oman, Qatar, Saudi Arabia, Tunisia and the United Arab Emirates) constitute a geographically and culturally coherent group of large negative outliers. Most of them are oil producing countries, and economic power resources are highly concentrated in all of them. Autocratic political systems persist in nearly all of these countries. Brunei as an oil-exporting autocracy belongs to the same category. Socialist or former socialist countries constitute another coherent group (Belarus, China, Cuba, Kazakhstan, North Korea, Laos and Vietnam). The failure of democratization in these countries is related to the legacy of autocratic socialist systems and to the concentration of power resources (IPR). In fact, because of the concentration of power resources, most countries of these two categories are not highly deviating ones on the basis of IPR. The other large negative outliers (Fiji, Myanmar, Singapore and Tonga) are dispersed around the world without any common characteristics. In Fiji military coups have been due to the ethnic strife between the indigenous Fijians and Indian immigrants. Myanmar has been ruled by autocratic military governments since the 1960s. Singapore is exceptionally an economically highly developed country in which democratization has not yet fully succeeded. Tonga is a traditional autocratic monarchy. In principle, large negative residuals predict a significant rise in the level of ID, but, as explained above, exceptional local factors have hampered democratization and supported the survival of autocratic regimes in most of these countries. However, it is important to note that in 2010-11 popular insurgencies broke out in many Arab and Middle Eastern Muslim countries with large negative residuals. Rebellious people demanded democratization.

The clear differences in the nature of large positive and negative outliers indicate the impact of some environmental factors, which explain the success or failure of democracy independently from the level of national IQ. The degree of resource distribution (IPR) seems to be the most important systematic factor which helps to explain the success of democracy in several countries with large positive residuals as well as the failure of democracy in several countries with large negative residuals. However, national IQ remains as an important background factor because of its strong relationship with IPR. It constrains the level of democratization and the quality of democracy significantly. The level of democratization seems to rise systematically with the level of national IQ. The results of this analysis lead to the conclusion that all countries do not have equal chances to establish and maintain democratic systems. Because of the constraining impact of national IQ, the level of democratization is and will most probably remain significantly lower in countries with low national IQs than in countries with high national IQs. It is a consequence of evolved human diversity. Vanhanen has analyzed extensively the impact of national IQ on the level and quality of democratization in his book *The Limits of Democratization* (Vanhanen, 2009).

5. Women's Representation and Gender Inequality

Women's relative representation in parliaments and other political institutions constitutes one dimension of democracy. In principle, both sexes should be equally represented in democratic political institutions. However, women's representation in parliaments is a quite recent phenomenon. Previously women were nearly completely excluded from parliaments, even from the parliaments of democratic countries (cf. Duverger, 1955; Ballington and Karam, 2005). Women's average representation in parliaments increased from 5.6 percent in 1970 to 15.8 percent in 2008 (*FSD2183 Women's Representation in National Parliaments 1970-2008*). The trend is rising, but it is not yet possible to know whether women's representation will ever approach 50 percent. It has already reached 40 percent in some countries, most of which are stable democracies.

It is useful to explore the relationship between national IQ and women's representation. If empirical evidence shows that there is a moderate or strong positive relationship between women's representation and national IQ, it would imply that women's average representation in parliaments would never reach 50 percent. In that case, women's representation might approach 50 percent in some countries with high national IQs, but it would remain at a much lower level in countries with low national IQ. On the other hand, if empirical evidence shows that correlation between national IQ and women's representation is weak, women would have better chances to reach a high level of representation in all countries because the level would not depend on differences in national IQ. However, some other relevant factors might still constrain women's representation and maintain significant differences between countries.

UNDP's Gender Inequality Index (GII-08) is another indicator of gender inequality. A zero correlation between national IQ and G11-08 would indicate that there is no gender inequality in human development based on differences in national IQs, whereas a high correlation would reflect the impact of national IQs on women's disadvantages in human development. Let us see the results of correlation analysis given in Table 5.5.

Table 5.5. National IQ correlated with Women-08 and GII-08 (Gender Inequality Index) in the three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Women-08	187	.316	.356
GII-08	136	-.857	-.870
Group of countries (inhabitants > 1 million)			
Women-08	150	.297	.350
GII-08	126	-.861	-.879
Group of countries with measured national IQs			
Women-08	149	.277	.346
GII-08	122	-.857	-.878

Table 5.5 shows that women's representation in parliaments is statistically significantly but only weakly associated with national IQ, which explains only 11 percent of the variation in Women-08 in the total group of 187 countries. Correlations in the two other groups of countries are equally weak, and Spearman rank correlations are only slightly stronger.

Approximately 90 percent of the variation in Women-08 seems to be due to various local, cultural, institutional, and accidental factors. What might those other factors be? Could IPR raise the explained part of variation in Women-08 significantly. When national IQ and IPR are taken together to explain variation in Women-08, the multiple correlation rises to 0.332 in the group of 171 countries and the explained part of variation in Women-08 remains in 11 percent. It is evident that the variation in women's representation is nearly completely independent from national IQ and resource distribution (IPR).

So we come to the conclusion that women's representation in parliaments is only slightly related to national IQ and to some other explanatory variables. It is not possible to predict the level of women's representation in parliaments on the basis of national IQ to any significant extent, although the relationship between them is positive. Consequently, national IQ does not constrain women's representation to any significant extent and it does not prevent a rise of women's representation in countries with low national IQs, but there may be other factors (cultural and institutional) which maintain great global differences in women's representation.

GII-08 is correlated very strongly with national IQ in all three groups of countries, which indicates the existence of significant women's disadvantages in human development. In the total group of 136 countries, the explained part of variation rises to 69 percent. When national IQ and IPR are taken together to explain variation in GII-08, the multiple correlation rises to 0.910 and the explained part of variation to 83 percent. In other words, IPR raises the explained part of variation by 14 percentage points independently from national IQ. Because of the very strong relationship between national IQ and GII-08, it is not reasonable to expect the disappearance of women's disadvantages in human development, although gender inequalities may decrease.

6. Corruption

Corruption is widespread in the world, but as Corruption Perceptions Index (CPI) indicates there is great global variation in the extent of corruption. It is interesting to see to what extent

CPI is related to national IQ. Because corruption is harmful to the economy and politics, it is reasonable to assume that nations with high national IQs are better able to constrain corruption and prevent its harmful effects than nations with low national IQs. Consequently, the level of CPI should be the lower, the higher the level of national IQ. This hypothesis is tested by data on CPI-09 (Table 5.6).

Table 5.6. National IQ correlated with CPI-09 in the three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
CPI-09	180	.586	.570
Group of countries (inhabitants > 1 million)			
CPI-09	152	.654	.624
Group of countries with measured national IQs			
CPI-09	147	.572	.593

Table 5.6 indicates that national IQ and CPI-09 are positively correlated as hypothesized in all three groups of countries. National IQ explains 34 percent of the variation in CPI-09 in the total group of 180 countries, and 66 percent of the variation in CPI-09 remains unexplained. It is due to other factors. The correlation is slightly stronger in the group of large countries.

It is reasonable to assume that several environmental variables are significantly correlated with CPI-09. Let us see how much IPR, ID-08, and PPP-GNI-08 can explain of the variation in CPI-09 independently from national IQ. When these three variables and national IQ are used to explain variation in CPI-09, the multiple correlation rises to 0.856 (N=168) and the explained part of variation to 73 percent. It is 33 percentage points more than what national IQ explains in the same group of 168 countries (correlation 0.635). The variation in CPI-09 is as much dependent on the three environmental variables as on national IQ. Corruption seems to be much more extensive in poor countries than in rich countries. It is also more extensive in countries in which intellectual and economic power resources are highly concentrated (IPR) than in countries in which power resources are more widely distributed. A high level of democratization tends to hamper corruption.

Although national IQ does not explain more than 34 percent total group of 180 countries, it is useful to examine the impact of national IQ on CPI-09 at the level of single countries on the basis of the regression analysis of CPI-09 on national IQ. Figure 5.2 summarizes the results of this regression analysis.

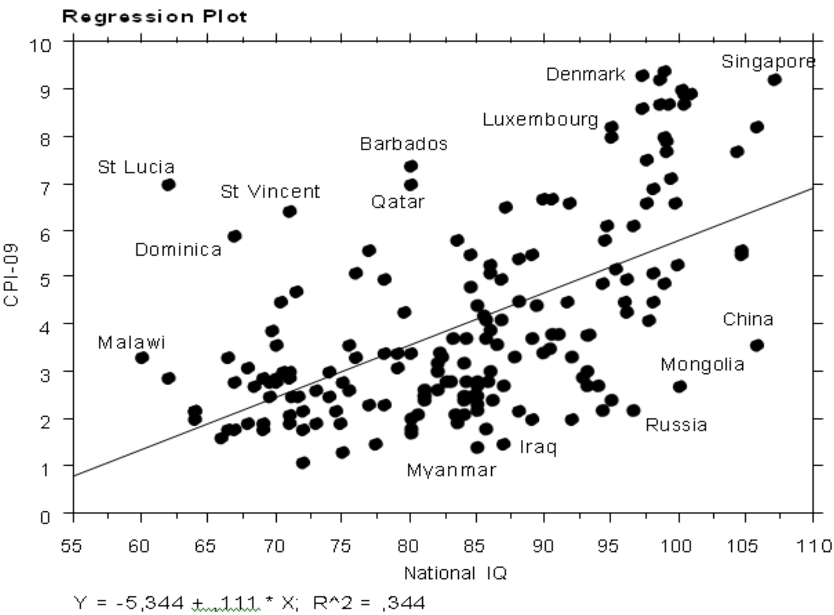

Figure 5.2. The results of regression analysis of CPI-09 on national IQ in the group of 180 countries

Figure 5.2 shows that the relationship between national IQ and CPI-09 is relatively weak and to some extent curvilinear. In the countries above the regression line (positive residuals), the level of corruption is lower than expected on the basis of the regression equation, and in the countries below the regression line (negative residuals) it is higher than expected. When national IQ crosses the level of 95, the level of corruption decreases steeply, although not in all countries. It is easy to see that many countries deviate extremely from the regression line and weaken the correlation. In the Caribbean tourist countries, for example, the level of corruption is much lower than expected on the basis of the regression equation. Let us examine the most extremely deviating countries by regarding as large outliers countries whose residual is ±2.0 or higher (one standard deviation is 1.7).

Positive residuals are large (+2.0 or higher) for the following 30 countries: Australia, Austria, Barbados, Botswana, Canada, Cape Verde, Chile, Denmark, Dominica, Finland, Germany, Iceland, Ireland, Luxembourg, Malawi, Namibia, the Netherlands, New Zealand, Norway, Qatar, St Lucia, St Vincent & the Grenadines, Singapore, South Africa, Sweden, Switzerland, the United Arab Emirates, the United Kingdom, the United States and Uruguay.

Economically highly developed countries with relatively high national IQs constitute the largest coherent group of positive outliers (17 countries). Most of them are European and European offshoot democracies, but the group includes also Singapore from East Asia. Most of these countries are large positive outliers also on the basis of ID-08 and PPP-GNI-08. The Caribbean tourist countries (Barbados, Dominica, St Lucia and St Vincent & the Grenadines) constitute another coherent group of large positive outliers. These countries have succeeded in keeping the level of corruption much lower than expected on the basis of their low national IQs. The extensive foreign control of tourism and other industries may be related to the relatively low level of corruption in these four countries. St Lucia's positive residual (5.2) is the highest in the world. It is partly a consequence of its very low level of national IQ (62). The nine other positive outliers (Botswana, Cape Verde, Chile, Malawi, Namibia, Qatar, South Africa, the United Arab Emirates and Uruguay) are dispersed around the world, and it is not possible to find any common characteristics for them. However, the economies of Botswana, Qatar and the United Arab Emirates are crucially dependent on foreign investments, technologies, and management. Large positive outliers are not evenly distributed around the world. They are concentrated to European and Caribbean countries and are rare in Asian, African, and Latin American countries. Nearly all of the large positive outliers are democracies.

Negative residuals are large (-2.0 or higher) for the following 16 countries: Argentina, Armenia, Belarus, Bosnia & Herzegovina, Cambodia, China, Ecuador, Iran, Iraq, Laos, Mongolia, Myanmar, Russia, Ukraine, Venezuela and Vietnam.

Nearly all of these are relatively poor countries. The group does not include any economically highly developed democracy in Europe or in other parts of the world. Sub-Saharan African countries are missing from this group, but it should be noted that because predicted CPI-09 values for all sub- Saharan African countries are very low (see Figure 5.2), it would be technically nearly impossible for any of them to get a large negative residual.

The nine socialist or former socialist countries (Armenia, Belarus, Bosnia & Herzegovina, China, Laos, Mongolia, Russia, Ukraine and Vietnam) constitute the largest coherent group of negative outliers. They share the same historical and institutional legacy. Corruption in these countries is much more extensive than expected on the basis of their national IQs. Cambodia and Myanmar are poor South Asian and Southeast Asian countries. Both of them have suffered from civil wars. It should be noted that residuals are negative also for nearly all other countries of this region. Iran and Iraq are geographically connected to this group of highly corrupt Asian countries. It is obvious that Asian countries constitute the core region of higher than expected level of corruption. They have one common characteristic. Almost all of them have suffered from serious ethnic or other civil wars and conflicts. Argentina, Ecuador and Venezuela are South American countries with exceptionally high levels of corruption. Residuals are negative also for nearly all other Latin American countries.

There are clear differences, both regional and structural, between the countries of large positive and large negative outliers. Nearly all positive outliers are economically highly developed democracies, mostly in Europe, or countries in which foreign technologies, investments, and management have a dominant role. On the other hand, nearly all large negative outliers are socialist or former socialist countries or economically less developed Asian countries. One crucial difference between positive and negative outliers concerns their ethnic structures. The populations of positive outliers are ethnically relatively homogeneous, whereas the populations of many negative outliers are ethnically highly heterogeneous. These structural differences seem to have affected the level of corruption independently from national IQ.

7. Conclusion

The statistical investigations carried out in this chapter show that global differences in the levels of democratization, women's representation in parliaments, gender inequality in human development, and corruption can be traced, to some extent, to differences in national IQs, although only slightly in the case of women's representation. The nature of political institutions is in principle under human control, but historical and cultural legacies may support the survival of existing structures and make it difficult to change them. Our analysis on the impact of national IQ on political institutions is based on the assumption that people use their intelligence in their attempts to improve the quality of political institutions and that, consequently, more intelligent nations are able to construct qualitatively better political institutions than less intelligent nations. Therefore, differences in national IQs are assumed to explain a significant part of the qualitative differences between political institutions and of the persistence of those differences. Our socio-biological research formula summarizes the results as follows:

ID-08 = (national IQ 33% + IPR 31%) + unexplained variation 36% (N=172).
FH-08 = (national IQ 21% + IPR 32 %) + unexplained variation 47% (N=172).
Polity-08 = (national IQ 10% + IPR 25%) + unexplained variation 65% (N=157).
Women-08 = (national IQ 11% + IPR 0%) + unexplained variation 89% (N=171).
GII-08 = (national IQ 69% + IPR 14%) + unexplained variation 17% (N=136).
CPI-09 = (national IQ 40% + ID-08, IPR, PPP-GNI-08 33%) + unexplained variation 27% (N=168).

The results of statistical analysis support the hypothesis on the positive impact of national IQ on the level of democratization, but democratization is more strongly related to the degree of resource distribution (IPR) within societies than to national IQ. IPR explains 31 percent of the variation in ID-08, 32 percent of the variation in FH-08, and 25 percent of the variation in Polity-08 independently from national IQ, but because national IQ explains more than half of the variation in IPR, it is justified to conclude that national IQ's impact on democratization takes place principally through IPR. This strong relationship means that significant national differences in the level and quality of democracy will probably continue indefinitely. This is so for the reason that equalization of national IQ values is highly improbable because IQ differences between individuals and nations are partly based on genetic differences between individuals and populations. Thus our analysis leads to the conclusion that we should learn to accept some differences in the degree of democratization as consequences of evolved human diversity. However, contemporary differences in the level and quality of democracy do not need to be permanent. Democratization depends even more on factors that are under human control than on national IQ. It is in human power to change political institutions and to improve or to worsen the quality of democracy, although the level of democratization may continually remain higher in countries with high national IQ than in countries with low national IQ.

Women's representation in parliaments is only slightly related to national IQ and IPR. The variation in the Women-08 variable seems to be mostly due to accidental, institutional, and local factors, which we were not able to identify. We paid attention to the fact that women's significant representation in parliaments is a quite recent phenomenon. It has not yet stabilized. Stronger relationships may appear in the future when women's representation increases throughout the world and stabilizes to some level. It is possible that the relationship between national IQ and women's representation will always remain weak. Our finding of only a slight positive correlation between national IQ and Women-08 leads to the important conclusion that large differences in national IQs can not prevent the rise of women's political representation even in countries with low national IQs.

The variation in UNDP's Gender Inequality Index (GII-08) is principally due to national IQ (69%), but IPR has also impact on GII-08 independently from national IQ. Together they explain more than 80 percent of the variation in GII-08.

Some environmental variables - ID-08, IPR, and PPP-GNI-08 - explain almost as much of the variation in the Corruption Perceptions Index (CPI-09) than national IQ. However, because the three other variables used in this analysis are moderately or strongly related to national IQ, it is justified to argue that national IQ constitutes an important background factor behind the variation in CPI-09. National IQ explains 40 percent of the variation in CPI-08 in the group of 168 countries, but taken together the four variables explain 73 percent of the variation in

CPI-09. The extent of corruption is significantly related to the level of national IQ, to the level of democratization, to the degree of resource distribution (IPR), and to the level of per capita income (PPP-GNI-08). Corruption is more extensive in poor countries than in rich countries and in less democratized than in more democratized countries. The results of our analysis lead to the conclusion that, because of these relationships, we cannot expect the disappearance of corruption, or the equalization of the level of corruption throughout the world. Significant global differences in the level of corruption will most probably continue, and the persistence of these differences can be partly traced to national IQ.

Political institutions are in principle under human control, but it is evident that differences in the nature and quality of these institutions depend partly on considerable differences in the average intelligence of nations, especially so in the cases of democratization, Gender Inequality Index, and corruption, but not in the case of women's representation in parliaments. Because differences in political institutions reflect evolved human diversity, it means that it would be in practice extremely difficult to equalize the nature and quality of many kinds of political institutions.

Chapter 6

Health

1. National IQ and Health. 2. New Global Comparisons. 3. Variables. 4. Nutrition and Life Expectancy. 5. Regression of Life-08 on National IQ. 6. Infant Mortality Rate. 7. HIV/AIDS and Tuberculosis. 8. Conclusion

There are a number of studies reporting that intelligence is positively associated with good health among individuals. For instance, Anstey, Low and Sachdev (2009) have shown that the intelligence is associated with higher levels of physical activity, greater likelihood of taking vitamins, and reduced likelihood of smoking, all of which promote good health.

Several studies have reported that low birth weight is associated with low IQ in childhood and adolescence, e.g. Bhutta, Cleves, Case, Cradock and Anand, 2002; Deary, Whalley and Starr (2009, pp. 193-195).

Infant mortality (infant deaths in the first year of life) is associated with low IQ mothers. This was first shown by Savage (1946) who reported that the mothers of infants who died in their first year had below average intelligence. This was confirmed by Herrnstein and Murray (1994, p. 218) who showed that the mothers of infants who had died in their first year had an average IQ of 94, compared with 100 of the mothers of infants who had not died in their first year. These results are understandable, because mothers with low IQs would be less competent in taking care of the health of their infants. Mothers with higher IQs would be better at anticipating possible accidents and preventing them happening, judging whether illnesses are sufficiently serious to justify seeing a physician, and giving medications that are prescribed.

Several studies have found that intelligence is a determinant of life expectancy. This was shown first in Australia by O'Toole and Stankov (1992) in a study of 2,309 men who were conscripted into the military and intelligence tested at the age of 18, between 1965 and 1971. They were followed up in 1982, when they were aged between 22 and 40, and it was found that 523 had died. These had an IQ 4 points lower than those who remained alive. The commonest cause of death was accidents of various kinds (389), of which motor vehicle accidents (217) were the most frequent. It seems probable that the explanation for this association is that those with lower IQs make more misjudgements. Some of these misjudgements result in accidents and some of these are fatal. Gottfredson (2004) has reviewed a number of subsequent studies confirming the association of low intelligence with high mortality, and this has also been found in Sweden (Hemmingsson, 2009).

An extensive research program in Scotland examining the relation of IQ measured at the age of 11 to mortality (i.e. age of death) has been summarized by Deary, Whalley and Starr (2009, pp. 50-52). They confirm that low intelligence predicts high mortality and have found that low intelligence is associated with several specific causes of death. Low intelligence is associated with smoking and death from lung cancer and other smoking-related cancers, namely mouth, pharynx, esophagus, larynx, pancreas and bladder cancers. Low intelligence is also associated with death from all cardiovascular diseases, coronary heart disease, stroke, and respiratory disease. They suggest four explanations for these associations. First, childhood IQ might be a record of bodily insults including illness, poor nutrition, and injuries. Second, childhood IQ might be a marker for genetic bodily system integrity. Third, people with higher IQs may be better at avoiding risks and at preserving their health, for instance by eating sensible foods, avoiding smoking, recognizing symptoms that might be injurious to health, consulting physicians, and complying with prescribed treatments. This theory implies that intelligence differences are causal to mortality. Fourth, people with higher IQs may tend to work in occupations where there is less risk of death.

1. National IQ and Health

We can predict from these studies that intelligence is positively associated with good health and low mortality among individuals and that the same association would be present across nations. Studies showing that this is the case are summarized in Table 6.1.

Table 6.1. Health correlates of national IQ

	Variable	N countries	r x IQ	Reference
1	Low birth weight	81	-.48	Barber, 2005
2	HIV/AIDS	129	-.46	Templer, 2008
3	HIV: percent, 2001-3	165	-.48	Rindermann, 2008a
4	HIV: percent	165	-.48	Rindermann & Meisenberg, 2009
5	HIV: percent	82	-.30	Rindermann et al., 2009
6	AIDS: percent,2001-3	83	-.21	Rindermann et al., 2009
7	HIV: percent	113	-.52	Rushton & Templer, 2009
8	HIV/AIDS: deaths	104	-.47	Reeve, 2009
9	Infant mortality	81	-.34	Barber, 2005
10	Infant mortality	149	-.77	Lynn & Vanhanen, 2006

	Variable	N countries	r x IQ	Reference
11	Infant mortality	126	-.84	Kanazawa, 2006
12	Infant mortality	129	-.84	Templer, 2008
13	Infant mortality	116	-.67	Rushton & Templer, 2009
14	Infant mortality	191	-.69	Reeve, 2009
15	Life expectancy, 2002	192	.75	Lynn & Vanhanen, 2006
16	Life expectancy: men	126	.78	Kanazawa, 2006
17	Life expectancy: women	126	.82	Kanazawa, 2006
18	Life expectancy	56	.76	Lynn et al., 2007
19	Life expectancy	98	.51	Ram, 2007
20	Life expectancy	129	.84	Templer, 2008
21	Life expectancy	116	.74	Rushton & Templer, 2009
22	Life expectancy	190	.75	Reeve, 2009
23	Malnutrition	120	-.49	Lynn & Meisenberg, 2011
24	Mortality: maternal	149	-.73	Lynn & Vanhanen, 2006
25	Mortality: maternal	131	-.65	Reeve, 2009
26	Suicide, 1970/1980	70	.53	Lester, 2003
27	Suicide-men	85	.39	Voracek, 2004
28	Suicide-women	85	.46	Voracek, 2004
29	Suicide, age 65+	48	.06	Voracek, 2005
30	Suicide	85	.54	Voracek, 2008
31	Suicide-men	-	.70	Templer et al., 2007

	Variable	N countries	r x IQ	Reference
32	Suicide-women	-	.46	Templer et al., 2007
33	Suicide-men	73	.37	Voracek, 2009
34	Suicide-women	73	.48	Voracek, 2009

Row 1 gives a correlation of -0.48 between national IQ and low birth weight defined as below 2500 gr. showing that the incidence of babies with low birth weight is greater in low IQ countries. Barber (2005) suggests the likely explanation is that the incidence of low birth weight is determined largely by the incidence of malnutrition and diseases, and that these are partly determined by national IQ.

Rows 2 through 8 give seven studies showing negative correlations ranging from -0.21 to -0.52 between national IQ and various measures of the incidence of HIV and AIDS. The negative correlations show that HIV and AIDS are more prevalent in low IQ countries.

Rows 9 through 14 give six studies showing negative correlations ranging from -0.34 to -0.84 between national IQ and rates of infant mortality. The negative correlations show that rates of infant mortality are higher in low IQ countries. Barber (2005) was the first to report this negative correlation based on infant mortality rates averaged for 1978-1980 and suggests that this arises because "infant mortality is affected by the prevalence of infection as well as infant nutritional status and is considered a sensitive indicator of infant health for a population" (p. 278). We accept this but propose in addition that the population's IQ has a direct effect on rates of infant mortality because less intelligent mothers are less competent in looking after their children, giving rise to a negative correlation between mothers' IQs and infant mortality that has been shown by Savage (1946) and confirmed in a review of the literature on IQ and infant mortality by Cvorovic, Rushton and Tenjevic (2008). Kanazawa (2006) reports a negative correlation of -0.84 based on 126 countries and notes that "the unstandardized regression coefficient of 22.5816 for national IQ . . . means that each additional point in the mean IQ of a population saves more than two and half infants from death per 1,000 live births."

Rows 15 through 22 give eight studies showing positive correlations ranging from 0.51 to 0.84 between national IQ and life expectancy. The positive correlations show that life expectancy is longer in high IQ countries. Kanazawa (2006) gives correlations for men and women and concludes:

> National IQ single-handedly explains about half of the variance in life expectancy across the 126 countries. Even though economic development is highly correlated with national IQ, national IQ is not a proxy for economic development in the present analysis. When entered with the Gini coefficient and national IQ, GDP per capita has no effect at all on male or female life expectancy . . . each additional point in mean IQ of a population increases the female life expectancy at birth by more than a year.

He explains that in late adolescence and early adulthood "individuals in this age group begin to make their own decisions about what to eat (and, more importantly, what not to eat), how to behave and, in general, what to do for the first time in their lives. So late adolescence and early adulthood are when their own intelligence begins to impact on their health."

Row 23 gives a negative correlation of -0.49 between national IQs and the percentage of children with malnutrition. Our interpretation of this is that nations with low IQs have low per capita income (r = -0.74) and these populations are unable to provide their children with good quality nutrition.

Rows 24 and 25 give negative correlations -0.72 and -0.65 between national IQ and maternal mortality probably reflecting the greater prevalence of infectious diseases and lower health care in low IQ countries.

Rows 26 through 34 give nine studies showing positive correlations ranging from 0.37 to 0.70 between national IQ and suicide rates. The positive correlations show that suicide rates are higher in high IQ nations. The evidence on the relation between suicide rates and intelligence among individuals is conflicting. Four studies have reported that suicide is associated with higher IQ (De Hert, McKenzie and Peuskens, 2001; Fenton, 2000; Webb, Långström, Runeson, Lichtenstein and Fazel, 2011; Westermeyer, Harrow and Marengo, 1991). On the other hand a study in Sweden has shown that suicide is associated with low IQ among males, although not among females (Andersson, Allebeck, Gustafsson and Gunnel, 2008). Other studies have shown that suicide is associated with poor educational attainment in Australia, Norway, Denmark and Finland (Gunnell, Lofving, Gustafsson and Allebeck, 2011). In the United States, universitry students who have higher than average IQs, have lower suicide rates than non-students of the same age, where the percentages of deaths due to suicide are 14.4% for students and 16.7% non-students (Stack, 2011).

A theory that assumes there is a positive association between suicide and intelligence among individuals and across nations has been proposed by Voracek (2009a), who suggests that a certain level of intelligence is required to understand that a person's kin would benefit from one's death, and therefore that suicide can increase a person's inclusive fitness. A possible alternative or additional explanation is that depression is less prevalent in the low IQ countries of sub-Saharan Africa. This was noted in the early 1950s by Carothers (1953, p. 144), a medical officer at the mental hospital in Nairobi, who recorded that among 1,508 patients admitted over the years 1939-48, only 24 suffered from depression, amounting to 1.6 per cent of admissions. He contrasted this with 22 per cent of admissions of European patients admitted to the same hospital diagnosed as depressives. He wrote that "there is no doubt that classical psychotic depression of any type is relatively rare in the African" (p. 145). The low prevalence of depression among sub-Saharan Africans has been confirmed in the United States by Gonzalez, Neighbors, Nesse, Sweetman and Jackson (2007).

We propose that there is a positive feedback loop across nations between good health, IQ, and per capita income. Healthy people work more efficiently than unhealthy workers, so good health promotes high per capita income, good nutrition and health care, and higher intelligence. In the positive feedback loop, high national intelligence promotes high per capita income and good health.

2. New Global Comparisons

Nutrition is a basic factor affecting health because it is not possible to live without sufficient nutrition. Many kinds of climatic, geographical, and other environmental factors affect the availability of appropriate nutrition, but the sufficiency of nutrition depends also on human skills and policies. Therefore we hypothesize that nutrition correlates positively with national IQ. It is interesting to investigate whether national IQ is the best explanatory factor or are there some other factors which explain as much or more of the variation in indicators of nutrition independently from national IQ. If national IQ remains as the dominant explanatory variable, it will lead to the conclusion that it would be extremely difficult to equalize nutritional conditions in the world.

It can be assumed that people live longer in good health conditions than in poor health conditions. Therefore life expectancy at birth is a good indicator of the general state of health conditions in a country. The higher the average life expectancy of people, the better health conditions are in a country. If our basic hypothesis on the positive impact of intelligence on health conditions is correct, life expectancy should be positively correlated with national IQ. It is again interesting to see how much some other factors, for example per capita income, might be able to explain of the variation in life expectancy independently from national IQ.

There are several other perspectives from which differences in national health conditions can be evaluated and measured. Infant mortality rate provides one indicator. It can be assumed that a low infant mortality rate indicates good health conditions and a high infant mortality rate poor health conditions. Further, because intelligence is needed to lower infant mortality rate, it should be negatively correlated with national IQ.

The prevalence and spreading of HIV depends crucially on human choices. Because it is a dangerous disease, it is reasonable to assume that more intelligent nations are better able to prevent its spreading than less intelligent nations. Consequently, national IQ should be negatively correlated with the prevalence of HIV, although, of course, there are also other factors affecting the spreading and avoidance of HIV. We are not able to take into account or even to know all important factors, but we explore to what extent the prevalence of HIV is related to national IQ.

There are also other diseases whose prevalence depends more or less on human choices and health policies and which, consequently, should be negatively related to national IQ. Tuberculosis is one of such diseases. It can be assumed that more intelligent nations have been better able to control tuberculosis than less intelligent nations, although the extent of tuberculosis may depend also on per capita income and on some other relevant environmental variables.

Our purpose is to test our basic hypothesis on the relationship between national IQ and national health conditions by using several separate measures of health conditions because the use of different indicators may produce more reliable results than reliance on only one or two variables.

3. Variables

Some empirical evidence is available on the all aspects of health conditions discussed in the previous section, but a problem is that the available statistical datasets do not cover all countries of the world and that the samples of countries vary from one variable to another one.

WDI 2010 (Table 2.20) provides several variables which measure nutrition and prevalence of undernourishment from different perspectives. We take into account two of them: Prevalence of undernourishment, % of population, 2004-06 (PUN-06), and Prevalence of child malnutrition, % of children under age 5, underweight, 2000-08 (PCM-08). Prevalence of undernourishment refers to the percentage of the population "whose dietary energy consumption is continuously below a minimum requirement for maintaining a healthy life and carrying out light physical activity with an acceptable minimum weight for height." Prevalence of child malnutrition indicates "the percentage of children under age 5 whose weight for age (underweight) . . . is more than two standard deviations below the median for the international reference population ages 0-59 months." Being underweight "even mildly, increases the risk of death and inhibits cognitive development in children" (WDI 2010, p. 139). Data on PUN-06 are available from 144 countries and data on PCM-08 from 108 countries.

Data on life expectancy are available from WDI 2010 (Table 2.22) and from UNDP's *Human Development Report 2009* (Table H). Life expectancy at birth (Life-08) "is the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life" (WDI 2010, p. 147). We use data given in WDI 2010 for the year 2008, but they cover only 154 countries. Data were complemented from CIA's *The World Factbook 2009* in the following cases: Andorra, Antigua & Barbuda, the Bahamas, Bahrain, Barbados, Belize, Bermuda, Bhutan, Brunei, Cape Verde, Comoros, Cyprus, Djibouti, Dominica, Equatorial Guinea, Fiji, Grenada, Guyana, Iceland, Kiribati, Liechtenstein, Luxembourg, Macau, the Maldives, Malta, the Mariana Islands, the Marshall Islands, Micronesia, the Netherlands Antilles, New Caledonia, St Helena, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Samoa, Sao Tome & Principe, the Seychelles, the Solomon Islands, Suriname, Taiwan, Tonga and Vanuatu. Montenegro's value is the same as for Serbia (74). Data on Life-08 cover 197 countries.

Two indicators measure global differences in infant mortality: Infant mortality rate per 1,000 live births, 2008 (IMR-08) and Under-five mortality rate per 1,000, 2008. Data on these variables are given in WDI 2010 (Table 2.22). Because they are extremely strongly correlated with each other, we use only one of them, IMR-08. Infant mortality rate "is the number of infants dying before reaching one year of age, per 1,000 live births in a given year" (WDI 2010, p. 147). Data were complemented from CIA's *The World Factbook 2009* in the following cases: Andorrra, Antigua & Barbuda, the Bahamas, Bahrain, Barbados, Belize, Bermuda, Bhutan, Brunei, Cape Verde, the Comoros, Cyprus, Djibouti, Dominica, Equatorial Guinea, Fiji, Grenada, Guyana, Hong Kong, Iceland, Kiribati, Liechtenstein, Luxembourg, Macau, the Maldives, Malta, the Mariana Islands, the Marshall Islands, the Netherlands Antilles, New Caledonia, Puerto Rico, St Helena, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Samoa, Sao Tome & Principe, the Seychelles, the Solomon Islands, Suriname, Taiwan, Tonga and Vanuatu. Data cover 197 countries,

Data and estimates of HIV prevalence are available from WDI 2010 (Table 1.3 and Table 2.21) and from CIA's *The World Factbook 2009.* In this study we use data on HIV prevalence % of population ages 15-49, in 2007 (HIV-07), given in WDI 2010 (Table 2.21). Data refer to the percentage of people ages 15-49 who are infected with HIV. Data were complemented from CIA's *The World Factbook 2010* in the cases of Afghanistan, the Bahamas, Bahrain, Bangladesh, Barbados, Belize, Bermuda, Bhutan, Brunei, Bulgaria, Cape Verde, the Comoros, Congo, D.R., Cyprus, the Czech Republic, Djibouti, Egypt, Equatorial Guinea, Fiji, Guyana, Hong Kong, Iceland, Iraq, Japan, Jordan, Kenya, Kuwait, Libya, Luxembourg, Maldives, Malta, Oman, the Philippines, Qatar, Saudi Arabia, Sri Lanka, Suriname, Syria, Turkey, the United Arab Emirates, Vietnam and Yemen. Data cover 168 countries.

Of other diseases, we use data on incidence of tuberculosis per 100,000 people 2008 (Tuber-08) to test our basic hypothesis. This variable (Tuber-08) indicates the estimated number of new tuberculosis cases (pulmonary, smear positive, extrapulmonary). Data on Tuber-08 are from WDI 2010, Table 2.21, and they cover 154 countries.

The intercorrelations of these six variables are given in Table 6.2. Life-08 and IMR-08 (infant mortality rate) are extremely strongly correlated with each other. HIV and Tuberculosis-08 are also strongly correlated (0.808). Almost all other correlations are moderate, but HIV is only slightly correlated with PUN-06, PCM-08, and IMR-08. Different aspects of health conditions seem to be moderately or strongly intercorrelated with each other, except the prevalence of HIV.

Table 6.2. Intercorrelations of the six indicators of health conditions in various groups of countries

Variable	**PUN-06**	**PCM-08**	**Life-08**	**IMR-08**	**HIV**	**Tuber-08**
PUN-06	1.000	.584	-.690	.722	.287	.496
		N=103	N=144	N=144	N=140	N=144
PCM-08		1.000	-.598	.679	.033	.383
			N=108	N=108	N=104	N=108
Life-08			1.000	-.905	-.556	-.770
				N=197	N=168	N=154

Variable	PUN-06	PCM-08	Life-08	IMR-08	HIV	Tuber-08
IMR-08				1.000	.299	.603
					N=168	N=154
HIV					1.000	.808
						N=149
Tuberculosis-08						1.000

It is interesting to see which variables are most strongly correlated with national IQ and to what extent national IQ remains as the most important explanatory variable when some other explanatory variables are taken into account.

4. Nutrition and Life Expectancy

Let us start from the correlations between national IQ and the three measures of nutrition and life expectancy (PUN-06, PCM-08, and Life-08). These three variables are moderately intercorrelated (see Table 6.2), which indicates that they measure health conditions from clearly different perspectives. Correlations between national IQ and these three variables are given in Table 6.3.

Table 6.3. National IQ correlated with three indicators of nutrition and life expectancy in three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
PUN-6 (Prevalence of undernourishment)	144	-.582	-.571
PCM-08 (Prevalence of child malnutrition)	108	-.467	-.567

Dependent variable	N	Pearson correlation	Spearman rank correlation
Life -08 (Life expectancy at birth)	197	.759	.766
Group of countries (inhabitants > 1 million)			
PUN-06	144	-.582	-.571
PCM-08	108	-.467	-.567
Life-08	154	.821	.814
Group of countries with measured IQs			
PUN-06	124	-.605	-.556
PCM-08	87	-.483	-.619
Life-08	156	.777	.757

Table 6.3 shows that correlations between national IQ and PUN-06 and PCM-08 are negative as hypothesized, but the strength of correlations is only moderate. Positive correlations between national IQ and Life-08 are considerably stronger. The explained part of variation rises to 58 per cent in the total group of countries. The Spearman rank correlations do not differ significantly from Pearson correlations, and most correlations in the groups of large countries and measured IQ countries are approximately the same. The highest correlation between national IQ and Life-08 (0.821) is in the group of large countries.

PUN-06. Are differences in the extent of undernourishment (PUN-06) principally due to differences in national IQ, or could some other variables like PPP-GNI-08, ID-08, and Literacy-08 explain as much or more of this variation? When they and national IQ are used to explain the variation in PUN-06, the multiple correlation rises to 0.635 and the explained part of variation to 40 per cent, in PUN-06, the multiple correlation rises to 0.635 and the explained part of variation to 40 per cent, which is six percentage points more than national IQ explains (34%). Thus their ability to explain variation in undernourishment independently from national IQ is quite limited. More than half of the variation remains unexplained. The unexplained variation is principally due to unknown local factors. National IQ remains as the most significant explanatory factor, although it does not explain more than 34 per cent of the variation in PUN-06. This relationship implies that significant national differences in undernourishment will most probably continue.

PCM-08. Prevalence of child malnutrition (PCM-08) is only moderately correlated with national IQ (-0.467, N=108) and it is almost as strongly or more strongly correlated with PPP-GNI-08 (-0.514), ID-08 (-0.310), and Literacy-08 (-0.719). When national IQ and these three other variables are used to explain variation in PCM-08, the multiple correlation rises to 0.751 and the explained part of variation to 56 per cent, which is 34 percentage points more than national IQ explains (22%). In other words, the three environmental variables explain independently from national IQ clearly more of the variation in PCM-08 than national IQ. In this case some environmental variables are more powerful explanatory factors than national IQ. However, it should be noticed that these results are based on a relatively small sample of countries.

Life-08. Life expectancy at birth can be regarded to be an ultimate measure of health conditions. The better health conditions are in a country, the longer people live. According to our hypothesis, the correlation between national IQ and Life-08 should be strongly positive. In fact, the correlation is 0.759 in the total group of 197 countries and 0.821 in the group of countries with more than one million inhabitants. These are among the highest correlations between national IQ and various measures of human conditions, but still some environmental variables are able to explain a part of the variation in Life-08 independently from national IQ. Life-08 is moderately correlated with PPP-GNI-08 (0. 635), ID-08 (0.532), and Literacy (0.710). These are significant correlations but a little weaker than between national IQ and Life-08. When these three variables and national IQ are taken together to explain variation in Life-08, the multiple correlation rises to 0.839 (N=188) and the explained part of variation in Life-08 to 73 per cent, which is 15 percentage points more than national IQ explains (58%). Most of the variation in the three environmental variables is overlapping with national IQ, which remains as the dominant explanatory factor.

5. Regression of Life-08 on National IQ

The regression analysis of Life-08 on national IQ shows how well the average relationship between national IQ and Life-08 explains the actual values of Life-08 at the level of single countries and which countries deviate most from the regression line. The results are summarized in Figure 6.1 and presented for single countries in Table 6.4. Figure 6.1 shows that the relationship is approximately linear as hypothesized. Life expectancy at birth is high for all countries above the national IQ level of 90, whereas it varies greatly in the group of countries below national IQ of 75. In fact, there does not seem to be any correlation between national IQ and Life-08 in the group of countries with low national IQs, although life expectancy is less than 60 years for most of them.

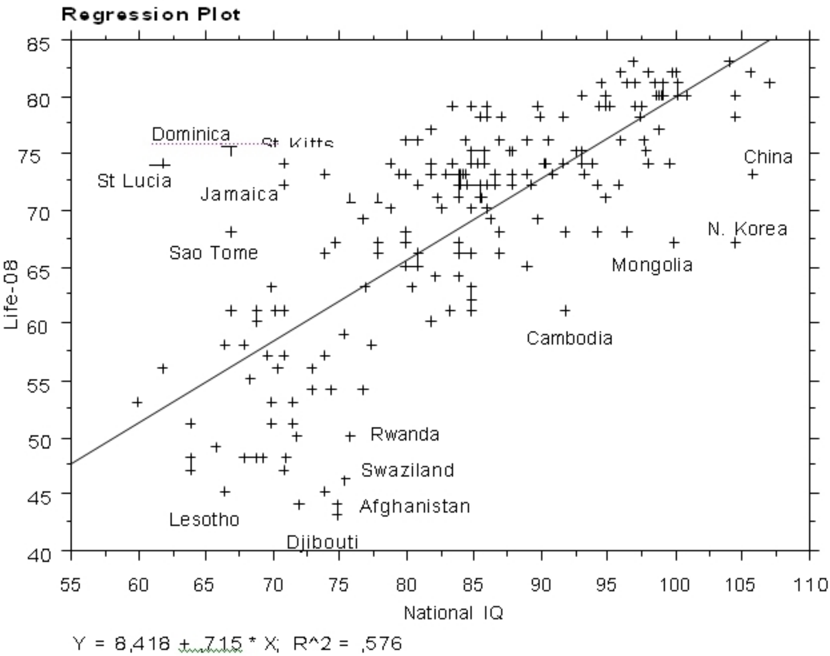

Figure 6.1. The results of regression analysis of Life-08 on national IQ in the group of 197 countries

Table 6.4. The results of regression analysis of Life-08 on national IQ in the total group of 197 countries

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
1	Afghanistan	75.0	44	-18	62
2	Albania	82.0	77	10	67
2	Algeria	84.2	72	3	69
4	Andorra	97.0	83	5	78
5	Angola	71.0	47	-12	59
6	Antigua & Barbuda	74.0	73	12	61
7	Argentina	92.8	75	0	75
8	Armenia	93.2	74	-1	75
9	Australia	99.2	81	2	79
10	Austria	99.0	80	1	79
11	Azerbaijan	84.9	70	1	69
12	Bahamas	84.0	66	-3	69
13	Bahrain	85.9	75	5	70
14	Bangladesh	81.0	66	0	66
15	Barbados	80.0	73	7	66
16	Belarus	95.0	71	-5	76
17	Belgium	99.3	80	1	79
18	Belize	76.8	69	6	63
19	Benin	71.0	61	2	59

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
20	Bermuda	90.0	78	5	73
21	Bhutan	78.0	66	2	64
22	Bolivia	87.0	66	-5	71
23	Bosnia & Herzegovina	93.2	75	0	75
24	Botswana	76.9	54	-9	63
25	Brazil	85.6	72	2	70
26	Brunei	89.0	76	4	72
27	Bulgaria	93.3	73	-2	75
28	Burkina Faso	70.0	53	-6	59
29	Burundi	72.0	50	-10	60
30	Cambodia	92.0	61	-13	74
31	Cameroon	64.0	51	-3	54
32	Canada	100.4	81	1	80
33	Cape Verde	76.0	71	8	63
34	Central African Republic	64.0	47	-7	54
35	Chad	66.0	49	-7	56
36	Chile	89.8	79	6	73
37	China	105.8	73	-11	84
38	Colombia	83.1	73	5	68
39	Comoros	77.0	63	-1	64
40	Congo, Dem. Rep	68.0	48	-9	57

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
41	Congo, Republic	73.0	54	-7	61
42	Cook Islands	89.0	-	-	-
43	Costa Rica	86.0	79	9	70
44	Côte d'Ivoire	71.0	57	-2	59
45	Croatia	97.8	76	-2	78
46	Cuba	85.0	79	10	69
47	Cyprus	91.8	78	4	74
48	Czech Republic	98.9	77	-2	79
49	Denmark	97.2	79	1	78
50	Djibouti	75.0	43	-19	62
51	Dominica	67.0	75	19	56
52	Dominican Republic	82.0	73	6	67
53	Ecuador	88.0	75	4	71
54	Egypt	82.7	70	2	68
55	El Salvador	78.0	71	7	64
56	Equatorial Guinea	69.0	61	3	58
57	Eritrea	75.5	59	-3	62
58	Estonia	99.7	74	-6	80
59	Ethiopia	68.5	55	-2	57
60	Fiji	85.0	70	1	69
61	Finland	100.9	80	-1	81

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
62	France	98.1	82	3	79
63	Gabon	69.0	60	2	58
64	Gambia	62.0	56	3	53
65	Georgia	86.7	72	2	70
66	Germany	98.8	80	1	79
67	Ghana	69.7	57	-1	58
68	Greece	93.2	80	5	75
69	Grenada	74.0	66	5	61
70	Guatemala	79.0	70	5	65
71	Guinea	66.5	58	2	56
72	Guinea-Bissau	69.0	48	-10	58
73	Guyana	81.0	66	0	66
74	Haiti	67.0	61	5	56
75	Honduras	81.0	72	6	66
76	Hong Kong	105.7	82	-2	84
77	Hungary	98.1	74	-5	79
78	Iceland	98.6	81	2	79
79	India	82.2	64	-3	67
80	Indonesia	85.8	71	1	70
81	Iran	85.6	71	1	70
82	Iraq	87.0	68	-3	71
83	Ireland	94.9	80	4	76

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
84	Israel	94.6	81	5	76
85	Italy	96.1	82	5	77
86	Jamaica	71.0	72	13	59
87	Japan	104.2	83	0	83
88	Jordan	86.7	73	3	70
89	Kazakhstan	85.0	66	-3	69
90	Kenya	74.5	54	-8	62
91	Kiribati	85.0	63	-6	69
92	Korea, North	104.6	67	-16	83
93	Korea, South	104.6	80	-3	83
94	Kuwait	85.6	78	8	70
95	Kyrgyzstan	74.8	67	5	62
96	Laos	89.0	65	-7	72
97	Latvia	95.9	72	-5	77
98	Lebanon	84.6	72	3	69
99	Lesotho	66.5	45	-11	56
100	Liberia	68.0	58	1	57
101	Libya	85.0	74	5	69
102	Liechtenstein	100.3	80	0	80
103	Lithuania	94.3	72	-4	76
104	Luxembourg	95.0	79	3	76
105	Macao	99.9	82	2	80

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
106	Macedonia	90.5	74	1	73
107	Madagascar	82.0	60	-7	67
108	Malawi	60.1	53	2	51
109	Malaysia	91.7	74	0	74
110	Maldives	81.0	65	-1	66
111	Mali	69.5	48	-10	58
112	Malta	95.3	79	2	77
113	Mariana Islands	81.0	76	10	66
114	Marshall Islands	84.0	71	3	68
115	Mauritania	74.0	57	-4	61
116	Mauritius	88.0	73	2	71
117	Mexico	87.8	75	4	71
118	Micronesia	84.0	71	3	68
119	Moldova	92.0	68	-6	74
120	Mongolia	100.0	67	-13	80
121	Montenegro	85.9	74	4	70
122	Morocco	82.4	71	4	67
123	Mozambique	69.5	48	-10	58
124	Myanmar (Burma)	85.0	62	-7	69
125	Namibia	70.4	61	2	59
126	Nepal	78.0	67	3	64
127	Netherlands	100.4	80	0	80

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
128	Netherlands Antilles	87.0	76	5	71
129	New Caledonia	85.0	75	6	69
130	New Zealand	98.9	80	1	79
131	Nicaragua	84.0	73	5	68
132	Niger	70.0	51	-8	59
133	Nigeria	71.2	48	-11	59
134	Norway	97.2	81	3	78
135	Oman	84.5	76	7	69
136	Pakistan	84.0	67	-2	69
137	Palestine	84.5	73	4	69
138	Panama	80.0	76	10	66
139	Papua New Guinea	83.4	61	-7	68
140	Paraguay	84.0	72	4	68
141	Peru	84.2	73	4	69
142	Philippines	86.1	72	2	70
143	Poland	96.1	76	-1	77
144	Portugal	94.4	79	3	76
145	Puerto Rico	83.5	79	11	68
146	Qatar	80.1	76	10	66
147	Romania	91.0	73	-1	74
148	Russia	96.6	68	-10	78

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
149	Rwanda	76.0	50	-13	63
150	St Helena	86.0	78	8	70
151	St Kitts & Nevis	74.0	73	12	61
152	St Lucia	62.0	74	21	53
153	St Vincent & Grenadines	71.0	74	15	59
154	Samoa (Western)	88.0	72	1	71
155	Sao Tome & Principe	67.0	68	12	56
156	Saudi Arabia	79.6	73	8	65
157	Senegal	70.5	56	-3	59
158	Serbia	90.3	74	1	73
159	Seychelles	84.4	73	4	69
160	Sierra Leone	64.0	48	-6	54
161	Singapore	107.1	81	-4	85
162	Slovakia	98.0	75	-4	79
163	Slovenia	97.6	79	1	78
164	Solomon Islands	83.0	73	5	68
165	Somalia	72.0	50	-10	60
166	South Africa	71.6	51	-9	60
167	Spain	96.6	81	4	77
168	Sri Lanka	79.0	74	9	65
169	Sudan	77.5	58	-6	64

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
170	Suriname	89.0	73	1	72
171	Swaziland	75.4	46	-16	62
172	Sweden	98.6	81	2	79
173	Switzerland	100.2	82	2	80
174	Syria	82.0	74	7	67
175	Taiwan	104.6	78	-5	83
176	Tajikistan	80.0	67	1	66
177	Tanzania	73.0	56	-5	61
178	Thailand	89.9	69	-4	73
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	61	-8	69
181	Togo	70.0	63	5	58
182	Tonga	86.0	70	0	70
183	Trinidad & Tobago	86.4	69	-1	70
184	Tunisia	85.4	74	5	69
185	Turkey	89.4	72	0	72
186	Turkmenistan	80.0	65	-1	66
187	Uganda	71.7	53	-7	60
188	Ukraine	94.3	68	-8	76
189	United Arab Emirates	87.1	78	7	71

	Country	National IQ	Life-08	Residual Life-08	Fitted Life-08
190	United Kingdom	99.1	80	1	79
191	United States	97.5	78	0	78
194	Vanuatu	84.0	64	-5	69
195	Venezuela	83.5	74	6	68
196	Vietnam	94.0	74	-2	76
197	Yemen	80.5	63	-3	66
198	Zambia	74.0	45	-16	61
199	Zimbabwe	72.1	44	-16	60

As can be seen from Figure 6.1, most countries are relatively close to the regression line, but there are also many highly deviating countries, which moderate the hypothesis on the positive correlation between national IQ and Life-08. It is useful to explore the nature of the most extremely outlying countries because they may provide hints about factors which have caused them to deviate so much from the regression line. Let us use residual ±8 or higher to separate the most deviating countries from the less deviating ones (one standard deviation of residual Life-08 is 7). Positive residuals indicate that life expectancy is longer than expected on the basis of the regression equation, and negative residuals that it is shorter than expected.

The group of large positive outliers includes the following 19 countries: Albania, Antigua & Barbuda, Cape Verde, Costa Rica, Cuba, Dominica, Jamaica, Kuwait, the Mariana Islands, Panama, Puerto Rico, Qatar, St Helena, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Sao Tome & Principe, Saudi Arabia and Sri Lanka.

Latin American and Caribbean (10) countries dominate in the group of large positive outliers. In these countries, some living conditions seem to be significantly better than expected on the basis of national IQ. The expansion of tourist industries has improved living conditions and raised per capita income in the Caribbean tourist islands (Antigua & Barbuda, Dominica, Jamaica, Puerto Rico, St Kitts & Nevis, St Lucia and St Vincent). Political stability in Costa Rica may have supported the improving of living conditions. Cuba's socialist system seems to have improved the health and life expectancy of the population, although the country's per capita income is low. Panama has probably benefitted from the Panama Canal and Puerto Rico from its connection with the United States. Kuwait, Qatar and Saudi Arabia are oil producing countries in which oil wealth has been used to improve living conditions and health of the populations. We do not have any special explanation for large positive residuals of Albania, Cape Verde, the Mariana Islands, St Helena, Sao Tome & Botswana, Burundi, Cambodia, China, Congo, D.R., Djibouti, Guinea-Bissau, Kenya, North Korea, Lesotho, Mali, Mongolia, Mozambique, Niger, Nigeria, Russia, Rwanda, Somalia, South Africa, Swaziland, Timor-Leste, Ukraine, Zambia and Zimbabwe.

The group of 18 sub-Saharan African countries constitutes a geographically coherent group of large negative outliers. National IQ is below 75 for nearly all of these countries. HIV/AIDS may be the most important local factor which has decreased life expectancy in many of these countries, especially in southern Africa. Besides, several of these countries have suffered from ethnic and other civil wars. Six contemporary or former socialist countries (Cambodia, China, North Korea, Mongolia, Russia and Ukraine) constitute another coherent group of negative outliers. Afghanistan and Timor-Leste have suffered from serious civil wars.

It is remarkable that national IQ explains almost 60 per cent of the global variation in Life-08 and that it does not seem to be possible to find any other factor which could explain a significant part of the variation in Life-08 independently from national IQ. The observed strong relationship implies that extensive disparities in life expectancy will most probably continue, although various other factors cause deviations from the average relationship. Most of the unexplained variation in Life-08 seems to be due to particular local factors and perhaps also to measurement errors in some cases.

6. Infant Mortality Rate

It is hypothesized that national IQ is negatively correlated with infant mortality rate per 1,000 live births in 2008 (IMR-08). In fact, the correlation between national IQ and IMR-08 is -0.713 in the total group of 197 countries, -0.778 (N=154) in the group of countries with one million or more inhabitants, and -0.741 (N=156) in the group of countries with measured IQs. Thus the results of correlation analysis support strongly the hypothesis. Now the question is whether some environmental variables could explain significant parts of the variation in IMR-08 independently from national IQ.

IMR-08 is related negatively also to several environmental variables. IMR-08 is correlated with PPP-GNI-08 -0.570 (N=196), with ID-08 -0.489 (N=188), and with Literacy-08 -0.794 (N=196). The correlation between Literacy-08 and IMR-08 is stronger than between national IQ and IMR-08. When these three variables and national IQ are taken together to explain variation in IMR-08 in multiple regression analysis, the multiple correlation rises to 0.845 (N=187) and the explained part of variation to 71 per cent, which is 20 percentage points more than national IQ explains (51%). It is obvious that some environmental variables, especially Literacy-08, affect the infant mortality rate significantly independently from national IQ.

Figure 6.2 summarizes the results of regression analysis of IMR-08 on national IQ in the group of 197 countries. The negative relationship is clearly linear but much weaker among low national IQ countries than among high national IQ countries just like in Figure 6.1. Some of the most highly deviating countries are named in the figure. Afghanistan is the most extremely deviating country. In the countries above the regression line, the infant mortality rate is higher than expected on the basis of the regression equation and in the countries below the regression rate it is lower than expected.

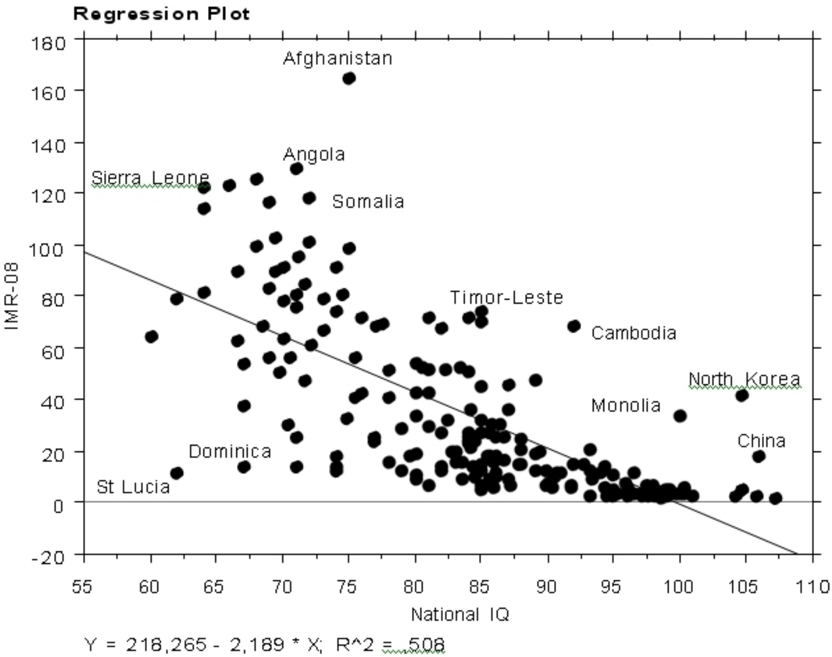

Figure 6.2. The results of regression analysis of IMR-08 on national IQ in the group of 197 countries

It is useful to explore whether there are any systematic differences between the largest positive and negative outliers (see

Table 6.4). Let us use residual ±25 (one standard deviation of residual IMR-08 is 23.4) to separate large deviations from the less deviating countries.

Using this criterion, the group of large positive outliers includes the following 26 countries: Afghanistan, Angola, Burkina Faso, Burundi, Cambodia, the Central African Republic, Chad, China, Congo, D.R., Djibouti, Guinea-Bissau, Honduras, Kenya, North Korea, Liberia, Madagascar, Mali, Mauritania, Mongolia, Myanmar, Nigeria, Pakistan, Sierra Leone, Somalia, Timor-Leste and Zambia.

The infant mortality rate is much higher than expected on the basis of the regression equation in all these countries with large positive residuals. However, China should be excluded from this category for the reason that the fitted IMR-08 turns negative for the countries above the national IQ of 101 (see Figure 6.2). Of the other 25 countries, 17 are sub-Saharan African countries and three (Cambodia, North Korea and Mongolia) are contemporary or former socialist countries. Afghanistan, Myanmar, Pakistan and Timor-Leste have suffered from serious ethnic and other civil wars. Because IMR-08 and Life-08 are extremely strongly correlated with each other, nearly all countries with large positive residuals are the same as the countries with large negative residuals in the case of Life-08 (see Figure 6.1).

The group of large negative outliers includes 20 countries: Albania, Antigua & Barbuda, Barbados, Belize, Cuba, Dominica, El Salvador, Grenada, Jamaica, the Mariana Islands, Namibia, New Caledonia, Puerto Rico, Qatar, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Sao Tome & Principe, Saudi Arabia and Sri Lanka.

This group of 20 large negative outliers is dominated by the Caribbean (10) and other small island countries (the Mariana Islands, New Caledonia and Sao Tome & Principe). Qatar and Saudi Arabia are wealthy oil producing countries. It is characteristic for these countries that they have avoided serious ethnic conflicts and that per capita income is in most of them much higher than expected on the basis of national IQ. Albania, Cuba, El

Salvador, Namibia and Sri Lanka are separate cases without any common characteristics. It is remarkable that despite its long civil war, the infant mortality rate has remained in Sri Lanka much lower than expected on the basis of national IQ. Most of these countries (15) are the same as the countries with large positive residuals in the case of Life-08.

The negative relationship between national IQ and the infant mortality rate is surprisingly strong despite exceptional local factors which have weakened this relationship. This means that we have to expect great global disparities in infant mortality rates to continue in the future.

7. HIV/AIDS and Tuberculosis

HIV/AIDS and tuberculosis are serious infectious diseases. Our purpose is to see to what extent global data on HIV prevalence (HIV-07) and on the incidence of tuberculosis (Tuber-08) are related to national IQ and to some environmental variables. The percentages of people infected by HIV and the number of tuberculosis cases per 100,000 people vary greatly in the world. We assume that people in more intelligent nations are able to understand the nature of infectious HIV disease sooner and to avoid infection more effectively than people in less intelligent nations. Consequently, national IQ and HIV-07 should be negatively correlated with each other. Of the many other diseases, we try to check to what extent the incidence of tuberculosis per 100,000 people in 2008 is related to national IQ. According to our hypothesis, this relationship should be negative because it is reasonable to assume that nations with higher national IQs are better able to control this infectious disease than nations with lower national IQ. In addition, it would be reasonable to assume that wealthy countries have better ability to control this disease than poor countries. Therefore, we check the results by correlating Tuber-08 with some alternative environmental variables. The correlations between national IQ and the two indicators of infectious diseases are given in Table 6.5.

Table 6.5. National IQ correlated with HIV-07 and Tuber-08 in the three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
HIV-07	168	-.430	-.541
Tuber-08	154	-.569	-.662
Group of countries (inhabitants > 1 million)			
HIV-07	148	-.436	-.580
Tuber-08	153	-.571	-.663
Group of countries with measured IQs			
HIV-07	139	-.479	-.520
Tuber-08	132	-.601	-.660

All correlations given in Table 6.5 are negative as hypothesized, but they are not strong. So the results support the hypotheses only moderately. Spearman rank correlations are clearly stronger than Pearson correlations, and there is not much difference in correlations between the three groups of countries. The explained part of variation in HIV-07 varies from 18 to 34 per cent and in the case of tuberculosis from 23 to 44 per cent. Most of the variation remains unexplained. The question is whether some alternative environmental variables could increase the explained part of variation significantly.

HIV-07. In the total group of 168 countries, national IQ does not explain more than 18 per cent of the global variation in

HIV-07. It is not much. It is remarkable that HIV-07 is even more weakly related to some alternative environmental variables: PPP-GNI-08 -0.216, ID-08 -0.213, and Literates-08 -0.116. The level of per capita income, democratization, and adult literacy rate are nearly independent from HIV-07. When national IQ, PPP-GNI-08, ID-08, and Literacy-08 are used to explain variation in HIV-07, the multiple correlation rises to -0.507 (N=166) and the explained part of variation to 26 percent, which is eight percentage points more than national IQ explains. Is there any other systematic explanation for the rest of the variation, or is it due to some accidental local factors?

There seems to be one geographical factor which weakens the negative relationship between national IQ and HIV-07. The percentage of people infected by HIV is many times higher in the countries of southern Africa than in the other parts of Africa and of the world. This geographical concentration of HIV to southern Africa reduces the overall correlation to some extent. Besides, it should be noted that in nearly all countries of sub-Saharan Africa HIV prevalence is higher than in most other countries of the world, which implies that in some way conditions for the spreading of HIV have been more conducive in sub-Saharan Africa than in other regions of the world (cf. Rushton, 1995, pp. 178-183; Rindermann and Meisenberg, 2009).

Tuber-08. Of the many other diseases, we tried to check to what extent the incidence of tuberculosis per 100,000 people in 2008 (Tuber-08) is related to national IQ. According to our hypothesis, this relationship should be negative because it is reasonable to assume that nations with higher national IQs are better able to control this infectious disease than nations with lower national IQ. However, it would also be reasonable to assume that wealthy countries, democracies, and countries with a high level of literacy have better ability to control this disease than poor countries. Consequently, Tuber-08 should be negatively correlated with PPP-GNI-08 as well as with ID-08 and Literacy-08. The results of correlation analysis support these hypotheses.

The correlation between national IQ and Tuber-08 is -0.569 (N = 154). Correlations between Tuber-08 and the three environmental variables are weaker but negative as hypothesized: PPP-GNI-08 -0.446, ID-08 -0.408, and Literacy-08 -0.396. When they are taken together with national IQ to explain variation in Tuber-08, the multiple correlation rises to -0.598 (N=151) and the explained part of variation to 35 per cent, which is only three percentage points more than national IQ explains (32%). National IQ is a more powerful explanatory variable than any of the three environmental variables, but more than 60 per cent of the variation in Tuber-08 remains unexplained. It is obvious that the unexplained variation is principally due to some local factors and perhaps also to measurement errors. The original data on tuberculosis incidence given in WDI-10 are based on estimations.

8. Conclusion

In this chapter, we have explored global disparities in health conditions from the perspectives of undernourishment, life expectancy, infant mortality, prevalence of HIV, and incidence of tuberculosis. We hypothesized that national IQ explains a significant part of the global variation in health conditions and that some environmental variables might explain some additional part independently from national IQ. Empirical evidence supports our hypotheses in all cases, although there is significant variation in the strength of correlations. National IQ explains 58 per cent of the variation in Life expectancy and 51 per cent of the variation in infant mortality rates, but only 22 per cent of the prevalence of child malnutrition (PCM-8) and 18 per cent of the variation in the prevalence of HIV. Correlations are not strictly comparable for the reason that samples of countries vary. In addition, there may be considerable variation in the reliability of data. Any way, no matter what indicator is used, health conditions tend to be significantly better in high national IQ countries than in low national IQ countries. This means that significant disparities in health conditions can be expected to continue.

It was found that the three environmental variables used in these analyses (PPP-GNI-08, ID-08, and Literacy-08) are able to explain some part of the variation in dependent variables independently from national IQ. Their independent explanatory power varies from 3 per cent (Tuber-08) to 34 per cent in the case of PCM-08. The following summary of the results of correlation and multiple regression analyses clarifies the explanatory power of national IQ and the independent explanatory power of the three alternative environmental variables used in this chapter. The summary is based on our socio-biological research formula: y = (b + e) + x.

PUN-06 (N=144) = (national IQ 34% + PPP-GNI-08, ID-08, Literacy-08 6%) + unexplained variation 60%.

PCM-08 (N=108) = (national IQ 22% + PPP-GNI-08, ID-08, Literacy-08 34%) + unexplained variation 44%.

Life-08 (N=188) = (national IQ 58% + PPP-GNI-08, ID-08, Literacy-08 15%) + unexplained variation 27%.

IMR-08 (N=187) = (national IQ 51% + PPP-GNI-08, ID-08, Literacy-08 20%) + unexplained variation 29%.

HIV-07 (N=166) = (national IQ 18% + PPP-GNI-08, ID-08, Literacy-08 8%) + unexplained variation 74%.

Tuber-08 (N=151) = (national IQ 32% + PPP-GNI-08, ID-08, Literacy-08 3%) + unexplained variation 65%.

Prevalence of undernourishment (PUN-06) is significantly related to national IQ (34%). The level of undernourishment is much lower in high national IQ countries than in low IQ countries. The three environmental variables explain independently from national IQ only six per cent of the variation in PUN-06. More than half of the variation remains unexplained, probably due to various local factors but also to measurement errors.

Prevalence of child malnutrition (PCM-08) is only slightly related to national IQ (22%). In this case it is remarkable that the three environmental variables explain independently from national IQ much more of the variation in PCM-08 (34%) than national IQ. Child malnutrition is partly related to national IQ as hypothesized, but it seems to be more strongly related to various indicators of social conditions, especially to the level of literacy.

Life expectancy at birth (Life-08) is most strongly related to national IQ (58%). The independent explanatory power of the three environmental variables is relatively small (15%), but not insignificant. The unexplained part of variation is not more than 27 per cent. Because life expectancy is strongly related to national IQ, it is reasonable to expect the continuation of significant global disparities.

Infant mortality rate (IMR-08) is also strongly related to national IQ (51%), but the three environmental variables increase significantly (20%) the explained part of variation. Consequently, the unexplained part of variation drops to 29 per cent. Considerable global differences in infant mortality rates will most probably continue in the future.

Prevalence of HIV (HIV-07) is slightly related to national IQ (18%) and even less to the three environmental variables (8%) independently from national IQ. The geographical concentration of HIV to sub-Saharan Africa and especially to the countries of southern Africa explains partly the low correlation between national IQ and HIV prevalence. The concentration of HIV in sub-Saharan Africa and in the Caribbean countries inhabited by black Africans seems to be principally due to some cultural and other exceptional local factors, although national

IQ explains a part of the global variation in HIV prevalence.

Incidence of tuberculosis (Tuber-08) is significantly related to national IQ (32%) but only slightly to the three environmental variables (3%) independently from national IQ. The unexplained part of variation (65%) is probably due to various local factors but also to possible errors of measurement.

It is evident on the basis of these analyses that the dominance of national IQ as the most important explanatory factor maintains extensive global disparities in health conditions, but the unexplained part of variation leaves room for significant improvements of health conditions in all countries of the world.

Chapter 7

Fertility

1. Intelligence and Fertility. 2. National IQ and Fertility. 3. The Decline of the World's IQ. 4. New Global Comparisons. 5. Variables. 6. Fertility. 7. Regression of Birth-08 on National IQ. 8. Population Growth. 9. Conclusion.

It has been well established in a number of countries that the more intelligent people have been having fewer children than the less intelligent. This negative association between intelligence and fertility was observed in the nineteenth century by Francis Galton in his *Hereditary Genius* (1869). He contended that in the early stages of civilization what he called "the more able and enterprising men" were the most likely to have children, but in older civilizations, like that of Britain, various factors operated to reduce the number of children of these and to increase the number of children of the less able and less enterprising. He suggested that the most important of these factors was that able and enterprising young men tended not to marry, or only to marry late in life, because marriage and children would impede their careers. The effect of this was that

> there is a steady check in an old civilization upon the fertility of the abler classes: the improvident and un-ambitious are those who chiefly keep up the breed. So the race gradually deteriorates, becoming in each successive generation less fit for a high civilization (Galton, 1869/1962, p. 414).

1. Intelligence and Fertility

Galton was remarkably perceptive in noting the negative association between intelligence and fertility as early as 1869. This negative association has become known as dysgenic fertility and has been extensively investigated in the United States. The American studies reporting this negative association are summarized in Table 7.1. Row 1 gives a correlation of -0.49 between intelligence and fertility derived from data on the IQs of all children aged 10 to 14 in Georgia, numbering approximately a quarter of a million. The correlation was calculated for the average IQs of children in each of 159 counties and the fertility rates of women aged 15 to 49. Because this is group data, the correlation is higher than would be expected on individual data.

Rows 2, 3 and 4 give negative correlations between intelligence and fertility based on a nationally representative American sample showing that the negative correlation is higher for white women than for white men, and higher for white women than for black women. This study is not wholly satisfactory because the age of the sample was 25 to 34 years and many of them would not have completed their fertility.

To overcome this problem, Vining (1995) published data on the fertility of his female sample of the ages between 35 and 44, which can be regarded as close to completed fertility. The results are given in rows 4 and 5 for white and black women and show that the correlations between intelligence and fertility are still significantly negative and are higher for black women (-0.226) than for white women (-0.062). These correlations are probably underestimates because the samples excluded high-school dropouts, who were about 14 per cent of whites and 26 per cent of blacks at this time, and who likely had low IQs and high average fertility.

Rows 8 and 9 give negative correlations between intelligence and fertility for approximately 17,000 white and 19,000 black babies born in the late 1970s. The IQs of the mothers correlated negatively with number of children at -0.22 for blacks and -0.12 for whites.

Table 7.1. Studies of the negative correlation between intelligence and fertility in the United States

	Population	N	Sex	r	Reference
1	All	250,000	M/F	-.49	Osborne, 1975
2	Whites	1,993	M	-.140	Vining, 1982
3	Whites	2,066	F	-.177	Vining, 1982
4	Blacks	473	F	-.202	Vining, 1982
5	Whites	1,839	F	-.062	Vining, 1995
6	Blacks	378	F	-.226	Vining, 1982
7	All	12,120	M/F	-.29	Van Court & Bean, 1985
8	Whites	17,000	F	-.12	Broman et al., 1987
9	Blacks	19,000	F	-.22	Broman et al., 1987
10	Whites	1,477	F	-.11	Lynn & Van Court, 2004
11	Blacks	196	F	-.21	Lynn & Van Court, 2004

	Population	N	Sex	r	Reference
12	Whites	1,092	M	-.09	Lynn & Van Court, 2004
13	Blacks	118	M	-.18	Lynn & Van Court, 2004
14	Whites	1,993	F	-.162	Meisenberg, 2010
15	Blacks	902	F	-.271	Meisenberg, 2010
16	Whites	1,781	M	-.089	Meisenberg, 2010
17	Blacks	707	M	-.049	Meisenberg, 2010

Rows 10 through 13 show negative correlations for national samples born between 1900-1949 and with completed fertility. As in previous studies, the negative correlations are higher for women than for men among both blacks and whites, and are higher for blacks than for whites.

Rows 14 through 17 give updated data for show further negative correlations for national samples aged between 30 and 47 years and therefore with virtually completed fertility. The results provide further confirmation that the negative correlations are higher for women than for men among both blacks and whites, and are higher for blacks than for whites.

All the studies summarized in Table 7.1 show that dysgenic fertility for intelligence has been present in the United States during the twentieth century. All the studies show that there has been greater dysgenic fertility for intelligence in women than among men. Probably the explanation for this is that children impose a greater cost on the careers and life style of intelligent and well-educated women than on those of intelligent and well-educated men, and also that women have a shorter period of childbearing years. It is women who have to bear most of the burden of childbearing and childrearing and who therefore have stronger incentives to limit their number of children or to remain childless. At the other end of the intelligence spectrum, low IQ women tend to have higher fertility because they are inefficient users of contraception and there are always plenty of men willing to have sex with them. Low IQ men, on the other hand, tend not to have such high fertility because many of them are unattractive to females and lack the social and cognitive skills required to secure sexual partners.

A second factor accounting for the greater dysgenic fertility of women is probably their shorter span of childbearing years. Many intelligent women undergo prolonged education and devote themselves to their careers in their twenties and into their thirties, intending to postpone childbearing during the years when less intelligent women are having children. By the time childless, high- IQ, career women are in their thirties, significant numbers of them discover that they have waited too long to find suitable partners with whom to have children, or that they have become infertile. Older intelligent men who delay marriage and children until their late thirties or forties are less likely to become infertile and can find young wives more easily than older women can find young husbands. It has been shown by Meisenberg and Kaul (2010, p. 177) that the lower fertility of intelligent women is not due to a lack of desire for children.

All the studies show that there has been greater dysgenic fertility for intelligence in American blacks than among whites. Dysgenic fertility for intelligence is particularly high among black women. Probably the main reason for this is that intelligent and well educated black women find it hard to find suitable men with whom to have children. Many black men do not make attractive husbands because they do not do so well in employment as black women, and a significant number of black men find white wives. For instance, in 1990 6.3 per cent of black men under the age of thirty were married to a white women, but only 2.5 per cent of black women were married to a white man (Heaton and Albrecht, 1996). It seems probable that the continuing disadvantaged position of blacks in the United States in regard to educational attainment and employment is to some significant extent due to the greater deterioration of their genotypic intelligence.

The negative association between intelligence and fertility that has been present in the United States throughout the twentieth century and into the twenty-first century implies that the genotypic intelligence must have declined (the genotypic intelligence is the genetic component of intelligence). This decline has been compensated for by an increase of phenotypic (measured) intelligence (Flynn, 2007). Meisenberg (2010) has calculated the magnitude of the decline of genotypic intelligence. He assumes a narrow heritabily of intelligence of 0.5 and on this basis calculates a decline of genotypic intelligence of 0.8 IQ points a generation and 2.9 IQ points a century. He calculated that the effect of this would be that the proportion of highly gifted people with IQs of 130 and above would decline by 11.5% in one generation and 37.7% in a century. Meisenberg and Kaul (2010) estimate that when the increase of the numbers of blacks and Hispanics as a proportion of the population is taken into account, genotypic intelligence in the United States will decline by approximately 1.2 IQ points a generation.

Apart from the United States, the evidence on intelligence and fertility elsewhere is remarkably sparse. There are studies in England, Scotland, Sweden, and Greece showing negative associations between intelligence and fertility, that we have summarized in Lynn (2011). There is also a study showing dysgenic fertility in the Caribbean island of Dominica reported by Meisenberg, Lawless, Lambert and Newton (2005). They found that the correlation between IQ and numbers of children was slightly positive ($r = 0.06$) for men, while for women it was negative (r = -0.163). These correlations show that fertility is eugenic for men, but more strongly dysgenic for women, as in the American studies summarized in Table 7.1.

A study reporting dysgenic fertility for intelligence in Sudan has been published by Khaleefa, Haroon and Abdulradi (2011). They report a negative association between intelligence and the number of siblings in a sample of 5,215 school students. Thus lower IQ children had larger numbers of siblings, and it can be inferred from this that lower IQ parents had larger numbers of children. They calculate a decline of genotypic intelligence at 0.66 IQ points a generation.

2. National IQ and Fertility

From the negative correlation between intelligence and fertility among individuals, we can predict that the same negative association should be present across nations. Studies showing that this is so are summarized in Table 7.2. Rows 1 through 7 give negative correlations ranging between -0.71 and -0.83 between national IQ and fertility measured as Total Fertility Rates (TFR), calculated as the number of children women can be expected to have during their life. Shatz (2008, p. 111) suggests as a possible explanations for this that (1) "the IQ fertility relationship is mediated by economics. . . it is possible that countries that are poorer have lower quality educational systems, lower quality health care, and more difficult access to birth control, all of which may contribute to higher fertility rates"; (2) "differential K theory (Rushton, 2004). . . it is possible that countries with higher IQ scores and lower fertility rates have larger aggregates of high K selected individuals with lower IQ scores and higher fertility rates".

Rows 8 and 9 give negative correlations of -0.85 and -0.86

between national IQ and birth rates, an alternative measure of fertility. The negative correlations show that birth rates are higher in low IQ countries.

Row 10 gives a positive correlation of 0.29 between national IQ and maternal age indicating that childbearing is delayed in higher IQ nations, which has the effect of reducing fertility.

Row 11 gives a negative correlation of -0.52 between national IQ and the population growth rate. The explanation for this is that nations with low IQ and high fertility have rapid rates of population growth.

Row 12 gives a positive correlation of 0.81 between national IQ and population pyramids measured as the extent to which there are equal percentages of the population at different ages. A population with a much higher percentage of old people than of the young people has a low index. Thus the positive correlation of 0.81 shows that high IQ countries have a much higher percentage of old people. This is a further effect of their low fertility.

Row 13 gives a positive correlation of 0.57 between national IQ and the sex ratio at birth (SRB), defined as the ratio of male live-births to female live-births. Normally, more boys are born than girls and the average SRB reported in many countries is 1.07, indicating that 107 boys are born for every 100 girls (Parazzini, La Vecchia, Levi and Franceschi, 1998). It is known that at the individual level high SRB is associated with wealth (Cameron and Dalerum, 2009), probably because wealthy women tend to be healthier, and good health is associated with a high SRB (Almond and Edlund, 2007; Cagnacci, Renzi, Arangino, Alessandrini and Volpe, 2004, 2005; Gibson and Mace, 2003; Mathews, Johnson and Neil, 2008; Pollet, Fawcett, Buunk and Nettle, 2009). Because national wealth is associated with intelligence, the positive correlation between national IQ and a high SRB is predictable.

Table 7.2. Fertility correlates of national IQ

	Variable	**N countries**	**r x IQ**	**Reference**
1	Fertility	57	-.80	Lynn et al., 2007
2	Fertility	192	-.73	Lynn & Harvey, 2008
3	Fertility	111	-.71	Shatz, 2008
4	Fertility, 1960-84	130	-.73	Rindermann, 2008a
5	Fertility	192	-.73	Reeve, 2009
6	Fertility, 2000-2005	170	-.83	Meisenberg, 2009
7	Fertility	192	-.72	Dama, 2011
8	Birth rate	129	-.85	Templer, 2008
9	Birth rate	116	-.76	Rushton & Templer, 2009
10	Maternal age	172	.29	Dama, 2011
11	Population growth rate	111	-.52	Shatz, 2008
12	Population pyramids	162	.81	Lynn & Vanhanen, 2006
13	Sex ratio	192	.57	Dama, 2011

3. The Decline of the World's IQ

Just as the negative correlation between intelligence and fertility within countries implies that genotypic intelligence is declining, so the negative correlation between intelligence and fertility across countries implies that the genotypic intelligence of the whole world is declining. The rate of this decline has been calculated by Meisenberg (2009) who calculates that the correlation between national IQs and TFR (Total Fertility Rate), averaged for the years 2000-2005 is -0.83.

To determine the effect of differential fertility on IQ, the average IQ of the world population in 2000 was first calculated according to the formula:

$$IQ = 1/P \times (IQi \times Pi)$$
$$= 90.07$$

In this formula, P is the size of the world population, and IQi and Pi are the average IQ and the population size of individual countries, respectively. Assuming that the current international fertility differentials persist, international migration is negligible and the average IQ within countries does not change, the average world IQ of the next generation can be calculated according to the formula:

$$IQ = (IQi \times Pi \times TFRi/2 \times (1 – Mi)) / (Pi \times TFRi/2 \times (1-Mi))$$
$$= 86.33$$

In this model, Mi is the country-specific rate of pre-reproductive mortality. It is based on the under-5 mortality rates for 2003 published by the United Nations (2005), with 25% added to account for mortality from age 5 to the onset of reproduction. The difference is -3.74 IQ points per generation or, assuming a generation time of 28 years, 1.34 points per decade. Meisenberg estimates that 35% of the IQ differences between countries can be attributed to genetic differences between national populations, and calculates that differential fertility between nations entails approximately 131 points per generation (3.75 x 0.35 = 1.31) decline of genotypic intelligence among the young world population.

4. New Global Comparisons

It is possible to measure national variation in the rate of reproduction and fertility from different perspectives. The growth of population indicates the final results of reproduction, although it is affected also by immigration and emigration and by mortality. In some cases, the impact of international migration on the percentage growth of the national population may be considerable. There are plenty of data and estimates of the average annual population growth, but the quality and reliability of these data is in many cases defective. WDI 2008 (p. 43) notes, for example, that population "estimates are from demographic modeling and so are susceptible to biases and errors from shortcomings in the model as well as in the data." Crude birth rate per 1,000 people provides another indicator to measure differences in the rate of reproduction. Total fertility rate (births per woman) measures directly national differences in fertility. In addition, adolescent fertility rates indicate great national differences in the fertility of young women. These four indicators measure differences in fertility from slightly different perspectives, but it is natural that all these indicators are strongly intercorrelated.

5. Variables

Various datasets are available on total fertility rate, crude birth rate, adolescent birth rate, and annual growth of population for long periods of time, but we limit our attention to some data on recent years published in the World Bank's *World Development Indicators 2010* (WDI-10), UNDP's *Human Development Report 2009* (HDR-09), and CIA's *The World Factbook 2009* (CIA-09).

WDI-10 (Table 2.19) provides data on total fertility rate for 2008 (Fertility-08), defined as "the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates" (WDI-10, p. 135). Data were complemented from CIA-09 in the following cases: Andorra, Antigua & Barbuda, the Bahamas, Bahrain, Barbados, Belize, Bermuda, Bhutan, Brunei, Cape Verde, the Comoros, the Cook Islands, Cyprus, Djibouti, Dominica, Equatorial Guinea, Fiji, Grenada, Guyana, Iceland, Kiribati, Liechtenstein, Luxembourg, Macau, the Maldives, Malta, the Mariana Islands, the Marshall Islands, Micronesia, the Netherlands Antilles, New Caledonia, St Helena, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Samoa, Sao Tome & Principe, the Seychelles, the Solomon Islands, Suriname, Taiwan, Tonga and Vanuatu. Data cover 198 countries.

WDI-10 (Table 2.1) gives data on crude birth rate per 1,000 people 2008 (Birth-08). CIA-09 provides data on the same variable (birth rate). Crude birth rate indicates the number of live births occurring during the year, per 1,000 people, estimated at midyear. It depends on both the level of fertility and the age structure of the population. In the following cases, data on crude birth rate were complemented from CIA-09: Andorra, Antigua & Barbuda, the Bahamas, Bahrain, Barbados, Belize, Bermuda, Bhutan, Brunei, Cape Verde, the Comoros, the Cook Islands, Cyprus, Djibouti, Dominica, Equatorial Guinea, Fiji, Grenada, Guyana, Iceland, Kiribati, Liechtenstein, Luxembourg, Macao, the Maldives, Malta, the Mariana Islands, the Marshall Islands, Micronesia, the Netherlands Antilles, New Caledonia, St

Helena, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Samoa, Sao Tome & Principe, the Seychelles, the Solomon Islands, Suriname, Taiwan, Tonga and Vanuatu. Data cover 198 countries.

WDI-10 (Table 2.19) provides separate data on adolescent fertility rate, births per 1,000 women ages 15-19, 2008. This dataset (AFR-08) indicates that there is extreme variation in adolescent fertility rate. Data are available from 154 countries. The missing countries are small countries.

WDI-10 (Table 2.1) includes data on average annual population growth % 1990-2008 (Growth-08). It is the exponential change for the period indicated. CIA-09 includes also data on population growth rate, which means the "average annual percent change in the population, resulting from a surplus (or deficit) of births over deaths and the balance of migrants entering and leaving a country" (CIA-09, p. xxiii). The rate may be positive or negative. Data on Growth-08 were complemented from CIA-09 in the following cases: Andorra, Antigua & Barbuda, the Bahamas, Bahrain, Barbados, Belize, Bermuda, Bhutan, Brunei, Cape Verde, the Comoros, Cyprus, Djibouti, Dominica, Equatorial Guinea, Fiji, Grenada, Guyana, Iceland, Kiribati, Liechtenstein, Luxembourg, Macao, the Maldives, Malta, the Mariana Islands, the Marshall Islands, Micronesia, Montenegro, the Netherlands Antilles, New Caledonia, St Helena, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Samoa, Sao Tome & Principe, the Seychelles, the Solomon Islands, Suriname, Taiwan, Tonga and Vanuatu. Data cover 197 countries.

These four variables are strongly intercorrelated as can be seen from Table 7.3.

Table 7.3. Intercorrelations between the four fertility indicators in various samples of countries.

Variable	Fertility-08	Birth-08	AFR-08	Growth-08
Fertility-08 (births per woman)	1.000	.979	.807	.715
		N=198	N=154	N=197
Birth-08(crude birth rate)		1.000	.823	.732
			N=154	N=197
AFR-08 (Adolescent fertility rate)			1.000	.560
				N=154
Growth-08 (Annual population growth %)				1.000

These four variables will be used to indicate national differences in fertility and population growth and to test the hypotheses. Data may include many types of errors, but they are enough to indicate approximate global differences in fertility and annual population growth. The four variables are strongly intercorrelated. The correlation between Fertility-08 and Birth-08 is extremely strong (0.979), whereas correlations between Growth-08 and the other three variables are much weaker because Growth-08 takes into account also the impact of migrations.

6. Fertility

Three variables (Fertility-08, Birth-08, and AFR-08) are used to measure global variation in the total fertility rate per woman, in the crude birth rate per 1,000 people, and in the adolescent fertility rate. Their strong intercorrelations indicate that different ways to measure fertility produce approximately similar results. It does not make much difference which one of them is used to measure fertility. Correlations between national IQ and the three indicators of fertility are given in Table 7.4.

Table 7.4. National IQ correlated with the three indicators of fertility in three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Fertility-08 (total fertility rate per woman)	198	-.730	-.771
Birth-08 (crude birth rate per 1,000 people)	198	-.778	-.802
AFR-08 (adolescent fertility rate)	154	-.771	-.785
Group of countries (inhabitants > 1 million)			
Fertility-08	154	-.791	-.829
Birth-08	154	-.837	-.852

Dependent variable	N	Pearson correlation	Spearman rank correlation
AFR-08	153	-.775	-.791
Group of countries with measured IQs			
Fertility-08	157	-.736	-.752
Birth-08	157	-.783	-.798
AFR-08	132	-.787	-.793

Table 7.4 shows that negative correlations between national IQ and the three measures of fertility are strong. The explained part of variation rises to 53-73 per cent. These results support strongly the hypothesis of a negative relation between national IQ and fertility. Besides, the fact that less intelligent nations tend to be much more fertile than more intelligent nations implies that the average intelligence of humans is declining rather than rising. Most Spearman correlations are stronger than Pearson correlations. There is not much difference in the strength of correlations between the three groups of countries, but the strongest correlations are in the second group of larger countries. Birth-08 is systematically more strongly correlated with national IQ than Fertility-08.

Fertility-08. National IQ explains more than half of the variation in the total fertility rate per woman (Fertility-08), but the unexplained part of variation leaves room for the impact of other explanatory factors. In fact, Fertility-08 is moderately or strongly related to several environmental variables. Its correlation with PPP-GNI-08 is -0.532, with ID-08 -0.494, with Literacy-08 -0.790, and with IMR-08 0.875. Fertility-08 is extremely strongly related (77%) to infant mortality rate per 1,000 live births (IMR-08). The higher the infant mortality rate, the higher the total fertility rate per woman. When national IQ, Literacy-08, and IMR-08 are used together to explain the variation in Fertility-08, the multiple correlation rises to 0.899 (N=196) and the explained part of variation in Fertility-08 to 81 per cent, which is 28 percentage points more than national IQ explains (53%). The variation in Fertility-08 depends overwhelmingly on national IQ, but Literacy-08 and IMR-08 variables are able to explain 28 per cent of the variation independently from national IQ. It means that the total fertility rate per woman depends both on national IQ and on some environmental factors. Only 19 per cent of the variation in Fertility-08 remained unexplained.

Birth-08. The crude birth rate per 1,000 people (Birth-08) is even more strongly correlated with national IQ than Fertility-08.

The explained part of variation rises to 61 per cent in the total group of 198 countries. The rest of the variation is due to some environmental and local factors. Birth-08 is approximately as strongly correlated with the four environmental variables as Fertility-08. When national IQ, Literacy-08, and IMR-07 are used together to explain the variation in Birth-08, the multiple correlation rises to 0.911 (N=196) and the explained part of variation to 83 per cent, which is 22 percentage points more than national IQ explains. Only 17 per cent of the variation remains unexplained.

AFR-08. Adolescent fertility rate (AFR) is strongly correlated with national IQ. The explained part of variation rises to 59 per cent in the total group of 154 countries. When national IQ, Literacy-08, and IMR-08 are used together to explain the variation in AFR-08, the multiple correlation rises to 0.820 (N=154) and the explained part of variation to 67 per cent. It is 8 percentage points more than national IQ explains.

7. Regression of Birth-08 on National IQ

Because the correlations between national IQ and the three measures of fertility are not complete, it is interesting to examine this relationship at the level of single countries in order to find out which countries deviate most clearly from the average relationship and which kinds of factors seem to be related to large positive and negative outliers. This analysis is limited to Birth-08, which is more strongly correlated with national IQ than Fertility-08. Figure 7.1 summarizes the results of the regression analysis of Birth-08 on national IQ in the total group of 198 countries.

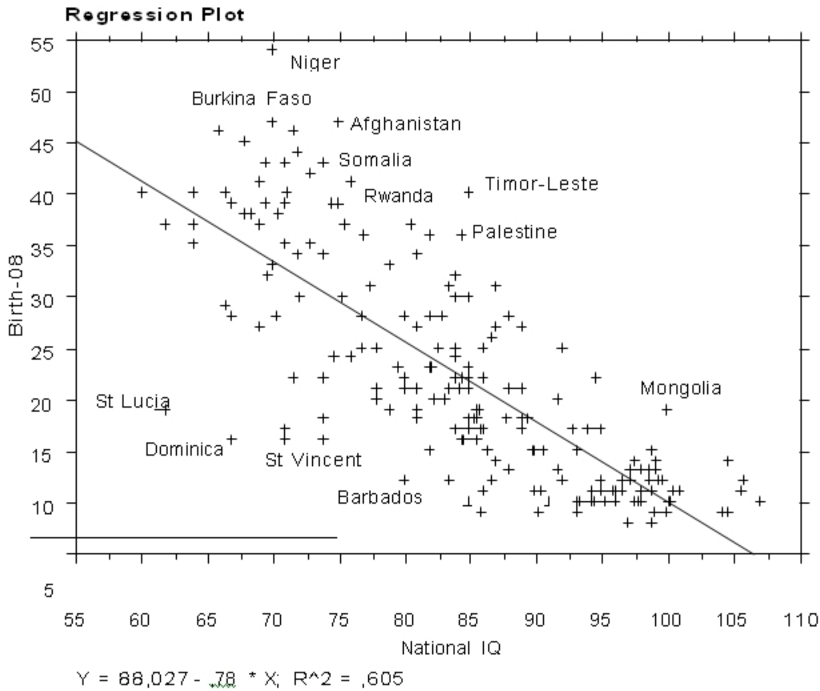

Figure 7.1. The results of regression analysis of Birth-08 on national IQ in the group of 198 countries

Figure 7.1 illustrates the strong linear relationship between national IQ and Birth-08. It is interesting to note that all countries above the national IQ of 90 are relatively close to the regression line, whereas below that IQ level some countries deviate extremely from the regression line. Some of the large deviations are named in the figure. The dispersion around the regression line seems to be most extensive below the national IQ level of 75. Residuals are highly negative for many Caribbean tourist countries and highly positive for many sub-Saharan African countries. Detailed results of this regression analysis for single countries are given in Table 7.5.

Table 7.5. The results of regression analysis of Birth-08 on national IQ in the total group of 198 countries

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
1	Afghanistan	75.0	47	17	30
2	Albania	82.0	15	-9	24
3	Algeria	84.2	21	-1	22
4	Andorra	97.0	8	-4	12
5	Angola	71.0	43	10	33
6	Antigua & Barbuda	74.0	16	-14	30
7	Argentina	92.8	17	1	16
8	Armenia	93.2	15	0	15
9	Australia	99.2	14	3	11
10	Austria	99.0	9	-2	11

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
11	Azerbaijan	84.9	18	-4	22
12	Bahamas	84.0	17	-6	23
13	Bahrain	85.9	17	-4	21
14	Bangladesh	81.0	21	-4	25
15	Barbados	80.0	12	-14	26
16	Belarus	95.0	11	-3	14
17	Belgium	99.3	12	1	11
18	Belize	76.8	28	0	28
19	Benin	71.0	39	6	33
20	Bermuda	90.0	11	-7	18
21	Bhutan	78.0	21	-6	27
22	Bolivia	87.0	27	7	20
23	Bosnia & Herzegovina	93.2	9	-6	15
24	Botswana	76.9	25	-3	28
25	Brazil	85.6	16	-5	21
26	Brunei	89.0	18	-1	19
27	Bulgaria	93.3	10	-5	15
28	Burkina Faso	70.0	47	14	33
29	Burundi	72.0	34	2	32
30	Cambodia	92.0	25	9	16

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
31	Cameroon	64.0	37	-1	38
32	Canada	100.4	11	1	10
33	Cape Verde	76.0	24	-5	29
34	Central African Republic	64.0	35	-3	38
35	Chad	66.0	46	9	37
36	Chile	89.8	15	-3	18
37	China	105.8	12	6	6
38	Colombia	83.1	20	-3	23
39	Comoros	77.0	36	8	28
40	Congo, Dem. Rep	68.0	45	10	35
41	Congo, Republic	73.0	35	4	31
42	Cook Islands	89.0	21	2	19
43	Costa Rica	86.0	17	-4	21
44	Côte d'Ivoire	71.0	35	2	33
45	Croatia	97.8	10	-2	12
46	Cuba	85.0	10	-12	22
47	Cyprus	91.8	13	-3	16
48	Czech Republic	98.9	11	0	11
49	Denmark	97.2	12	0	12

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
50	Djibouti	75.0	39	9	30
51	Dominica	67.0	16	-20	36
52	Dominican Republic	82.0	23	-1	24
53	Ecuador	88.0	21	2	19
54	Egypt	82.7	25	1	24
55	El Salvador	78.0	20	-7	27
56	Equatorial Guinea	69.0	37	3	34
57	Eritrea	75.5	37	8	29
58	Estonia	99.7	12	2	10
59	Ethiopia	68.5	38	3	35
60	Fiji	85.0	22	0	22
61	Finland	100.9	11	2	9
62	France	98.1	13	1	12
63	Gabon	69.0	27	-7	34
64	Gambia	62.0	37	-3	40
65	Georgia	86.7	12	-8	20
66	Germany	98.8	8	-3	11
67	Ghana	69.7	32	-2	34
68	Greece	93.2	10	-5	15
69	Grenada	74.0	22	-8	30

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
70	Guatemala	79.0	33	7	26
71	Guinea	66.5	40	4	36
72	Guinea-Bissau	69.0	41	7	34
73	Guyana	81.0	18	-7	25
74	Haiti	67.0	28	-8	36
75	Honduras	81.0	27	2	25
76	Hong Kong	105.7	11	5	6
77	Hungary	98.1	10	-2	12
78	Iceland	98.6	13	2	11
79	India	82.2	23	-1	24
80	Indonesia	85.8	19	-2	21
81	Iran	85.6	19	-2	21
82	Iraq	87.0	31	11	20
83	Ireland	94.9	17	3	14
84	Israel	94.6	22	8	14
85	Italy	96.1	10	-3	13
86	Jamaica	71.0	17	-16	33
87	Japan	104.2	9	2	7
88	Jordan	86.7	26	6	20
89	Kazakhstan	85.0	23	1	22

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
90	Kenya	74.5	39	9	30
91	Kiribati	85.0	30	8	22
92	Korea, North	104.6	14	8	6
93	Korea, South	104.6	9	3	6
94	Kuwait	85.6	18	-3	21
95	Kyrgyzstan	74.8	24	-6	30
96	Laos	89.0	27	8	19
97	Latvia	95.9	11	-2	13
98	Lebanon	84.6	16	-6	22
99	Lesotho	66.5	29	-7	36
100	Liberia	68.0	38	3	35
101	Libya	85.0	23	1	22
102	Liechtenstein	100.3	10	0	10
103	Lithuania	94.3	10	-5	15
104	Luxembourg	95.0	12	-2	14
105	Macao	99.9	9	-1	10
106	Macedonia	90.5	11	-6	17
107	Madagascar	82.0	36	12	24
108	Malawi	60.1	40	-1	41
109	Malaysia	91.7	20	3	17

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
110	Maldives	81.0	34	9	25
111	Mali	69.5	43	9	34
112	Malta	95.3	10	-4	14
113	Mariana Islands	81.0	19	-6	25
114	Marshall Islands	84.0	32	9	23
115	Mauritania	74.0	34	4	30
116	Mauritius	88.0	13	-6	19
117	Mexico	87.8	18	-2	20
118	Micronesia	84.0	24	1	23
119	Moldova	92.0	12	-4	16
120	Mongolia	100.0	19	9	10
121	Montenegro	85.9	9	-12	21
122	Morocco	82.4	20	-4	24
123	Mozambique	69.5	39	5	34
124	Myanmar (Burma)	85.0	21	-1	22
125	Namibia	70.4	28	-5	33
126	Nepal	78.0	25	-2	27
127	Netherlands	100.4	11	1	10
128	Netherlands Antilles	87.0	14	-6	20
129	New Caledonia	85.0	17	-5	22

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
130	New Zealand	98.9	15	4	11
131	Nicaragua	84.0	25	2	23
132	Niger	70.0	54	21	33
133	Nigeria	71.2	40	7	33
134	Norway	97.2	13	1	12
135	Oman	84.5	22	0	22
136	Pakistan	84.0	30	7	23
137	Palestine	84.5	36	14	22
138	Panama	80.0	21	-5	26
139	Papua New Guinea	83.4	31	8	23
140	Paraguay	84.0	25	2	23
141	Peru	84.2	21	-1	22
142	Philippines	86.1	25	4	21
143	Poland	96.1	11	-2	13
144	Portugal	94.4	10	-4	14
145	Puerto Rico	83.5	12	-11	23
146	Qatar	80.1	12	-14	26
147	Romania	91.0	10	-7	17
148	Russia	96.6	12	-1	13
149	Rwanda	76.0	41	12	29

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
150	St Helena	86.0	11	-10	21
151	St Kitts & Nevis	74.0	18	-12	30
152	St Lucia	62.0	19	-21	40
153	St Vincent & Grenadines	71.0	16	-17	33
154	Samoa (Western)	88.0	28	9	19
155	Sao Tome & Principe	67.0	39	3	36
156	Saudi Arabia	79.6	23	-3	26
157	Senegal	70.5	38	5	33
158	Serbia	90.3	9	-9	18
159	Seychelles	84.4	16	-6	22
160	Sierra Leone	64.0	40	2	38
161	Singapore	107.1	10	5	5
162	Slovakia	98.0	11	-1	12
163	Slovenia	97.6	10	-2	12
164	Solomon Islands	83.0	28	5	23
165	Somalia	72.0	44	12	32
166	South Africa	71.6	22	-10	32
167	Spain	96.6	11	-2	13
168	Sri Lanka	79.0	19	-7	26

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
169	Sudan	77.5	31	3	28
170	Suriname	89.0	17	-2	19
171	Swaziland	75.4	30	1	29
172	Sweden	98.6	12	1	11
173	Switzerland	100.2	10	0	10
174	Syria	82.0	28	4	24
175	Taiwan	104.6	9	3	6
176	Tajikistan	80.0	28	2	26
177	Tanzania	73.0	42	11	31
178	Thailand	89.9	15	-3	18
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	40	18	22
181	Togo	70.0	33	0	33
182	Tonga	86.0	22	1	21
183	Trinidad & Tobago	86.4	15	-6	21
184	Tunisia	85.4	18	-3	21
185	Turkey	89.4	18	0	18
186	Turkmenistan	80.0	22	-4	26
187	Uganda	71.7	46	14	32
188	Ukraine	94.3	11	-4	15

	Country	National IQ	Birth-08	Residual birth-08	Fitted birth-08
189	United Arab Emirates	87.1	14	-6	20
190	United Kingdom	99.1	13	2	11
191	United States	97.5	14	2	12
192	Uruguay	90.6	15	-2	17
193	Uzbekistan	80.0	22	-4	26
194	Vanuatu	84.0	22	-1	23
195	Venezuela	83.5	21	-2	23
196	Vietnam	94.0	17	2	15
197	Yemen	80.5	37	12	25
198	Zambia	74.0	43	13	30
199	Zimbabwe	72.1	30	-2	32

Table 7.5 shows that the crude birth rate varies extensively from country to country and that many countries deviate significantly from the regression line. Let us use a residual ±8 (one standard deviation of residual Birth-08 is 7) to separate the most extremely deviating countries from the less deviating ones. It is useful to explore whether there are any systematic characteristics which separate the two opposite groups of large outliers from each other and which might explain their deviations from the regression line.

The category of large positive outliers includes the following 31 countries: Afghanistan, Angola, Burkina Faso, Cambodia, Chad, the Comoros, Congo, D.R., Djibouti, Eritrea, Iraq, Israel, Kenya, Kiribati, North Korea, Laos, Madagascar, the Maldives, Mali, the Marshall Islands, Mongolia, Niger, Palestine, Papua New Guinea, Rwanda, Samoa, Somalia, Tanzania, Timor-Leste, Uganda, Yemen and Zambia. It is common for these countries that the crude birth rate per 1,000 people is much higher than expected on the basis of the average relationship between national IQ and Birth-08. The problem is why they deviate so much from the average relationship. Do they have any common characteristics which might explain their much higher than expected positive residuals?

It is remarkable that this group of large positive outliers does not include any European, Latin American, or the Caribbean country and that the national IQ is below 90 for nearly all of them. The crude birth rate seems to have decreased more or less equally in all countries above national IQ level of 90. More than half of the large positive outliers (16) are poor sub-Saharan African countries, in which a high level of infant mortality and a low level of literacy have supported an exceptionally high rate of fertility. The other 15 countries, except Israel, are relatively poor Asian and Pacific countries. The group includes six Oceanian and other island states (Kiribati, the Maldives, the Marshall Islands, Papua New Guinea, Samoa and Timor-Leste) and four contemporary or former socialist countries (Cambodia, North Korea, Laos and Mongolia). In addition, Afghanistan, Iraq, Palestine and Yemen are Muslim countries with exceptionally high birth rates.

The group of large negative outliers includes the following 18 countries: Albania, Antigua & Barbuda, Barbados, Cuba, Dominica, Georgia, Grenada, Haiti, Jamaica, Montenegro, Puerto Rico, Qatar, St Helena, St Kitts & Nevis, St Lucia, Saint Vincent & the Grenadines, Serbia and South Africa.

Ten Caribbean countries (Antigua & Barbuda, Barbados, Dominica, Grenada, Haiti, Jamaica, Puerto Rico, St Kitts & Nevis, St Lucia and St Vincent & the Grenadines) constitute a geographically homogeneous group of large negative outliers. They differ sharply from the sub-Saharan African countries with large positive residuals. As noted several times earlier, successful tourist industries have improved human conditions in the Caribbean islands. It is difficult to find any common characteristics which might explain the clearly lower than expected crude birth rates in the other eight countries, of which four are former European socialist countries (Albania, Georgia, Montenegro and Serbia) and four others (Cuba, Qatar, St Helena and South Africa) are dispersed around the world.

8. Population Growth

Growth-08 (Average annual population growth %) variable measures the rate of reproduction from a slightly different perspective. The correlations of Growth-08 with the three other indicators are moderate (see Table 7.3). The correlations between national IQ and Growth-08 are given in Table 7.6.

Table 7.6. National IQ correlated with Growth-08 in three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Growth-08 (annual population growth %)	197	-.550	-.601

Group of countries (inhabitants > 1 million)			
Growth-08	154	-.632	-.683
Group of countries with measured IQs			
Growth-08	156	-.532	-.605

Table 7.6 shows that Growth-08 is only moderately correlated with national IQ (cf. Table 7.4). The explained part of variation rises to 28-47 percent. The strongest correlations are in the group of countries with more than one million inhabitants.

Of course, national IQ is not the only factor capable to explain national differences in population growth rates. Several environmental variables are clearly related to Growth-08: PPP-GNI-08 -0.234 (N=196), Literacy-08 -0.585 (N=196), and IMR-08 0.555 (N=197). When national IQ, PPP-GNI-08, Literacy-08, and IMR-08 are used together to explain the variation in Growth-08, the multiple correlation rises to 0.669 and the explained part of variation to 45 per cent, which is 15 percentage points more than national IQ explains (30%). This means that the variation in Growth-08 is due both to national IQ and to some environmental variables, but still more than half of the variation remains unexplained. It is probably due to some exceptional local factors and impacts of international migrations.

National IQ does not explain more than 30 percent of the variation in annual population growth in the total group of countries, but it is useful to see on the basis of regression analysis how well it explains the level of population growth in single countries and which countries deviate most from the regression line. Figure 7.2 summarizes the results of the regression analysis of Growth-08 on national IQ in the group of 197 countries.

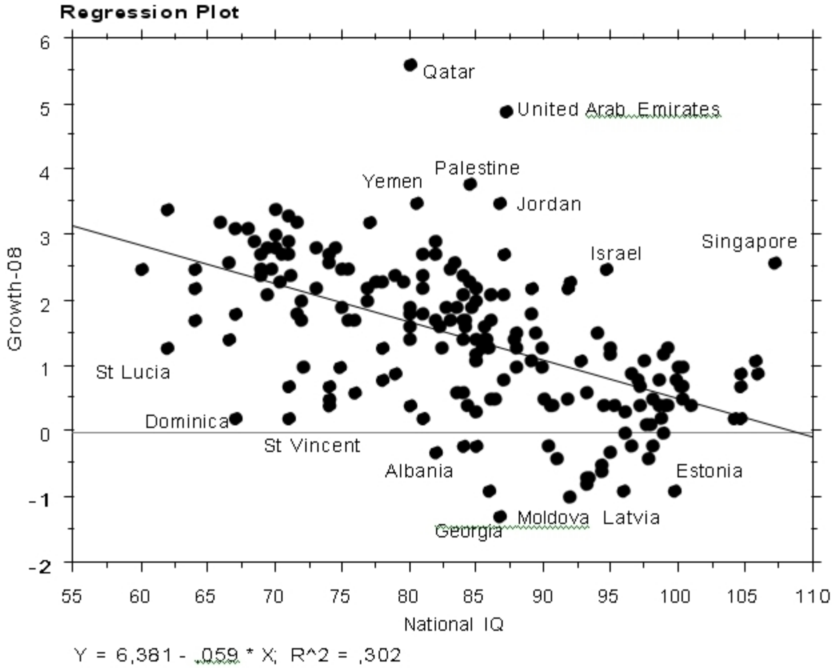

Figure 7.2. The results of regression analysis of Growth-08 (annual population growth %) on national IQ in the group of 197 countries

Figure 7.2 shows that the relationship between national IQ and Growth-08 is linear, but many countries deviate greatly from the regression line at all levels of national IQ and weaken the overall relationship. Some of the largest outliers are named in the figure. An interesting question is again whether there are any common factors which might explain large deviations. We can see from Figure 7.2 that many of the large negative outliers are Caribbean tourist countries and former European socialist countries, whereas large positive outliers seem to constitute a more heterogeneous group. Let us use a residual ±1.2 (one standard deviation of residual Growth-08 is 1.0) to separate the most extreme outliers from less deviating countries.

The group of large positive outliers includes the following 12 countries: Cambodia, the Comoros, Iraq, Israel, Jordan, Madagascar, Malaysia, Palestine, Qatar, Singapore, the United Arab Emirates and Yemen. Are there any common characteristics which could explain the much higher than expected level of average population growth in these countries? One geographical fact is obvious. The group does not include any European, Caribbean, or Latin American countries. All positive outliers are African, Asian, and Oceanian countries.

If population growth were dependent only on the rate of fertility, the same countries which were found to be large positive outliers on the basis of Birth-08 should be large outliers also on the basis of Growth-08. This is true in the cases of Cambodia, the Comoros, Iraq, Israel, Madagascar, Palestine and Yemen, which are large positive outliers also on the basis of Birth-08. In these cases, a high rate of fertility provides a principal explanation for their high rates of population growth. Five other countries (Jordan, Malaysia, Qatar, Singapore and the United Arab Emirates) are not large positive outliers on the basis of Birth-08, although residuals are positive for three of them (Jordan, Malaysia and Singapore). Qatar and the United Arab Emirates with significant negative residuals on the basis of Birth-08 deviate from the pattern. Population growth in these two countries seems to be principally due to immigration.

The group of large negative outliers includes the following 26 countries: Albania, Antigua & Barbuda, Armenia, Barbados, Bosnia & Herzegovina, Bulgaria, Cape Verde, Dominica, Estonia, Georgia, Grenada, Guyana, Jamaica, Kazakhstan, Latvia, Lithuania, Micronesia, Moldova, Montenegro, Romania, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Serbia, Ukraine and Zimbabwe.

Contrary to the group of large positive outliers, most of these countries (22) are European and Caribbean countries. Twelve of these countries (Albania, Antigua & Barbuda, Barbados, Dominica, Georgia, Grenada, Jamaica, Montenegro, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines and Serbia) have large negative residuals also on the basis of Birth-08, which means that a low level of fertility provides a sufficient explanation for their large negative residuals also on the basis of Growth-08. Residuals based on Birth-08 are clearly negative (at least -5) also for Bosnia & Herzegovina, Bulgaria, Cape Verde, Guyana, Lithuania and Romania. The other eight countries with slight negative or positive residuals based on Birth-08 are more problematic cases (Armenia, Estonia, Kazakhstan, Latvia, Micronesia, Moldova, Ukraine and Zimbabwe). Significant emigration seems to have turned population growth negative in these countries. It is remarkable that the group of large negative outliers includes 13 former socialist countries. In many of them, people have reacted to economic hardships by reducing the rate of reproduction and by emigration.

9. Conclusion

We have explored the impact of national IQ on fertility and the rate of reproduction from two slightly different perspectives: from the perspective of fertility rates and from the perspective of actual population growth. The indicators of fertility and population growth are strongly intercorrelated. Differences in death rates and international migration reduce the correlations between the measures of fertility and population growth. In general, differences in population growth rates are smaller than differences in fertility rates for the reason that in the countries of high fertility rates the infant mortality rates tend to be high.

Because the question is ultimately on the rate of successful reproduction in the Darwinian struggle for existence, it seemed to be justified to hypothesize that more intelligent nations would be more successful in reproduction than less intelligent nations. Consequently, fertility rates and population growth rates should be positively correlated with national IQ. Empirical evidence shows, however, that this is not true. Strongly negative correlations contradict and falsify this hypothesis. The problem is, why? The results of empirical analyses presented in previous chapters indicate uniformly that more intelligent nations tend to be better able to improve human conditions than less intelligent nations. Therefore, why are they less successful in reproduction? Why are less intelligent nations winners in the Darwinian struggle for reproduction? These are important questions. If strongly negative correlations between national IQ and indicators of reproductive success persist, we should expect some decline in the average genotypic intelligence of the human population.

A high level of national intelligence has not helped to increase the number of people as effectively as lower levels of intelligence. This means that in the Darwinian struggle for existence nations with lower national IQs have been winners compared to nations with higher national IQs, but they have more or less failed in attempts to improve the living conditions of their populations. On the other hand, as noted earlier, a lower rate of fertility has helped more intelligent nations to safeguard better living conditions for their members. This contradiction between the natural striving for unlimited reproduction and the striving to improve living conditions of people by restricting reproduction is bound to intensify tension and interest conflicts between nations.

We assume that the correlation between national IQ and the rate of successful reproduction has not always been negative. In the evolutionary history of human species, at least in some periods, it has most probably been positive because the genotypic intelligence of humans seems to have increased. It may be that there are periodic fluctuations in the correlation between national IQ and the rate of reproduction. In the contemporary world, especially since the 20th century, the rate of fertility has sharply declined in the economically developed parts of the world.

National IQ is the most powerful explanatory factor behind the global variation in fertility and population growth. It explains more than half of the variation in the three measures of fertility in the total group of countries and 30 per cent of the variation in annual population growth (Growth-08). However, national IQ is not the only significant explanatory variable. It was found that some environmental variables explain a part of the variation in these measures independently from national IQ. The following summary of the results of correlation and multiple regression analyses indicates the explanatory power of national IQ and the independent explanatory power of some environmental variables. The summary is based on our socio-biological research formula: y = (b + e) + x.

Fertility-08 (N=196) = (national IQ 53% + Literacy-08, IMR-08 28%) + unexplained variation 19%.

Birth-08 (N=196) = (national IQ 61% + Literacy-08, IMR-08 22%) + unexplained variation 17%.

AFR-08 (N=154) = (national IQ 59% + Literay-08, IMR-08 8%) + unexplained variation 33%.

Growth-08 (N=197) = (national IQ 30% + PPP-GNI-08, Literacy-8, IMR-08 15%) + unexplained variation 55%.

The summary shows that the independent explanatory power of some alternative environmental variables varies from 8 per cent (AFR-08) to 28 per cent (Fertility-08). National IQ remains as the dominant explanatory factor, but to some extent the variation in dependent variables is related also to various environmental variables independently from national IQ. The unexplained part of variation, which varies from 17 to 55 per cent, leaves room for the impact of special local factors and possible measurement errors.

Chapter 8

Clean Water and Sanitation

1. Introduction. 2. Variables. 3. Clean Water. 4. Sanitation. 5. Conclusion

Water is one of the most precious natural resources. It is of vital importance to life, but access to water is extremely unequally distributed in the world. UNDP's *Human Development Report 2006* (HDR-06) notes that water "is at the heart of a daily crisis faced by countless millions of the world's most vulnerable people - a crisis that threatens life and destroys livelihoods on a devastating scale" and that "overcoming the crisis in water and sanitation is one of the great human development challenges of the early 21st century" (p. 1). We agree. The problem is to what extent this crisis is due to absolute shortages of water and to what extent to deficiencies in securing water.

We believe that the peoples with high IQs have used their intelligence to ensure that they have a constant supply of clean water. For instance, the Egyptians had built an extensive system of reservoirs and canals to provide their cities with clean water by the 14th century B.C. In 272 B.C. the Romans built a 32 mile long underground channel, the Anio Vetus, to convey clean water from springs in the Apennines to Rome. In 144 B.C., the Romans constructed the first overhead aqueduct, the Aqua Marcia, to supply Rome with water. This was 60 miles long and much of it was built on arches. By the third century A.D., the Romans had built eleven aqueducts to carry an estimated 200 million gallons of water to Rome every 24 hours. The Romans built aqueducts to supply water in many of their cities throughout their empire, some of which survive to this day, including those in Tarragona, Segovia, Seville, Smyrna, and at the Pont du Gard in France. These were sophisticated engineering constructions made of stone or brick, held together with cement, which the Romans invented. The fall was set at 1 in 200, to provide a steady continuous flow of water (Rd, 1960, p.160). Those who lived in the country secured a supply of clean water by constructing wells, generally lined with brick. Later, the peoples with high IQs build reservoirs to provide a continuous supply of clean water. Yet today, many third world peoples do not have clean water from reservoirs, aqueducts or even from wells.

1. Introduction

It is evident that differences in geographical and climatic conditions affect the availability of freshwater, but HDR-06 rejects the argument that the global challenge in water is a problem of scarcity. The report refers to Thomas Malthus, who in the 19th century predicted a future of food shortages, and whose argument "increasingly pervades international debates on water" (p. 2). The report rejects the Malthusian argument and claims that "the scarcity at the heart of the global water crisis is rooted in power, poverty and inequality, not in physical availability" (p. 2). According to HDR-06, "some 1.1 billion people in developing countries have inadequate access to water, and 2.6 billion lack basic sanitation," but those "twin deficits are rooted in institutions and political choices, not in water's availability" (p. 2). The report continues that there "is more than enough water in the world for domestic purposes, for agriculture and for industry." In short, "scarcity is manufactured through political processes and institutions that disadvantage the poor" (p. 3). In other words, HDR-06 claims that the crisis in water and sanitation is principally caused by human political actions or inactions, not by availability of water. This is a highly interesting argument.

It is difficult to accept the claim that the lack of clean water and sanitation is exclusively attributable to political processes. Certainly some part of the problem is due also to the shortage of water and to unequal distribution of freshwater resources in the world, but unfortunately we do not have appropriate indicators to measure the availability of freshwater resources. However, if a significant part of the crisis in water and sanitation is causally related to political choices, then it becomes reasonable to ask, why? Why have some countries solved the problem of water and sanitation much better than many other countries? HDR-06 report argues that "on average, coverage levels for water and sanitation rise with income: the richer the country the greater the coverage" (p.35). This may be partly true, but we would like to add to the list of explanatory factors differences in average national IQ. According to our hypothesis, more intelligent nations have been able to provide these services for people more adequately than less intelligent nations. Consequently, there should be a clear positive correlation between national IQ and access to clean water and sanitation facilities.

One of the Millennium Development Goal targets is to half the proportion of world population without sustainable access to safe drinking water and basic sanitation by 2015. HDR-06 stresses that the "unprecedented combination of resources and technology at our disposal today makes the argument that the 2015 targets are beyond our reach both intellectually and morally indefensible" (p.5). This may be so, but if our hypothesis of the impact of national IQ is true, it may become extremely difficult or impossible to reach the 2015 targets. The hypothesis can be tested by empirical evidence on the percentage of the population with sustainable access to an improved water source and on the percentage of the population with sustainable access to improved sanitation. Such international statistical data have been available since the 1990s, although they do not cover all countries and although they are based on more or less reliable estimates.

Definitions of the concepts of "access to clean water" and "sustainable access to improved sanitation" vary, but they are based on certain criteria. According to HDR-06, in the case of sufficient water to meet even the most basic human needs, the minimum threshold is about 20 litres a day, but most "of the 1.1 billion people categorized as lacking access to clean water use about 5 liters a day - one tenth of the average daily amount used in rich countries to flush toilets" (p. 5). Further, being "without access to water means that people resort to ditches, rivers and lakes polluted with human and animal excrement or used by animals" (p. 5). In the case of sanitation, not having "access to sanitation means that people are forced to defecate in fields, ditches and buckets." In Nairobi, Kenya, lacking "access to toilets, people defecate into plastic bags that they throw onto the streets. The absence of toilets poses particularly severe public health and security problems for women and young girls" (p. 6).

We do not assume that national IQ is the only factor capable to explain global disparities in access to clean water and sanitation facilities; we only assume that it is probably the most important single and measurable explanatory factor. HDR-06 does not refer to differences in national intelligence or to educational differences between nations. The report emphasizes the significance of political leadership or, rather, its absence, and secondly the importance of poverty as a barrier to progress. Our argument is that the absence of good political leadership is related to national IQ. It would be interesting to explore what kinds of environmental variables are able to explain some parts of the variation in access to clean water and sanitation facilities independently from national IQ. It is reasonable to assume that per capita income, the level of democratization, adult literacy rate, the extent of tertiary education, and life expectancy at birth are positively correlated with access to clean water and sanitation facilities, but to what extent independently from national IQ? That is the question. A significant part of the variation may remain unexplained. It is probably due to unmeasureable environmental and geographical factors and to measurement errors.

2. Variables

There are data on access to an improved water source and access to improved sanitation facilities published in *World Development Indicators 2009* (Table 2.17) and similar data published in *Human Development Report 2006* (Table 7) and *Human Development Report 2010* (Table 13). We use all these datasets.

Water-04. This variable provides data on population with sustainable access to an improved water source, % 2004 (HDR-06, Table 7). Data cover 159 countries. These data concern the "share of the population with reasonable access to any of the following types of water supply for drinking: household connections, public standpipes, boreholes, protected dug wells, protected springs and rainwater collection." Reasonable "access is defined as the availability of at least 20 litres a person per day from a source within 1 kilometre of the user's dwelling" (HDR-06, p. 410).

Water-06. Data on access to an improved water source, % population 2006, are from WDI-09 (Table 2.17). They cover 135 countries. These data refer "to people with reasonable access to water from an improved source, such as piped water into dwelling, public tap, tube well, protected dug well, and rainwater collection. Reasonable access is the availability of at least 20 litres a person a day from a source within 1 kilometre of the dwelling" (WDI-09, p. 105). It is noted that "lack of clean water and basic sanitation is the main reason diseases transmitted by feces are so common in developing countries" (WDI-09, p. 105).

Water-08. This dataset published in HDR-10 (Table 7) concerns the percentage of population without access to improved water services in 2008. Data cover 160 countries.

Sanitation-04. These data on population with sustainable access to improved sanitation, % 2004, are from HDR-06 (Table 7) and they cover 149 countries. This variable concerns the "percentage of the population with access to adequate excreta disposal facilities, such as a connection to a sewer or septic tank system, a pour-flush latrine, a simple pit latrine or a ventilated improved pit latrine" (HDR-06, p. 409).

Sanitation-06. Data on access to improved sanitation facilities, % of population 2006, are from WDI-09 (Table 2.17) and they cover 130 countries. Data refer to "people with at least adequate access to excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta. Improved facilities range from protected pit latrines to flush toilets" (WDI-09, p. 105).

Sanitation-08. These data published in HDR-10 (Table 7) concern the percentage of the population without access to improved sanitation services in 2008 and they cover 160 countries.

The use of six datasets from three different years and from three different sources tests the consistency of the data. Data on different years and from three different sources should be strongly correlated with each other. Table 8.1 on the intercorrelations of the six variables shows that the correlated with each other. Table 8.1 on the intercorrelations of the six variables shows that the variables are indeed strongly correlated with each other.

Table 8.1. Intercorrelations of the six indicators of the access to improved water and sanitation services in various samples of countries

Variable	Water -04	Water -06	Water -08	Sanitation -04	Sanitation -06	Sanitation -08
Water-04	1.000	.929	-.912	.770	.791	-.799
	N=159	N=127	N=146	N=148	N=122	N=149
Water-06		1.000	-.981	.813	.814	-.827
		N=135	N=133	N=121	N=129	N=132
Water-08			1.000	-.782	-.807	.811
			N=166	N=138	N=127	N=160
Sanitation -04				1.000	.932	-.907
				N=149	N=121	N=141
Sanitation -06					1.000	-.968
					N=130	N=129
Sanitation -08						1.000
						N=166

The strongest correlations are between the three water variables and between the three sanitation variables. The nine correlations between the water and sanitation variables are weaker, from 0.770 to -0.827, which indicates that they measure the same phenomenon from different perspectives.

3. Clean Water

We can start by testing the hypothesis on the positive relationship between national IQ and the three measures of the access to clean water. The three water variables are extremely strongly intercorrelated (see Table 8.1). The correlations between national IQ and the three water variables are reported in Table 8.2.

Table 8.2. National IQ correlated with Water-04, Water-06, and Water-08 in three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Water-04	159	.567	.661
Water-06	135	.684	.787
Water-08	166	-.621	-.727
Group of countries (inhabitants > 1 million)			
Water-04	131	.635	.736
Water-06	135	.684	.787
Water-8	144	-.676	-.777
Group of countries with measured IQs			
Water=04	127	.574	.685
Water-06	115	.664	.786
Water-08	135	-.622	-.719

Table 8.2 shows that all correlations are positive or negative as hypothesized and moderate or strong. The explained part of variation varies from 32 to 62 percent. All Spearman rank correlations are clearly stronger than simple Pearson correlations, and the strongest correlations are in the group of countries with more than one million inhabitants. National IQ explains a significant part of the global inequalities in the access to clean

water, but because the explained part of variation is in most cases less than 50 percent, there is a lot of room for the impact of other explanatory factors, both of alternative environmental variables and of significant differences in geographical and climatic conditions. Of course, a part of the unexplained variation may be due to measurement errors.

We limit our analysis of the impact of other explanatory variables to some environmental variables used in this study. Because the three water variables are extremely highly intercorrelated, this analysis is limited to Water-08 (population without access to improved water services) in the total group of 166 countries. Water-08 is moderately or strongly correlated with several environmental variables: PPP-GNI-08 -0.556 (N=165), ID-08 -0.476 (N=164), Literacy-08 -0.746 (N=166), Tertiary-09 -0.634 (N=164), Life-08 -0.777 (N=166), and IMR-08 -0.834 (N=166). Most of these correlations are stronger than the correlation between national IQ and Water-08 (-0.621), but because all these environmental variables are moderately or strongly correlated with national IQ, the problem is how much they can explain of the variation in Water-08 independently from national IQ and to what extent the explanations provided by them are overlapping with the explanation provided by national IQ. When national IQ, PPP-GNI-08, ID-08, Literacy-08, Tertiary-09, Life-08, and IMR-08 are taken together to explain the variation in Water-08, the multiple correlation rises to 0.852 and the explained part of variation to 73 percent, which is 34 percentage points more than national IQ explains (39%). The independent explanatory power of environmental variables is significant, but still slightly less than the explanatory power of national IQ.

It would be interesting to explore to what extent differences in geographical circumstances and water resources affect the access to clean water, but unfortunately it is difficult to find appropriate indicators of geographical factors. However, there is one indicator for this purpose. WDI-09 (Table 3.5) includes data on renewable internal freshwater resources per capita in cubic metres in 2007 (Freshwater). It measures internal renewable resources (internal river flows and groundwater from rainfall) in the country. It is noted that these "estimates are based on different sources and refer to different years, so cross-country comparisons should be made with caution" (WDI-09, p. 153). It could be assumed that freshwater resources per capita are negatively correlated with Water-08, but in fact there is no correlation between these variables (0.050, N=139). The correlation between national IQ and Freshwater is also in zero (0.014, N=147). Access to clean water seems to be completely independent from freshwater resources, whereas it is significantly dependent on national IQ (39%) and several environmental variables. Therefore, it is interesting to see how well national IQ explains the variation in Water-08 at the level of single countries and what kinds of countries deviate most from the regression line. Figure 8.1 summarizes the results of the regression analysis of Water-08 on national IQ in the group of 166 countries. Detailed results for single countries are reported in Table 8.3.

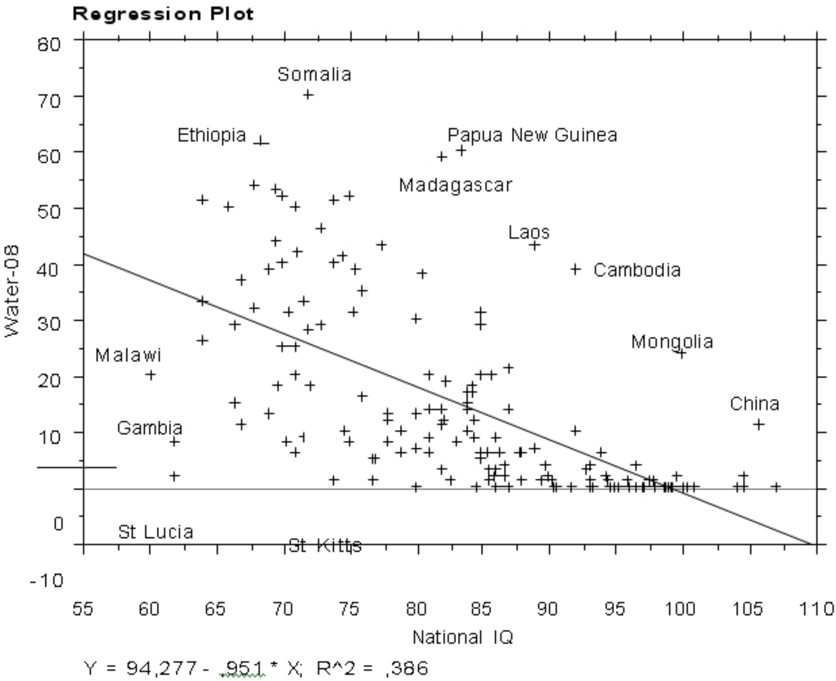

Figure 8.1. The results of regression analysis of Water-08 on national IQ in the group of 166 countries

Figure 8.1 shows that the relationship between national IQ and Water-08 is linear as hypothesized, but many highly deviating countries weaken the relationship. In the countries above the regression line, the percentage of people without access to improved water services is higher than expected on the basis of the regression equation, and in the countries below the regression line it is lower than expected. In all countries above the national IQ level of 90, the percentage of the population without access to clean water is zero or near zero, except in Cambodia, China and Mongolia, whereas this percentage varies greatly in the countries below the national IQ level of 85. National IQ is not able to explain the great variation in Water-08 in the group of countries with low national IQs. Most of that variation seems to be due to some environmental and local factors, perhaps also to measurement errors.

Table 8.3. The results of regression analysis of Water-08 on national IQ in the total group of 166 countries

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
1	Afghanistan	75.0	52	29	23
2	Albania	82.0	3	-13	16
2	Algeria	84.2	17	3	14
4	Andorra	97.0	0	-2	2
5	Angola	71.0	50	23	27
6	Antigua & Barbuda	74.0	-	-	-
7	Argentina	92.8	3	-3	6
8	Armenia	93.2	4	-2	6
9	Australia	99.2	0	0	0
10	Austria	99.0	0	0	0
11	Azerbaijan	84.9	20	6	14
12	Bahamas	84.0	-	-	-
13	Bahrain	85.9	-	-	-

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
14	Bangladesh	81.0	20	3	17
15	Barbados	80.0	0	-18	18
16	Belarus	95.0	0	-4	4
17	Belgium	99.3	0	0	0
18	Belize	76.8	1	-20	21
19	Benin	71.0	25	-2	27
20	Bermuda	90.0	-	-	-
21	Bhutan	78.0	8	-12	20
22	Bolivia	87.0	14	2	12
23	Bosnia & Herzegovina	93.2	1	-5	6
24	Botswana	76.9	5	-16	21
25	Brazil	85.6	3	-10	13
26	Brunei	89.0	-	-	-
27	Bulgaria	93.3	0	-6	6
28	Burkina Faso	70.0	25	-3	28
29	Burundi	72.0	28	2	26
30	Cambodia	92.0	39	32	7
31	Cameroon	64.0	26	-7	33
32	Canada	100.4	0	1	-1
33	Cape Verde	76.0	16	-6	22

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
34	Central African Rep.	64.0	33	0	33
35	Chad	66.0	50	19	31
36	Chile	89.8	4	-5	9
37	China	105.8	11	17	-6
38	Colombia	83.1	8	-7	15
39	Comoros	77.0	5	-16	21
40	Congo, Dem. Rep	68.0	54	24	30
41	Congo, Republic	73.0	29	4	25
42	Cook Islands	89.0	-	-	-
43	Costa Rica	86.0	3	-9	12
44	Côte d'Ivoire	71.0	20	-7	27
45	Croatia	97.8	1	0	1
46	Cuba	85.0	6	-7	13
47	Cyprus	91.8	0	-7	7
48	Czech Republic	98.9	0	0	0
49	Denmark	97.2	0	-2	2
50	Djibouti	75.0	8	-15	23
51	Dominica	67.0	-	-	-
52	Dominican Republic	82.0	14	-2	16

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
53	Ecuador	88.0	6	-5	11
54	Egypt	82.7	1	-15	16
55	El Salvador	78.0	13	-7	20
56	Equatorial Guinea	69.0	-	-	-
57	Eritrea	75.5	39	17	22
58	Estonia	99.7	2	3	-1
59	Ethiopia	68.5	62	33	29
60	Fiji	85.0	-	-	-
61	Finland	100.9	0	2	-2
62	France	98.1	0	-1	1
63	Gabon	69.0	13	-16	29
64	Gambia	62.0	8	-27	35
65	Georgia	86.7	2	-10	12
66	Germany	98.8	0	0	0
67	Ghana	69.7	18	-10	28
68	Greece	93.2	0	-6	6
69	Grenada	74.0	-	-	-
70	Guatemala	79.0	6	-13	19
71	Guinea	66.5	29	-2	31

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
72	Guinea-Bissau	69.0	39	10	29
73	Guyana	81.0	6	-11	17
74	Haiti	67.0	37	6	31
75	Honduras	81.0	14	-3	17
76	Hong Kong	105.7	-	-	-
77	Hungary	98.1	0	-1	1
78	Iceland	98.6	0	0	0
79	India	82.2	12	-4	16
80	Indonesia	85.8	20	7	13
81	Iran	85.6	-	-	-
82	Iraq	87.0	21	9	12
83	Ireland	94.9	0	-4	4
84	Israel	94.6	0	-4	4
85	Italy	96.1	0	-3	3
86	Jamaica	71.0	6	-21	27
87	Japan	104.2	0	5	-5
88	Jordan	86.7	4	-8	12
89	Kazakhstan	85.0	5	-8	13
90	Kenya	74.5	41	18	23
91	Kiribati	85.0	-	-	-

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
92	Korea, North	104.6	0	5	-5
93	Korea, South	104.6	2	7	-5
94	Kuwait	85.6	1	-12	13
95	Kyrgyzstan	74.8	10	-13	23
96	Laos	89.0	43	33	10
97	Latvia	95.9	1	-2	3
98	Lebanon	84.6	0	-14	14
99	Lesotho	66.5	15	-16	31
100	Liberia	68.0	32	2	30
101	Libya	85.0	-	-	-
102	Liechtenstein	100.3	-	-	-
103	Lithuania	94.3	-	-	-
104	Luxembourg	95.0	0	-4	4
105	Macao	99.9	-	-	-
106	Macedonia	90.5	0	-8	8
107	Madagascar	82.0	59	43	16
108	Malawi	60.1	20	-17	37
109	Malaysia	91.7	0	-7	7
110	Maldives	81.0	9	-8	17
111	Mali	69.5	44	16	28

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
112	Malta	95.3	0	-4	4
113	Mariana Islands	81.0	6	-11	17
114	Marshall Islands	84.0	-	-	-
115	Mauritania	74.0	51	27	24
116	Mauritius	88.0	1	-10	11
117	Mexico	87.8	6	-5	11
118	Micronesia	84.0	-	-	-
119	Moldova	92.0	10	3	7
120	Mongolia	100.0	24	25	-1
121	Montenegro	85.9	2	-11	13
122	Morocco	82.4	19	3	16
123	Mozambique	69.5	53	25	28
124	Myanmar (Burma)	85.0	29	16	13
125	Namibia	70.4	8	-19	27
126	Nepal	78.0	12	-8	20
127	Netherlands	100.4	0	1	-1
128	Netherlands Antilles	87.0	-	-	-
129	New Caledonia	85.0	-	-	-
130	New Zealand	98.9	0	0	0

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
131	Nicaragua	84.0	15	1	14
132	Niger	70.0	52	24	28
133	Nigeria	71.2	42	15	27
134	Norway	97.2	0	-1	1
135	Oman	84.5	12	-2	14
136	Pakistan	84.0	10	-4	14
137	Palestine	84.5	9	-5	14
138	Panama	80.0	7	-11	18
139	Papua New Guinea	83.4	60	45	15
140	Paraguay	84.0	14	0	14
141	Peru	84.2	18	4	14
142	Philippines	86.1	9	-3	12
143	Poland	96.1	0	-3	3
144	Portugal	94.4	1	-3	4
145	Puerto Rico	83.5	-	-	-
146	Qatar	80.1	0	-18	18
147	Romania	91.0	-	-	-
148	Russia	96.6	4	2	2
149	Rwanda	76.0	35	13	22
150	St Helena	86.0	-	-	-

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
151	St Kitts & Nevis	74.0	1	-23	24
152	St Lucia	62.0	2	-33	35
153	St Vincent & Grenadines	71.0	-	-	-
154	Samoa (Western)	88.0	-	-	-
155	Sao Tome & Principe	67.0	11	-20	31
156	Saudi Arabia	79.6	-	-	-
157	Senegal	70.5	31	4	27
158	Serbia	90.3	1	-7	8
159	Seychelles	84.4	-	-	-
160	Sierra Leone	64.0	51	18	33
161	Singapore	107.1	0	8	-8
162	Slovakia	98.0	0	-1	1
163	Slovenia	97.6	1	0	1
164	Solomon Islands	83.0	-	-	-
165	Somalia	72.0	70	44	26
166	South Africa	71.6	9	-17	26
167	Spain	96.6	0	-2	2
168	Sri Lanka	79.0	10	-9	19

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
169	Sudan	77.5	43	22	21
170	Suriname	89.0	7	-3	10
171	Swaziland	75.4	31	8	23
172	Sweden	98.6	0	0	0
173	Switzerland	100.2	0	1	-1
174	Syria	82.0	11	-5	16
175	Taiwan	104.6	-	-	-
176	Tajikistan	80.0	30	12	18
177	Tanzania	73.0	46	21	25
178	Thailand	89.9	2	-7	9
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	31	18	13
181	Togo	70.0	40	12	28
182	Tonga	86.0	0	-12	12
183	Trinidad & Tobago	86.4	6	-6	12
184	Tunisia	85.4	6	-7	13
185	Turkey	89.4	1	-8	9
186	Turkmenistan	80.0	-	-	-
187	Uganda	71.7	33	7	26

	Country	National IQ	Water-08	Residual water-08	Fitted water-08
188	Ukraine	94.3	2	-3	5
189	United Arab Emirates	87.1	0	-11	11
190	United Kingdom	99.1	0	0	0
191	United States	97.5	1	-1	2
192	Uruguay	90.6	0	-8	8
193	Uzbekistan	80.0	13	-5	18
194	Vanuatu	84.0	17	3	14
195	Venezuela	83.5	-	-	-
196	Vietnam	94.0	6	1	5
197	Yemen	80.5	38	20	18
198	Zambia	74.0	40	16	24
199	Zimbabwe	72.1	18	-8	26

Table 8.3 shows the countries which deviate most from the regression line and for which positive or negative residuals are large. An interesting question is whether some systematic differences between large positive and negative outliers could help to explain their deviations from the regression line. Let us regard as large outliers countries whose residuals are ±15 or higher (one standard deviation is 13).

The group of large positive outliers (residuals +15 or higher) includes the following 26 countries: Afghanistan, Angola, Cambodia, Chad, China, Congo, D.R., Eritrea, Ethiopia, Kenya, Laos, Madagascar, Mali, Mauritania, Mongolia, Mozambique, Myanmar, Niger, Nigeria, Papua New Guinea, Sierra Leone, Somalia, Sudan, Tanzania, Timor-Leste, Yemen and Zambia. The percentage of the population without access to clean water is in all these countries much higher than expected on the basis of the regression equation.

It is remarkable that this group does not include any economically highly developed countries, Caribbean tourist countries, Latin American countries, or oil exporting countries. Most of them are poor sub-Saharan African countries (17). China is not really a large positive outlier for the reason that its predicted value of Water-08 is negative -6. The other eight positive outliers are poor Asian and Oceanian countries. Most of them (especially Afghanistan, Cambodia, Myanmar and Timor-Leste) have suffered from serious civil wars, which have hampered socio-economic development.

The group of large negative outliers includes 17 countries: Barbados, Belize, Botswana, the Comoros, Djibouti, Egypt, Gabon, Gambia, Jamaica, Lesotho, Malawi, Namibia, Qatar, St Kitts & Nevis, St Lucia, Sao Tome & Principe and South Africa.

It is significant that several of these countries below the national IQ level of 85 have benefitted from foreign investments, technologies, and management. These are the Caribbean tourist countries (Barbados, Belize, Jamaica, St Kitts & Nevis and St Lucia), oil exporting countries (Gabon and Qatar), as well as Botswana and South Africa, which were previously ruled by their white minorities. The other eight negative outliers are African countries (the Comoros, Djibouti, Egypt, Gambia, Lesotho, Malawi, Namibia and Sao Tome & Principe), which have been able to reduce the percentage of the population without access to clean water much more successfully than most other African countries at the same level of national IQ. Their example implies that it is possible to improve significantly water services in poor African countries.

Some systematic differences in the characteristics of large positive and negative outliers provide partial explanations for their large residuals. Most countries with large negative residuals have benefitted from investments, technologies, and management from countries of higher national IQs, whereas most countries with large positive residuals have received much less such foreign help.

4. Sanitation

The three indicators of sanitation are also extremely strongly intercorrelated (see Table 8.1). Table 8.4 reports the correlations between national IQ and the three indicators of sanitation.

Table 8.4. National IQ correlated with the three indicators of sanitation in three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Sanitation-04	149	.637	.678
Sanitation-06	130	.742	.772
Sanitation-08	166	-.714	-.734
Group of countries (inhabitants > 1 million)			
Sanitation-04	124	.717	.755
Sanitation-06	130	.742	.772
Sanitation-08	142	-.742	-.773
Group of countries with measured IQs			
Sanitation-04	117	.663	.717

Dependent variable	N	Pearson correlation	Spearman rank correlation
Sanitation-06	111	.728	.773
Sanitation-08	133	-.707	-.736

Table 8.4 shows that the indicators of sanitation are a little more strongly correlated with national IQ than the indicators of water (cf. Table 8.2). The explained part of variation varies from 41 to 60 percent. Differences between the three groups of countries are relatively small, although the correlations are strongest in the group of countries with more than one million inhabitants. It should be noted that the correlations between national IQ and Sanitation-08 are negative because Sanitation-08 concerns the percentage of the population without access to improved sanitation services (see section 2).

National IQ explains 51 percent of the variation in Sanitation-08 in the total group of 166 countries and 55 percent in the group of countries with more than one million inhabitants, but the unexplained part of variation leaves room for the impact of other explanatory variables. Because the three indicators of sanitation are strongly intercorrelated (see Table 8.1), it is enough to explore the impact of other explanatory variables only in the case of Sanitation-08 in the total group of countries. Sanitation-08 is approximately as strongly related to PPP-GNI-08 (-0.661), ID-08 (-0.470), Literacy-08 (-0.777), Tertiary-09 (-0.673), Life-08 (-0.788), and IMR-08 (0.805) as Water-08, but most of the explanations provided by these variables are overlapping with the explanation provided by national IQ. Multiple regression analysis clarifies their independent explanatory power. When national IQ, PPP-GNI-08, ID-08, Literacy-08, Tertiary-09, Life-08, and IMR-08 are used together to explain the variation in Sanitation-08, the multiple correlation rises to 0.860 (N=164) and the explained part of variation to 74 percent, which is 23 percentage points more than national IQ explains (51%). The independent explanatory power of these six environmental variables is significant, although much less than the explanatory power of national IQ.

Regression analysis can be used to show how well the average relationship between national IQ and Sanitation-08 applies to single countries and which countries deviate most from the regression line. Figure 8.2 summarizes the results of the regression analysis of Sanitation-08 on national IQ in the total group of countries.

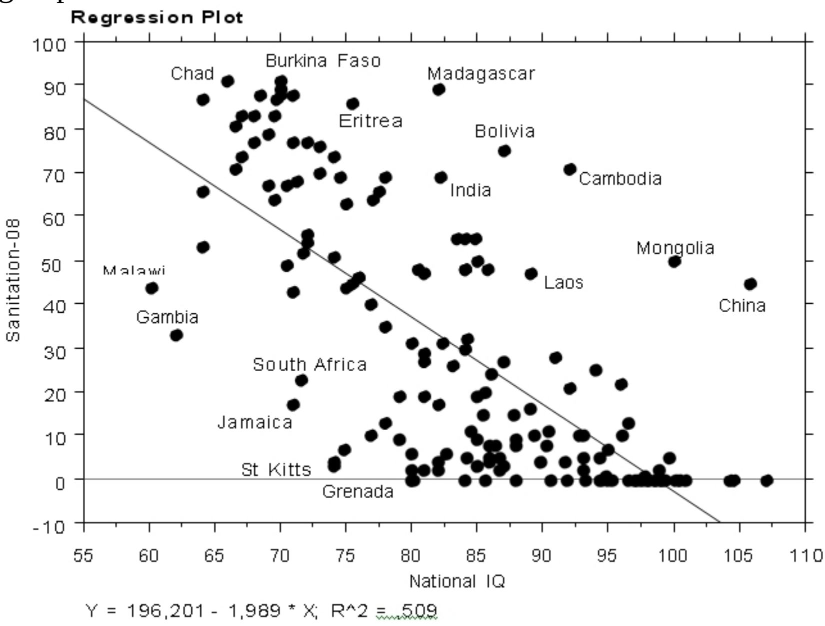

Figure 8.2. The results of regression analysis of Sanitation-08 on national IQ in the group of 166 countries

Figure 8.2 shows that the relationship between the variables is approximately linear as hypothesized, but many extremely outlying countries are inconsistent with the hypothesis and weaken the overall relationship. Positive residuals indicate that the percentage of the population without access to improved sanitation services is higher than expected on the basis of the regression equation, and negative residuals indicate that the percentage is lower than expected. We can see from Figure 8.2 that national IQ explains much less of the variation in Sanitation-08 in the group of countries below the national IQ level of 90 than in the group of countries above this IQ level. The value of Sanitation-08 is zero or near zero for most countries above the national IQ level of 90. It is again useful to compare the opposite groups of countries with large positive and large negative residuals. Let us use a residual ±25 to separate the most outlying countries from the countries which are closer to the regression line (one standard deviation is 21).

Using this criterion, the group of large positive outliers includes the following 22 countries: Azerbaijan, Benin, Bolivia, Burkina Faso, Cambodia, Chad, China, Eritrea, Ethiopia, Ghana, India, Laos, Madagascar, Mauritania, Mongolia, Mozambique, Nepal, Niger, Pakistan, Papua New Guinea, Tanzania and Togo. For all these countries, the percentage of population without access to improved sanitation services is much higher than expected on the basis of national IQ.

Thirteen of the large positive outliers are the same as in the case of the Water-08 variable (Cambodia, Chad, China, Eritrea, Ethiopia, Laos, Madagascar, Mauritania, Mongolia, Mozambique, Niger, Papua New Guinea and Tanzania), which reflects the strong positive correlation between Water-08 and Sanitation-08 (0.811). For the other nine countries, residuals for Water-08 are slightly positive or negative. Twelve of the large positive outliers are sub-Saharan African countries and nine others are relatively poor Asian and Oceanian countries. Bolivia is the only Latin American country, and the group does not include any European or Caribbean country.

Negative residuals are large for the following 21 countries: Albania, the Bahamas, Barbados, Belize, Egypt, El Salvador, Gambia, Grenada, Jamaica, Kuwait, Kyrgyzstan, Malawi, the Maldives, Qatar, St Kitts & Nevis, South Africa, Sri Lanka, Syria, Tajikistan, Turkmenistan and Uzbekistan. In all these countries, the percentage of the population without access to improved sanitation services is much lower than expected on the basis of their national IQs.

Nine of these countries are the same as large negative outliers on the basis of Water-08 (Barbados, Belize, Egypt, Gambia, Jamaica, Malawi, Qatar, St Kitts & Nevis and South Africa). The other 12 countries are not large outliers on the basis of Water-08. It is characteristic of large negative outliers that national IQ is below 90 in all of them. Eight of them are Caribbean tourist countries or oil producing countries, which reflects the beneficial impact of foreign investments, technologies, and management. Five others are former socialist countries. The rest of the large negative outliers (Egypt, El Salvador, Gambia, Malawi, the Maldives, South Africa, Sri Lanka and Syria) seem to be without any common characteristics.

There are some systematic differences in the characteristics of large positive and negative outliers. Many of the large negative outliers have benefitted from internal peace and intensive foreign investments, technologies and management, whereas ethnic or other civil wars have devastated some of the countries with large positive residuals, or they are overpopulated compared to the available means of livelihood. The Caribbean tourist countries constitute a coherent core region of large negative outliers, whereas sub-Saharan African countries, at about the same level of national IQ, constitute the main region of large positive outliers.

5. Conclusion

People's health is certainly affected by the environment in which they live (see WDI-09, p.105). Access to clean drinking water and satisfactory sanitation facilities belong to the most important environmental factors affecting disease prevention. Global inequalities in access to clean water and sanitation are enormous. The problem is, why? We have explored this problem on the basis of the assumption that national IQ is the most important explanatory factor because more intelligent nations can be assumed to be more capable of providing water and sanitation services than less intelligent nations.

The results of empirical analysis support this hypothesis strongly. National IQ explains from 32 to 62 percent of the variation in Water-08 variable and from 41 to 60 percent of the variation in Sanitation-08 in various groups of countries. These are high percentages considering the fact that access to clean water and sanitation facilities depend also on other factors, perhaps on available freshwater resources and on several environmental variables, including governmental policies as HDR-06 emphasizes. The strong dependence of water and sanitation services on national IQ means that we have to expect significant global disparities to continue because it is not reasonable to expect the disappearance of significant differences in national IQs.

HDR-06 argues that the roots of the crisis in water and sanitation services can be traced to poverty, inequality and unequal power relations, not to the scarcity of water. According to HDR-06, there is more than enough water in the world for domestic purposes, for agriculture, and for industry. Scarcity is manufactured through political processes and institutions that disadvantage the poor. We found one variable (Freshwater) to test the impact of existing freshwater resources to water and sanitation variables. The results show that correlations between Freshwater and Water-08 and Sanitation-08 are close to zero. So the results of empirical analysis support the HDR-06 argument that the crisis in water is not principally related to the scarcity of freshwater resources. However, it may be that the Freshwater variable based on data on renewable internal freshwater resources per capita does not take into account all relevant aspects of available freshwater resources. Therefore we leave still open the question about the impact of available freshwater resources on the variation in water and sanitation variables.

We do not have variables to measure the impact of "political processes and institutions that disadvantage the poor," but we tested the impact of some environmental variables on Water-08 and Sanitation-08. The results show that several environmental variables are moderately or strongly related to them and that environmental variables are able to explain a significant part of the variation in Water and Sanitation independently from national IQ. The following summary of the results of correlation and multiple regression analyses indicates the explanatory power of national IQ and the independent explanatory power of some environmental variables.

> Water-08 (N=166) = (national IQ 39% + PPP-GNI-08, ID-08, Literacy-08, Tertiary-09, Life-08, IMR-08 34%) + unexplained variation 27%.

> Sanitation-08 (N=166) = (national IQ 51% + PPP-GNI-08, ID-08, Literacy-08, Tertiary-09, Life-08, IMR-08 23%) + unexplained variation 26%.

The summary shows that national IQ is the dominant explanatory factor, although several environmental variables have some explanatory power independently from national IQ. The unexplained part of variation is relatively small. The results of our empirical analyses imply that differences in national IQs are to a significant extent behind the "political processes and institutions that disadvantage the poor." However, the fact that some low IQ countries have already been able to provide satisfactory water and sanitation services indicates that a low national IQ does not constitute an insurmountable obstacle to provide water and sanitation services to all people, but it is important to note that many of the successful countries have benefitted from significant foreign investments, technologies, and management, whereas several of the least successful countries have been devastated by ethnic and other civil wars. On the basis of these findings, it is reasonable to expect that significant inequalities in water and sanitation services will continue in the world, although it is certainly possible to improve access to clean water and sanitation services in all countries.

Chapter 9

Sociology: Crime, Liberalism, Cognition

1. Crime and Intelligence. 2. National IQ and Crime Rates. 3. Liberalism-Conservatism. 4. Cognition.

1. Crime and Intelligence

There is a large amount of evidence showing that crime is associated with low intelligence. In a review of these studies, Wilson and Herrnstein (1985, p. 159) wrote that "For four decades, large bodies of evidence have consistently shown about a ten IQ point gap between the average offender and the average non-offender in Great Britain and the United States". This conclusion has subsequently been confirmed by Ellis and Walsh (2003) in a summary of more than a hundred studies from all over the world. The influence of socio-economic status and family environment on crime has been controlled in a Danish study of pairs of brothers that has shown that the brother with a criminal record scored an average of 15 IQ points lower than the law-abiding sibling (Kandel, Mednick and Kirkegaard-Sorensen, 1988).

Several explanations have been proposed to explain the low average intelligence of criminals. Wilson and Herrnstein (1985, pp. 167-171) suggest that low intelligence is associated with "present- orientation", i.e. a propensity to seek immediate gratification without regard to the possibility of future punishment; that those with low IQs typically have a weak moral sense and poor moral reasoning ability; typically do poorly at school, so they become alienated and seek status by joining criminal gangs; and are typically in low paid jobs or are unemployed, so they have less to lose by crime and obtaining a criminal record.

The association of low intelligence with crime among individuals suggests that the same association should be present among populations. The first study showing that this is so was published by Maller (1933a, 1933b) in an analysis of average IQs and crime rates in 310 districts of New York City. He found that the correlation between the average IQ of ten year olds and the rates of juvenile delinquency was -0.57. The relation between intelligence and crime among populations has also been investigated by Bartels, Ryan, Urban and Glass (2010) in a study of the IQs of American states and crime rates. They report that crime rates are higher in states with lower IQ and that these negative correlations are higher for violent crime (-0.58) than for non-violent crime, including motor- vehicle theft and other theft (-0.29).

2. National IQ and Crime Rates

From these results showing an association of low intelligence with crime among individuals and among populations in New York City and American states, we can predict that there should be negative correlations between national IQ and crime rates. The results of five studies showing that crime rates are higher in low IQ countries are summarized in Table 9.1. Row 1 gives the first study reporting this negative correlation for homicide rates in the 1970s. Row 2 confirms this result using homicide rates in the 1990s. The high correlation of -0.82 reported by Templer et al. (2007) is obtained because they used age adjusted homicide rates. Row 3 provides further confirmation of this result using homicide rates in the 1990s for a larger number of countries. Rows 4 and 5 show that this negative relationship is also present for rape and assault.

Table 9.1. Negative correlations between national IQ and crime rates

	Variable	N countries	r x IQ	Reference
1	Homicide, 1970s	70	-.50	Lester, 2003
2	Homicide, 1990s	-	-.82	Templer et al., 2007
3	Homicide, 1990s	116	-.25	Rushton & Templer, 2009
4	Rape, 1990s	116	-.29	Rushton & Templer, 2009
5	Assault, 1990s	116	-.21	Rushton & Templer, 2009

3. Liberalism-Conservatism

There is a liberalism-conservatism dimension of political and social values. Liberalism can be defined as a syndrome of values including sympathetic attitudes to the poor, the unemployed, immigrants, criminals, alcoholics, drug addicts, the mentally retarded, and people with AIDS, toleration of homosexuality, prostitution and others with different views, support for abortion, lack of respect for authority, and lack of belief in religion. Conservatism consists of holding the opposite of these values. It has been shown by Kanazawa (2010) that liberalism is associated with intelligence. He reported that those who identified themselves as "very liberal" had a childhood IQ of 106.4, while those who identified themselves as "very conservative" had a childhood IQ of 94.8.

We can predict from these results that there should be a positive correlation across nations between national IQs and liberalism. Studies confirming that this is so are summarized in Table 9.2. Row 1 gives a positive correlation of 0.51 between national IQ and liberalism reported by Kanazawa (2009) who uses income equality (measured by the Gini coefficient) as a measure of liberalism. His theory is that liberal populations have sympathy for the poor, and consequently favor high redistributive taxation of the rich and other measures such as the minimum wage that benefit the poor. The result of this is greater income equality. Kanazawa's theory which he designates the Savanna-IQ interaction hypothesis is that liberalism is evolutionarily novel and higher IQ populations have a greater tendency to adopt evolutionarily novel values.

Table 9.2. Correlation between national IQ and liberalism

	Variable	**N countries**	**r x IQ**	**Reference**
1	Liberalism	127	.51	Kanazawa, 2009
2	Modernism	45	.74	Meisenberg, 2004
3	Post-Modernism	45	.43	Meisenberg, 2004
4	Interpersonal trust	41	.49	Rindermann, 2008a
5	Polygyny	187	-.61	Kanazawa, 2009
6	Polygyny	119	-.53	Dama, 2011
7	Son preference	119	.18	Dama, 2011

Rows 2 and 3 give correlations of 0.74 and 0.43 between national IQs and "Modernism" and "Post-Modernism" reported by Meisenberg (2004), who defines "Modernism" as a set of a liberal set of values and "Post-Modernism" as a more advanced form of "Modernism". The positive correlations show that countries with higher IQs have stronger Modernist and Post-Modernist values.

Row 4 gives a positive correlation of 0.49 between national IQ and "interpersonal trust" defined as the extent to which people trust each other to behave honestly in transactions. Apparently "interpersonal trust" is stronger in more liberal and modern populations.

Row 5 gives a negative correlation of -0.61 between national IQ and polygyny, a system in which one man is married to several women, and row 6 confirms this negative correlation of (-0.53). Kanazawa (2009) who first reported this negative correlation proposes the theory that polygyny has been prevalent throughout human evolutionary history, and that its replacement by monogamy has been evolutionarily novel for men. His theory is that high intelligence is associated with evolutionarily novel behavior, and hence high IQ populations have tended to adopt monogamy.

Row 7 gives a low but statistically significant positive correlation of 0.18 between national IQ and son preference. This may be a surprising result, because it might be expected that liberal and more modern populations would not have such a strong preference for sons as more traditional peoples.

4. Cognition

We now consider some cognitive expressions of intelligence that are correlated with national IQs. Studies of this kind are summarized in Table 9.3. Row 1 gives a negative correlation of -.55 between national IQ and "acquiescence" defined as agreement with statements presented in opinion surveys. The negative correlation shows that people in low IQ countries are more likely to acquiesce. Meisenberg and Williams (2008) report that acquiescence is associated at the individual level with low IQ, predict that the same association should be present across nations, and demonstrate that this is the case.

Row 2 gives a negative correlation of -0.78 between national IQ and "extremity" defined as the preferential use of the end points of the scale in statements presented in opinion surveys. Meisenberg and Williams (2008) note that extremity is associated at the individual level with low IQ, predict that the same association should be present across nations, and verify the prediction.

Row 3 gives a positive correlation of 0.59 between national IQ and the number of books in the home, largely reflecting the higher literacy in high IQ countries.

Table 9.3. Cognitive correlates of national IQ

	Variable	**N countries**	**r x IQ**	**Reference**
1	Acquiescence	79	-.55	Meisenberg & Williams, 2008
2	Extremity	79	-.78	Meisenberg & Williams, 2008
3	Books in home	63	.59	Rindermann, 2008
4	Speed of life	31	.59	Rindermann, 2008a
5	War	186	-.22	Rindermann, 2008a
6	Time preference	10	.70	Jones, 2011

Row 4 gives a positive correlation of 0.59 between national IQ and the speed of life as the speed of service at post offices, walking speed and the accuracy of clocks. The positive correlation suggests that the populations of IQ countries are more energetic and alert.

Row 5 shows a negative correlation of -0.22 between national IQ and war measured as participation, intensity and destructive effects of war in the years 1960-2000, including civil wars. The negative correlation shows that high IQ countries have less engagement in war. The correlation is low but statistically significant. Possibly the explanation for this negative correlation is that high IQ countries are more likely to be democratic, and democracies are less likely to engage in war.

Row 6 shows a correlation of 0.70 between national IQ and low time preference in 10 Asian countries. Time preference was measured by responses to the question "Would you prefer $3400 this month or $3800 next month?" Choosing the second option indicates low time preference or in psychological terms, present-orientation, delay discounting and a capacity to delay gratification. It has been shown in a meta-analysis of 24 studies that a low time preference (a capacity to delay gratification) is correlated with IQ at 0.23 (Shamosh and Gray, 2008)

Chapter 10

Religion

1. Intelligence and Religious Belief in Individuals. 2. National Differences in Intelligence and Religion. 3. New Global Comparisons. 4. Variables. 5. Correlation Analysis. 6. Regression Analysis. 7. Discussion

The classical theory of the relationship of intelligence to religion was advanced by the British anthropologist Sir James Frazer in his 1922 book *The Golden Bough.* Frazer documented a great deal of evidence to show that the early peoples held religious beliefs and he proposed that this was because religion provided explanations for natural phenomena. For instance, if some infectious disease appeared, they believed this was because some god was angry and was punishing them. Frazer argued that with the development of civilization, people became more intelligent and were able to understand the causes of these natural phenomena, and that, for instance, diseases are spread by viruses and bacteria. As he put is "the keener minds came to reject the religious theory of nature as inadequate. . . religion, regarded as an explanation of nature, is replaced by science" (Frazer, 1922, p. 712). By "keener minds" Frazer evidently meant the more intelligent. Thus, those with less keen minds or the less intelligent continue to hold religious beliefs, while those with "keener minds" or the more intelligent reject them.

1. Intelligence and Religious Belief in Individuals

Consistent with Frazer's analysis, it has been found in a number of studies of individuals within nations that there is a negative relationship between intelligence and religious belief. This negative relationship was first reported in the United States in the 1920s by Howells (1928) and Sinclair (1928), who both reported studies showing negative correlations between intelligence and religious belief among college students of -0.27 to -0.36 (using different measures of religious belief). A number of subsequent studies confirmed these early results, and a review of 43 of these studies by Bell (2002) found that all but four found a negative correlation. To these can be added a study in the Netherlands of a nationally representative sample (total N=1,538) that reported that agnostics scored 4 IQs higher than believers (Verhage, 1964). In a more recent study Kanazawa (2010) has analyzed the data of the American National Longitudinal Study of Adolescent Health, a national sample initially tested for intelligence with the PPVT (Peabody Picture Vocabulary Test) as adolescents and interviewed as young adults in 2001-2 (N=14,277). At this interview they were asked: "To what extent are you a religious person?" The responses were coded "not religious at all", "slightly religious", "moderately religious", and "very religious". The results showed that the "not religious at all" group had the highest IQ (103.09), followed in descending order by the other three groups (IQs = 99.34, 98.28, 97.14). The negative relationship between IQ and religious belief is highly statistically significant.

These studies are confirmed by evidence showing that the percentages of religious believers among intelligence elites are lower than in the general population. This was shown as early as 1921 in a survey of the religious beliefs of eminent American scientists and scholars that reported that 39 per cent stated that they believed in God (with a range of 48 per cent among historians to 24 per cent among psychologists) (Leuba, 1921). It was later reported by Roe (1965) that among a group of 64 eminent scientists, 61 were "indifferent to religion", while only three were religious believers. These are much lower than the percentage religious believers in the population among whom 95.5 per cent in the United States stated that they believed in God in a 1948 Gallup Poll (Argyle, 1958). In the 1990s a study of members of the American National Academy of Sciences reported that 7 per cent believed in the existence of God, as compared with approximately 90 per cent found in a poll of the general population (Larsen and Withham, 1998). In Britain, it has been reported that 3.3 per cent of Fellows of the Royal Society believed in the existence of God, while 78.8 per cent did not believe (the remainder being undecided) (Dawkins, 2006). At the same time a poll showed that 68.5 per cent of the general population believed in the existence of God.

Further evidence for a negative correlation between intelligence and religious belief is the decline in religious belief during adolescence and into adulthood as cognitive ability increases. This has been found in the United States for the age range of 12-18 year olds by Kuhlen and Arnold (1944) who reported that among 12 year olds 94 per cent endorsed the statement "I believe there is a God", while among 18 year olds this had fallen to 78 per cent. Similarly, in England Francis (1989) has found a decline in religious belief over the age range 5-16 years. Religious belief was measured by a scale consisting of questions like "God means a lot for me" and "I think that people who pray are stupid", etc. The results were that among 5-6 year olds 87.9 per cent of boys and 96.0 per cent of girls held religious belief, but at the age of 15-16, these percentages had fallen to 55.7 of boys and 70.4 of girls.

Finally, in several economically developed countries there has been a decline of religious belief during the course of the last 150 or so years, while at the same time the intelligence of the population has increased. For instance, in England self-reported weekly attendance at church services reported in census returns declined from 40 per cent of the population in 1850, to 35 per cent in 1900, to 20 per cent in 1950, and to 10 per cent in 1990 (Giddens, 1997, p. 460). Church of England Easter week communicants declined from 9 per cent of the population in 1900 to 5 per cent in 1970 (Argyle and Beit-Hallahmi, 1975). The attendance of children at Sunday schools declined from 30 per cent of the child population in 1900 to 13 per cent in 1960 (Goldman, 1965). In Gallup Polls 72 per cent of the population stated in 1950 that they believed in God (Argyle, 1958), but by 2004 this had fallen to 58.5 per cent (Zuckerman, 2006).

There has also been some decline of religious belief during the course of the last century in the United States. Hoge (1974) has reviewed several surveys that have found a decline of religious belief in college students. For instance, students at Bryn Mawr were asked whether they believed in a God who answered prayers. Positive responses were given by 42 per cent of students in 1894, 31 per cent in 1933, and 19 per cent in 1968. Students enrolling at the University of Michigan were invited to provide a "religious preference". In 1896, 86 per cent of students did so; in 1930 this had dropped to 70 per cent, and in 1968 it had dropped to 44 per cent. At Harvard, Radcliffe, Williams and Los Angles City College the percentages of students who believed in God, prayed daily or fairly frequently, and attended church about once a week all declined from 1946 to 1966. Heath (1969) has also reported a decline in belief in God among college students from 79 per cent in 1948 to 58 per cent in 1968. Among the general population, Gallup Polls have found that 95.5 per cent stated that they believed in God in 1948 (Argyle, 1958), but by 2004 this had fallen to 89.5 per cent (Zuckerman, 2006).

2. National Differences in Intelligence and Religion

From these studies showing a negative relationship between intelligence and religion among individuals, we can predict that the same negative relationship should also be present across nations. Five publications showing that this is so in studies that have measured religious belief in various ways are summarized in Table 10.1.

Table 10.1. Correlations between national IQ and religious belief

	Variable	N countries	r x IQ	Reference
1	Religiosity: atheism	137	-.60	Lynn et al., 2009
2	Religiosity: atheism	137	-.60	Reeve, 2009
3	Religiosity: % belief	58	-.58	Kanazawa, 2009
4	Religiosity: importance	60	-.75	Kanazawa, 2009
5	Religiosity: % religious	60	-.56	Kanazawa, 2009

Row 1 gives a negative correlation of -0.60 between national IQ and religious belief measured as the percentage of the population who say they do not believe in god. Row 2 gives a confirmation of this result. Rows 3, 4 and 5 give further confirmations reported by Kanazawa (2009) who reports negative correlations between national IQ and three measures of religiosity. These are belief in god (r = -0.58), the importance of god in respondent's life (r = -0.75), and the proportion of respondents who identify themselves as a religious person (r = -0.56). Kanazawa's theory is that

> "The human brain may be biased to perceive intentional forces (the hands of God at work) behind a wide range of natural physical phenomena whose exact causes are unknown. If these theories are correct, then it means that religion and religiosity have an evolutionary origin. It is evolutionarily familiar and natural to believe in God, and evolutionarily novel not to be religious".

He proposes that intelligence has evolved as an adaptation to deal with novel situations and to adopt novel beliefs. As religious disbelief is novel, more intelligent individuals are more likely to be atheist than less intelligent individuals.

3. New Global Comparisons

The importance of religion began to decline since the Enlightenment when scientific knowledge of natural phenomena increased and the sphere of inexplicable decreased. The need to resort to religion and God correspondingly declined. Secularization gradually reduced the need and importance of religion, although most people remained as members of their religious communities and continued to participate in some religious rites, especially in those connected with births, weddings, and funerals (cf. Norris and Inglehart, 2004). The importance of religion varies greatly in the contemporary world. Its importance in everyday life is relatively small in secularized societies, whereas its importance is still great in highly religious societies where nearly all people believe in God. Although the importance of God has declined in secularized societies, it does not need to disappear completely for the reason that the ultimate mystery of existence remains permanently inexplicable.

Many survey studies indicate that there is great global variation in the importance of religion and in the belief or disbelief in God (see Inglehart et al., 2004; Zuckerman, 2007; Adherents.com, 2009).

In this study, empirical data on national differences in religious affiliation are derived from Barrett et al. (2001) and in religious beliefs principally from survey studies which have been carried out in many countries of the world since the 1980s. Survey questions have covered different aspects of religious beliefs, particularly the importance of religion and belief or disbelief in God. The results of survey studies indicate great national differences, but it should be noted that those results are only rough approximations and that they may include significant errors. Besides, the concepts of religious beliefs and God may differ considerably across cultural regions, and there is variation in the concept of God also among individuals within the same society.

Zuckerman (2007) notes that assessing rates of belief or disbelief among large populations is extremely difficult. He pays attention to four methodological difficulties: (1) low response rates, (2) non-random samples, (3) adverse political or cultural climates, and (4) problematic cross-cultural terminology. Because of low response rates in many surveys, it is questionable whether the results can be generalized to the wider society. Even a high response rate does not help if the sample is non- random. The results based on non-random samples are not generalizable. Besides, differences in the political or cultural climate may affect the results of surveys significantly. In totalitarian countries where atheism is promulgated by the government people who actually believe in God are reluctant to admit it. Conversely, in a totalitarian society where religion is heavily enforced by the government, there are serious risks for citizens viewed as non-believers. In open democratic societies without pervasive government coercion, individuals often feel it necessary to say that they are religious because such a response is deemed socially desirable or culturally appropriate. In some other democratic societies the cultural climate may induce negative answers. In other words, the dominant cultural climate affects the results of surveys. Finally, Zuckerman stresses that there are methodological problems relating to terminology. Signifiers such as "religious," "secular," or even "God" may have dramatically different meanings and connotations in different cultures. Such concepts are laden with historical, political, social, and theological implications that are unique to every country. Therefore, making cross-national comparisons of beliefs between markedly different societies is tenuous.

Because of these methodological limitations, we want to emphasize that the comparability of data on religious beliefs produced by survey studies is in many cases limited. However, survey data are the only available empirical data on religious beliefs. Therefore we have to use them.

4. Variables

There are various data by which it is possible to test the hypothesis on the negative relationship between national IQ and the degree of religiosity. We use both statistical data on religious affiliations and survey data on religious beliefs and practices.

Religious affiliation (RA). Barrett, Kurian and Johnson's extensive *World Christian Encyclopedia* (2001) provides data and estimations on religious affiliations from all countries of the world. Their data cover all religions and religious communities. According to their data, global adherents of the world's major distinct religions include Christians (33.0%), Muslims (19.6%), Hindus (13.4%), Chinese folk-religionists (6.4%), Buddhists (5.9%), Ethnoreligionists (3.8%), New Religionists (1.7%), Sikhs (0.4%), Jews (0.2%), Spiritists (0.2%), Baha's (0.1%), Confucians (0.1%), and Jains (0.1%). We do not make any distinctions between religions in this study. We have calculated the percentage of religiously affiliated people (RA) from the total population by subtracting the combined percentage of nonreligious people and atheists from 100 percent. In Argentina, for example, the percentage of nonreligious is 2.3 and of atheists 0.8. Consequently, the percentage of religiously affiliated people (RA) is 96.9. Their category of "nonreligious" covers persons "professing no religion, no interest in religion, secularists, materialists, agnostics, but not militantly antireligious or atheists" (p. 29). Their concept of "atheists" refers to "militantly anti-religious or anti-Christian agnostics, secularists, or marxists" (p. 27). The percentage of religiously affiliated people (RA) varies considerably in the world, but it should be noted that this variable does not make distinction between intensively religious people and people who are only nominally affiliated with a religious denomination. Data on RA are available from 193 countries of this study.

Importance of religion (IR) Survey studies provide data on the variation in religious beliefs and practices. Most of those data are derived from the World Values Surveys, which have been carried out since the 1980s. We use data based on the 1999-2002 World Values Survey. Data are from Inglehart et al.'s *Human Beliefs and Values. A cross-cultural sourcebook based on the 1999-2002 values surveys* (2004). The questionnaire includes several questions on religious beliefs. We took into account the following six questions on religious beliefs in mid-2000:

A006. Religion important. For each of the following aspects, indicate how important it is in your life: religion. Very important (%).

F024. Belonging to religious denomination. Do you belong to a religious denomination? Yes (%).

F028. How often do you attend religious services. Apart from weddings, funerals and christenings, about how often do you attend religious services these days? Once a month or more (%).

F034. Religious person. Independently of whether you go to church or not, would you say you are... A religious person (%).

F050. Believe in God. Which, if any, of the following do you believe in? Believe in God. Yes (%).
F063. How important is God in your life. How important is God in your life? Please use this scale to indicate (10 means very important and 1 means not at all important). % Important (codes 7 to 10).

Answers to these questions measure or at least illustrate national differences in religious beliefs and practices. Percentages may vary significantly from one question to another one. We calculated the mean of the six percentages to indicate the importance of religion (IR) in a country. In some cases the value of IR is based on only two (Israel), four (China), or five (Algeria, South Korea, Singapore and Venezuela) percentages. We assume that a combination of percentages indicates better the importance of religion in a country than answers to any single question. Inglehart et al. (2004, p. 2) emphasize that there is enormous cross-cultural variation in people's beliefs and values. The people of the poorest societies tend to place the greatest emphasis on religion, but it is also clear that societies with an Islamic cultural heritage are particularly likely to attach great importance to religion (p. 4). Our purpose is to seek a theoretical explanation for this enormous cross-cultural variation. Data on IR are available only from 80 countries of this study. This sample of 80 countries is to some extent biased. Low IQ countries are greatly underrepresented in the sample.

Similar questions have been presented in some other survey studies in different parts of the world. The results of such survey studies are reported in several books, for example, in Bondeson (2003), Greeley (2003), Norris and Inglehart (2004), Inoguchi et al. (2006), and Zuckerman (2007).

Religious beliefs and affiliations (RBA). Zuckerman's (2007) article "Atheism: Contemporary Numbers and Patterns" includes a global summary of survey studies on religious beliefs. He presents principally data on the percentage of people who do not believe in God. Adherents.com (http://www.adherents.com/Na/Na_517.html) summarizes Zuckerman's data with references to original sources. Zuckerman's data were gathered especially from survey studies reported in Inglehart et al. (2004), Norris and Inglehart (2004), Greeley (2003), and Bondeson (2003). In most cases, data are based on only one survey study, but there are also many countries for which data are available from two or more surveys, from different points of time, and from different survey studies. In such cases, a country's percentage of RBA represents an arithmetic mean of different percentages given in Zuckerman (2007). The fact that percentages based on different surveys may differ considerably from each other indicates that many people were not sure whether they believe in God or not, or that they were not sure what was meant by the question.

In addition to survey results, Zuckerman presents data on the percentage of nonreligious people, agnostics, and atheists derived principally from Barrett et al. (2001). These data cover most sub-Saharan African and Latin American countries, but also some countries from other parts of the world. Such data measure more the extent of religious affiliation than religious beliefs. All people affiliated with some religion do not necessarily believe in God.

Zuckerman's data on religious beliefs and affiliations concern the percentage of people who do not believe in God or who are not affiliated with any religious denomination. If Zuckerman reports more than one percentage, we calculated the arithmetic mean of the percentages. In the case of Argentina, for example, the mean of two percentages is 5.5, but we do not use this percentage in our analysis. We use its inverse 94.5 per cent, which indicates the percentage of people who believe in God or are affiliated with some religious denomination. Our inverse percentage of RBA is assumed to reflect approximate national differences in the importance of religion measured by belief in God or by religious affiliation, but it should be noted that these data certainly include many errors. However, despite all uncertainties and errors, Zuckerman's data show quite significant national differences in belief in God and in religious affiliation. Data on RBA are available from 143 countries.

Combined degree of religiosity (R). We have three different data sets on the religious affiliation (RA), importance of religion (IR), and religious beliefs and affiliations (RBA). These data sets can and will be used separately in statistical analyses, but because they are assumed to measure more or less the same phenomenon, the degree of religiosity from different perspectives, it is reasonable to combine them into a combined degree of religiosity. A combination of the three data sets may provide a more reliable indicator of religiosity than any of them separately. For this purpose, the arithmetic mean of RA, IR, and RBA is calculated for each country. It represents the combined degree of religiosity (R). If data are available only from two data sets, the value of Religiosity variable is based on these two percentages (RA and IR, or RA and RBA). The countries on which data are available only from one data set (RA) are excluded from this data set. Data on R are available from 147 countries.

In addition to the three datasets on RA, IR, and RBA, data on religious beliefs and practices reported in Inoguchi et al. (2006) are taken into account in the calculation of the value of Religiosity in the cases of Japan, Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and South Korea. Data reported in Inoguchi et al. (2006) concern questions on frequency of prayers (daily) and participation in the collective rituals: (a) regular meetings for prayers, (b) giving donations to religious institutions, and (c) fasting, attending religious festivals. The mean of the four percentages was calculated for each of these countries (Japan 10.2, Brunei 72.5, Cambodia 33.2, Indonesia 78.5, Laos 60.5, Malaysia 75.7, Myanmar 83.7, the Philippines 68.2, Singapore 51.7, Thailand 67.2 and South Korea 30.5). These means, in addition to RA, IR, and RBA, were taken into account when the values of the combined degree of religiosity were calculated for these Asian countries.

So we have four variables (RA, IR, RBA, and R) to indicate national differences in the importance of religion. The four variables are positively intercorrelated (Table 10.2), which implies that they measure the same phenomenon, although from clearly different perspectives. IR, RBA, and R are strongly intercorrelated, whereas RA's correlations with the three other variables are only moderate. The hypothesis will be tested by all four variables.

Table 10.2. Intercorrelations of the four indicators of religiosity in various samples of countries

Variable	**RA**	**IR**	**RBA**	**R**
RA (religious affiliation)	1.000	.728 N=80	.568 N=143	.762 N=147
IR (importance of religion)		1.000	.811 N=74	.963 N=78
RBA (religious beliefs and affiliation)			1.000	.908 N=143
R (combined degree of religiosity)				1.000

5. Correlation Analysis

The results of correlation analysis show to what extent empirical evidence supports the hypothesis about the negative relationship between national IQ and religious beliefs. Correlations between national IQ and the four indicators of religious beliefs are given in Table 10.3.

Table 10.3. National IQ correlated with RA, IR, RBA, and R in three groups of countries

Variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
Religiously affiliated (RA)	193	-.480	-.661
Importance of religion (IR)	80	-.749	-.762
Religious beliefs and affiliations (RBA)	143	-.632	-.723
Combined degree of religiosity (R)	147	-.754	-.819
Group of countries (inhabitants > 1 million)			
Religiously affiliated (RA)	152	-.501	-.694
Importance of religion (IR)	76	-.768	-.783
Religious beliefs and affiliations (RBA)	140	-.638	-.725
Combined degree of religiosity (R)	142	-.764	-.818
Group of countries with measured IQs			
Religiously affiliated (RA)	153	-.460	-.688
Importance of religion (IR)	79	-.751	-.766
Religious beliefs and affiliations (RBA)	123	-.615	-.732
Combined degree of religiosity (R)	127	-.735	-.810

All correlations between national IQ and the indicators of religious beliefs are moderate or strong and negative as hypothesized. The explained part of variation varies from 21 to 67 per cent. So the results of correlation analyses support the hypothesis, but there are significant differences in the strength of correlations. The weakest correlations are between national IQ and the extent of religious affiliation (RA). This reflects the fact that RA does not make difference between intensively religious people and people who are only nominally affiliated with some religion. It is reasonable to assume that the number of intensively religious people is in all countries considerably smaller than the number of formally religiously affiliated people. The fact that the strongest correlations are between national IQ and IR (importance of religion) highlights this difference. National IQ explains statistically 56-61 per cent of the variation in IR, which represents a high level of explanation. The rest of the variation is due to some other factors and probably also to measurement errors. RBA's moderately negative correlations with national IQ reflect the composition of Zuckerman's data, which concern both religious affiliations and religious beliefs based on survey studies. Almost half of Zuckerman's data concern only religious affiliation. The correlations between national IQ and R are approximately as strong as correlations between national IQ and IR. This result implies that the combination of different data sets may provide the best measure for the degree of religiosity. However, it should be noted that the correlations given in Table 10.3 are not strictly comparable with each other for the reason that they are based on different samples of countries.

Spearman rank correlations are clearly stronger than Pearson correlations, which indicates that some extremely deviating cases weaken Pearson correlations. The highest correlations are in the group of countries with more than one million inhabitants, but, in the following analyses, we limit our attention to correlations in the total groups of countries as in previous chapters.

Our argument is that national IQ can be regarded as the causal factor in these relationships because differences in national IQs have emerged much earlier than differences in contemporary religious beliefs and in various environmental conditions which may be related to religious beliefs and practices. Furthermore, it would be difficult to indicate any mechanism by which religious beliefs could affect differences in national IQs.

A problem is to what extent some other factors might be able to explain the national variation in the RA, IR, RBA, and R variables independently from national IQ. It would be justified to argue that because secularization is connected with the level of socioeconomic development and of education and probably also with democratization, correlations between indicators of socioeconomic development and indicators of religious beliefs should be negative. We test this hypothesis by using PPP-GNI-08, ID-08, Literacy-08, and Tertiary-09 to measure the level of socioeconomic development, education, and democratization. The results of correlation analyses are given in Table 10.4.

Table 10.4. The four indicators of religious beliefs correlated in turn with PPP-GNI-08, ID-08, Literacy-08, and Tertiary-09 in the total groups of countries

Variable	RA	IR	RBA	R
PPI-GNI-08	-.109	-.460	-.510	-.410
	N=193	N=80	N=143	N=147
ID-08	-.128	-.406	-.491	-.460
	N=188	N=79	N=143	N=146
Literacy-08	-.385	-.572	-.461	-.567
	N=192	N=80	N=143	N=147
Tertiary-08	-.450	-.554	-.610	-.672
	N=189	N=80	N=143	N=147

Table 10.4 shows that empirical evidence supports the hypothesis on the negative impact of socioeconomic development on religious beliefs. All correlations are negative as hypothesized, but they are weak or only moderate and clearly weaker than corresponding correlations between national IQ and the four indicators of religious beliefs (cf. Table 10.3). The results show that national IQ explains much more of the variation in the dependent variables than the four indicators of socioeconomic development, education, and democratization. Also, because the four indicators of socioeconomic development are strongly dependent on national IQ, their independent explanatory power

can be assumed to be much smaller than these correlations indicate.

Multiple regression analyses in which national IQ, PPP-GNI-08, ID-08, Literacy-08, and Tertiary-08 are taken together to explain variation in the four indicators of religious beliefs show how much these indicators of socioeconomic development increase the explained part of variation in the dependent variables independently from national IQ. The results show that the multiple correlation rises in the case of RA (religious affiliation) to 0.594 (N=187) and the explained part of variation to 35 per cent, which is 12 percentage points more than national IQ explains (23%). In the case of IR, the multiple correlation is 0.765 (N=79) and the explained part of variation 58 per cent, which is only 2 percentage points more than national IQ explains (56%). In the case of RBA, the multiple correlation is 0.666 (N=143) and the explained part of variation 44 per cent, which is 4 percentage points more than national IQ explains (40%). Finally, in the case of R (religiosity), the multiple correlation rises to 0.767 (N=146) and the explained part of variation to 59 per cent, which is not more than 2 percentage points more than national IQ explains (57%). These results show that the independent explanatory powers of PPP-GNI-08, ID-08, Literacy-08, and Tertiary-09 are quite limited and in three cases negligible. The global variation in the indicators of religious beliefs seems to depend principally on national IQ. High national IQ nations are clearly less religious than low IQ nations. The explanations provided by alternative environmental variables are nearly completely overlapping with the explanation provided by national IQ.

6. Regression Analysis

National IQ seems to be the principal causal factor behind the global variation in religious beliefs, but it does not explain the variation equally well in all countries. Therefore it is useful to use regression analysis to disclose how well the average relationships between national IQ and indicators of religious beliefs apply to single countries and which countries deviate most clearly from the regression lines. Differences in the nature of large positive and negative outliers may provide hints about the impact of other explanatory factors. Regression analysis is limited to Religiosity, which is most strongly correlated with national IQ (-0.754). The excluded variables IR and RBA are extremely strongly correlated with Religiosity (see Table 10.2), and RA is only weakly correlated with national IQ (-0.480). Figure 10.1 illustrates the results of the regression analysis of Religiosity on national IQ in the total group of 147 countries. The detailed results for single countries are given in Table 10.5.

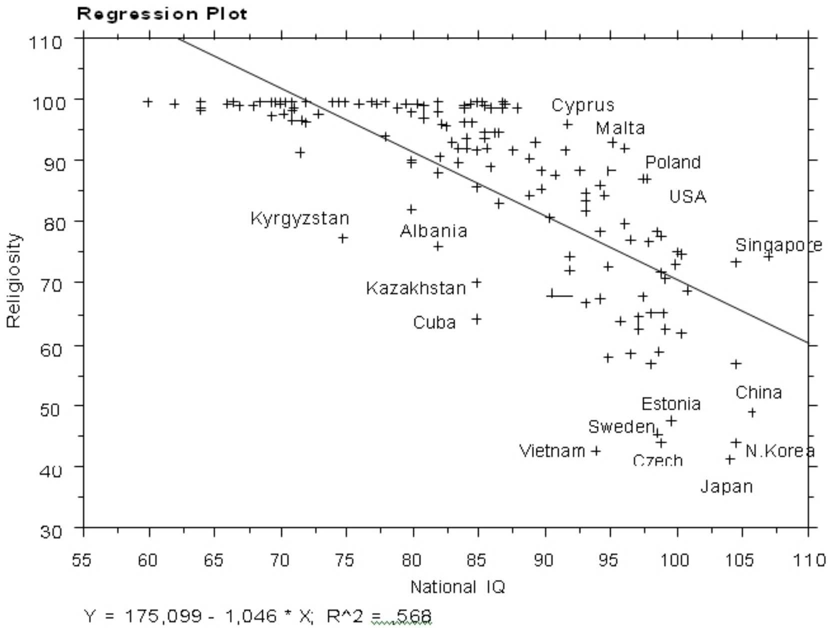

Figure 10.1. The results of regression analysis of Religiosity on national IQ in the group of 147 countries

Figure 10.1 illustrates the strong and curvilinear relationship between national IQ and Religiosity. Because of the relationship's curvilinearity, most of the large positive outliers are at the national IQ level from 80 to 95, whereas nearly all large negative outliers are above the national IQ level of 85. This indicates the fact that according to all variables, the level of religiosity starts to decline above the national IQ level of 85. Some of the most highly outlying countries are named in Figure 10.1. It is interesting to explore whether any common factors might explain their deviations from the regression line.

Table 10.5. The results of regression analysis of Religiosity on national IQ in the total group of 147 countries

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
1	Afghanistan	75.0	99.5	2.8	96.7
2	Albania	82.0	75.8	-13.6	89.4
2	Algeria	84.2	91.9	4.8	87.1
4	Andorra	97.0	-	-	-
5	Angola	71.0	98.0	-2.9	100.9
6	Antigua & Barbuda	74.0	-	-	-
7	Argentina	92.8	88.2	10.1	78.1
8	Armenia	93.2	81.6	4.0	77.6
9	Australia	99.2	70.5	-0.9	71.4
10	Austria	99.0	77.4	5.8	71.6
11	Azerbaijan	84.9	85.3	-1.0	86.3

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
12	Bahamas	84.0	-	-	-
13	Bahrain	85.9	-	-	-
14	Bangladesh	81.0	96.7	6.3	90.4
15	Barbados	80.0	-	-	-
16	Belarus	95.0	57.7	-18.1	75.8
17	Belgium	99.3	62.3	-9.0	71.3
18	Belize	76.8	-	-	-
19	Benin	71.0	99.3	-1.6	100.9
20	Bermuda	90.0	-	-	-
21	Bhutan	78.0	-	-	-
22	Bolivia	87.0	98.4	14.3	84.1
23	Bosnia & Herzegovina	93.2	84.3	6.7	77.6
24	Botswana	76.9	99.4	4.7	94.7
25	Brazil	85.6	93.5	7.9	85.6
26	Brunei	89.0	90.1	8.1	82.0
27	Bulgaria	93.3	66.6	-10.9	77.5
28	Burkina Faso	70.0	99.1	-2.8	101.9
29	Burundi	72.0	99.4	-0.4	99.8
30	Cambodia	92.0	74.2	-4.7	78.9
31	Cameroon	64.0	99.3	-8.9	108.2
32	Canada	100.4	74.5	4.4	70.1

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
33	Cape Verde	76.0	-	-	-
34	Central African Republic	64.0	98.1	-10.1	108.2
35	Chad	66.0	99.1	-7.0	106.1
36	Chile	89.8	85.0	3.8	81.2
37	China	105.8	48.6	-15.9	64.5
38	Colombia	83.1	92.9	4.7	88.2
39	Comoros	77.0	-	-	-
40	Congo, Dem. Rep	68.0	-	-	-
41	Congo, Republic	73.0	97.4	-1.4	98.8
42	Cook Islands	89.0	-	-	-
43	Costa Rica	86.0	98.4	13.2	85.2
44	Côte d'Ivoire	71.0	99.3	-1.6	100.9
45	Croatia	97.8	86.6	13.8	72.8
46	Cuba	85.0	64.0	-22.2	86.2
47	Cyprus	91.8	95.6	16.5	79.1
48	Czech Republic	98.9	43.6	-28.1	71.7
49	Denmark	97.2	62.1	-11.2	73.5
50	Djibouti	75.0	-	-	-
51	Dominica	67.0	-	-	-
52	Dominican Republic	82.0	87.7	-1.7	89.4

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
53	Ecuador	88.0	98.5	15.4	83.1
54	Egypt	82.7	95.4	6.8	88.6
55	El Salvador	78.0	93.8	0.3	93.5
56	Equatorial Guinea	69.0	-	-	-
57	Eritrea	75.5	-	-	-
58	Estonia	99.7	47.1	-23.7	70.8
59	Ethiopia	68.5	99.4	-4.1	103.5
60	Fiji	85.0	-	-	-
61	Finland	100.9	68.4	-1.2	69.6
62	France	98.1	56.4	-16.1	72.5
63	Gabon	69.0	-	-	-
64	Gambia	62.0	99.2	-11.1	110.3
65	Georgia	86.7	82.9	-1.5	84.4
66	Germany	98.8	58.4	-13.4	71.8
67	Ghana	69.7	99.3	-2.9	102.2
68	Greece	93.2	83.0	5.4	77.6
69	Grenada	74.0	-	-	-
70	Guatemala	79.0	98.3	5.8	92.5
71	Guinea	66.5	99.3	-6.3	105.6
72	Guinea-Bissau	69.0	-	-	-
73	Guyana	81.0	-	-	-

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
74	Haiti	67.0	98.8	-6.2	105.0
75	Honduras	81.0	98.7	8.3	90.4
76	Hong Kong	105.7	-	-	-
77	Hungary	98.1	64.7	-7.8	72.5
78	Iceland	98.6	78.2	6.2	72.0
79	India	82.2	90.4	1.3	89.1
80	Indonesia	85.8	91.9	6.5	85.4
81	Iran	85.6	94.3	8.7	85.6
82	Iraq	87.0	99.3	15.2	84.1
83	Ireland	94.9	88.0	12.1	75.9
84	Israel	94.6	84.2	8.0	76.2
85	Italy	96.1	79.5	4.9	74.6
86	Jamaica	71.0	96.5	-4.4	100.9
87	Japan	104.2	41.0	-25.1	66.1
88	Jordan	86.7	94.4	10.0	84.4
89	Kazakhstan	85.0	69.9	-16.3	86.2
90	Kenya	74.5	99.4	2.2	97.2
91	Kiribati	85.0	-	-	-
92	Korea, North	104.6	43.6	-22.1	65.7
93	Korea, South	104.6	56.4	-9.1	65.7
94	Kuwait	85.6	98.7	13.1	85.6

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
95	Kyrgyzstan	74.8	77.3	-19.6	96.9
96	Laos	89.0	84.0	2.0	82.0
97	Latvia	95.9	63.6	-11.2	74.8
98	Lebanon	84.6	96.2	9.6	86.6
99	Lesotho	66.5	-	-	-
100	Liberia	68.0	98.7	-5.3	104.0
101	Libya	85.0	99.3	13.1	86.2
102	Liechtenstein	100.3	-	-	-
103	Lithuania	94.3	78.1	1.6	76.5
104	Luxembourg	95.0	72.5	-3.4	75.8
105	Macao	99.9	-	-	-
106	Macedonia	90.5	80.3	-0.2	80.5
107	Madagascar	82.0	99.3	9.9	89.4
108	Malawi	60.1	99.3	-13.0	112.3
109	Malaysia	91.7	91.3	12.1	79.2
110	Maldives	81.0	-	-	-
111	Mali	69.5	99.4	-3.0	102.4
112	Malta	95.3	92.8	17.4	75.4
113	Mariana Islands	81.0	-	-	-
114	Marshall Islands	84.0	-	-	-
115	Mauritania	74.0	99.4	1.7	97.7

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
116	Mauritius	88.0	-	-	-
117	Mexico	87.8	91.5	8.2	83.3
118	Micronesia	84.0	-	-	-
119	Moldova	92.0	71.8	-7.1	78.9
120	Mongolia	100.0	72.9	2.4	70.5
121	Montenegro	85.9	-	-	-
122	Morocco	82.4	95.8	6.9	88.9
123	Mozambique	69.5	97.2	-5.2	102.4
124	Myanmar (Burma)	85.0	91.5	5.3	86.2
125	Namibia	70.4	97.4	-4.1	101.5
126	Nepal	78.0	99.3	5.8	93.5
127	Netherlands	100.4	61.5	-8.6	70.1
128	Netherlands Antilles	87.0	-	-	-
129	New Caledonia	85.0	-	-	-
130	New Zealand	98.9	71.4	-0.3	71.7
131	Nicaragua	84.0	98.5	11.2	87.3
132	Niger	70.0	99.4	-2.5	101.9
133	Nigeria	71.2	98.5	-2.1	100.6
134	Norway	97.2	64.1	-8.7	72.8
135	Oman	84.5	99.1	12.4	86.7

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
136	Pakistan	84.0	96.0	8.7	87.3
137	Palestine	84.5	-	-	-
138	Panama	80.0	97.7	6.3	91.4
139	Papua New Guinea	83.4	-	-	-
140	Paraguay	84.0	98.6	11.3	87.3
141	Peru	84.2	93.4	6.3	87.1
142	Philippines	86.1	88.6	3.5	85.1
143	Poland	96.1	91.7	17.1	74.6
144	Portugal	94.4	85.9	9.5	76.4
145	Puerto Rico	83.5	91.6	3.8	87.8
146	Qatar	80.1	-	-	-
147	Romania	91.0	87.4	7.5	79.9
148	Russia	96.6	58.1	-16.0	74.1
149	Rwanda	76.0	99.1	3.5	95.6
150	St Helena	86.0	-	-	-
151	St Kitts & Nevis	74.0	-	-	-
152	St Lucia	62.0	-	-	-
153	St Vincent & Grenadines	71.0	-	-	-
154	Samoa (Western)	88.0	-	-	-

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
155	Sao Tome & Principe	67.0	-	-	-
156	Saudi Arabia	79.6	98.9	7.0	91.9
157	Senegal	70.5	99.3	-2.1	101.4
158	Serbia	90.3	-	-	-
159	Seychelles	84.4	-	-	-
160	Sierra Leone	64.0	98.5	-9.7	108.2
161	Singapore	107.1	74.0	10.9	63.1
162	Slovakia	98.0	76.5	3.9	72.6
163	Slovenia	97.6	67.6	-5.4	73.0
164	Solomon Islands	83.0	-	-	-
165	Somalia	72.0	99.4	-0.4	99.8
166	South Africa	71.6	91.1	-9.1	100.2
167	Spain	96.6	76.8	2.7	74.1
168	Sri Lanka	79.0	98.3	5.8	92.5
169	Sudan	77.5	98.9	4.8	94.1
170	Suriname	89.0	-	-	-
171	Swaziland	75.4	-	-	-
172	Sweden	98.6	45.3	-26.7	72.0
173	Switzerland	100.2	74.9	4.6	70.3
174	Syria	82.0	97.8	8.4	89.4
175	Taiwan	104.6	73.3	7.6	65.7

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
176	Tajikistan	80.0	89.3	-2.1	91.4
177	Tanzania	73.0	97.3	-1.5	98.8
178	Thailand	89.9	88.0	6.9	81.1
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	-	-	-
181	Togo	70.0	99.4	-2.5	101.9
182	Tonga	86.0	-	-	-
183	Trinidad & Tobago	86.4	94.4	9.7	84.7
184	Tunisia	85.4	99.3	13.5	85.8
185	Turkey	89.4	92.7	11.1	81.6
186	Turkmenistan	80.0	89.8	-1.6	91.4
187	Uganda	71.7	96.5	-3.6	100.1
188	Ukraine	94.3	67.1	-9.4	76.5
189	United Arab Emirates	87.1	98.9	14.9	84.0
190	United Kingdom	99.1	64.7	-6.8	71.5
191	United States	97.5	86.8	13.7	73.1
192	Uruguay	90.6	68.2	-12.2	80.4
193	Uzbekistan	80.0	81.7	-9.7	91.4
194	Vanuatu	84.0	-	-	-
195	Venezuela	83.5	89.4	1.6	87.8
196	Vietnam	94.0	42.4	-34.4	76.8

	Country	National IQ	Religiosity	Residual religiosity	Fitted religiosity
197	Yemen	80.5	99.2	8.3	90.9
198	Zambia	74.0	99.3	1.6	97.7
199	Zimbabwe	72.1	96.1	-3.6	99.7

Table 10.5 shows that residuals are relatively small for most of the 147 countries, but there are also several countries which deviate significantly from the regression line. Let us use residuals ±12.0 or higher to separate extreme outliers from the countries which are closer to the regression line (one standard deviation is 10.2).

The group of large positive outliers (residual +12.0 or higher) includes the following 16 countries: Bolivia, Costa Rica, Croatia, Cyprus, Ecuador, Iraq, Ireland, Kuwait, Libya, Malaysia, Malta, Oman, Poland, Tunisia, the United Arab Emirates and the United States. In all these countries, the level of religiosity is much higher than expected on the basis of the regression equation.

It is easy to note that large positive outliers are not randomly distributed around the world. Six North African and Middle Eastern Muslim countries with large positive residuals (Iraq, Kuwait, Libya, Oman, Tunisia and the United Arab Emirates) constitute the geographically coherent core region of the Muslim world. Residuals are clearly positive also for all other North African and Middle Eastern Muslim countries. From the other parts of Asia, Malaysia belongs to the same group of Muslim countries with large positive residuals. For Pakistan, Bangladesh, Brunei and Indonesia residuals are also clearly positive, although lower than 12.0. The level of religiosity tends to be higher than expected on the basis of national IQ in nearly all Muslim countries.

Seven principally Roman Catholic countries (Bolivia, Costa

Rica, Croatia, Ecuador, Ireland, Malta and Poland) constitute another culturally coherent group of countries with large positive residuals, but these countries are geographically dispersed in Europe and Latin America. Croatia, Ireland, Malta and Poland are highly Catholic European countries, and the three others are Latin American countries. It is significant to note that residuals are clearly positive also for nearly all other Latin American countries, which reflects the strong position of the Catholic Church in Latin America.

Cyprus and the United States are separate cases. The higher than expected level of religiosity in Cyprus reflects the fact that a violent conflict between the Orthodox Creeks and the Muslim Cypriots, which led to the division of Cyprus in the 1960s, enhanced the importance of the Orthodox Church in Cyprus. In the United States, the cultural climate favors religiosity more than in most other Western countries.

The group of large negative outliers (residual -12.0 or higher) includes 17 countries: Albania, Belarus, China, Cuba, the Czech Republic, Estonia, France, Germany, Japan, Kazakhstan, North Korea, Kyrgyzstan, Malawi, Russia, Sweden, Uruguay and Vietnam. The level of religiosity is much lower than expected in all these countries. Malawi should be excluded from this category because its large negative residual is an artificial consequence of the linear regression equation (see Figure 10.1). The fitted values of Religiosity are over 100 percent for all countries below the national IQ level of 72.

Of the other 16 countries, 11 are contemporary or former socialist countries (Albania, Belarus, China, Cuba, the Czech Republic, Estonia, Kazakhstan, North Korea, Kyrgyzstan, Russia and Vietnam), in which the political and cultural climate was hostile to religion. The anti-religious Communist heritage seems to provide the most important local explanation for an exceptionally low level of religiosity in these countries.

Highly secularized Western European countries (France, Germany, and Sweden) constitute another coherent group of large negative outliers. Residuals are clearly negative also for some other Western European countries (Belgium, Denmark, Hungary, Luxembourg, the Netherlands, Norway and the United Kingdom). Western Europe is the most secularized region in the world. Japan and Uruguay are other highly secularized countries.

The anti-religious Communist heritage and secularization in socio-economically highly developed Western European countries are the two principal local factors which explain the decline of religiosity in many high IQ countries much more than expected on the basis of national IQ.

7. Discussion

Our purpose in this chapter has been to test the hypothesis about the negative relationship between national IQ and various measures of religiosity. We would like to emphasize that it is difficult to measure reliably national differences in the importance of religion. There is not any single variable which could satisfactorily measure national differences in the importance of religions and religious beliefs. Besides, all available data are only approximations. We used for this purpose four variables based on data of religious affiliations and of survey studies: RA (religious affiliations), IR (importance of religion), RBA (religious beliefs and affiliations), and Religiosity, which is a combination of RA, IR, and RBA, or of two of them. Unfortunately data on these variables do not cover all countries. The data set on RA covers 193 countries, on IR 80 countries, on RBA 143 countries, and on Religiosity 147 countries. The four variables are moderately or strongly correlated with each other, which implies that they measure the same phenomenon although from partly different perspectives.

The results of correlation analysis support our research hypothesis (see Table 10.3). National IQ explains statistically 23 per cent of the variation in RA, 56 per cent of the variation in IR, 40 per cent of the variation in RBA, and 57 per cent of the variation in Religiosity. The results of empirical analysis lead to the conclusion that the global variation in the significance of religious beliefs depends on national IQ more than on any other available explanatory factor. Several environmental variables are also negatively correlated with indicators of religious beliefs (see Table 10.4) but not as strongly as national IQ. In addition, their ability to explain variation in the measures of religiosity independently from national IQ is quite limited as the following summary of the results based on our socio-biological research formula shows:

RA (N=193) = (national IQ 23% + PPP-GNI-08, ID-08, Literacy-08, Tertiary-09 12%) + unexplained variation 65%.

IR (N=80) = (national IQ 56% + PPP-GNI-08, ID-08, Literacy-08, Tertiary-09 2%) + unexplained variation 42%.

RBA (N=143) = (national IQ 40% + PPP-GNI-08, ID-08, Literacy-08, Tertiary-09 4%) + unexplained variation 56%.

R (N=147) = (national IQ 57% + PPP-GNI-08, ID-08, Literacy-08, Tertiary-09 2%) + unexplained variation 41%.

The results of empirical analyses indicate that the degree of religiosity tends to decline when the level of national IQ rises, but until now this has clearly occurred only at higher levels of national IQ (above 85). There seems to be little variation in the level of religiosity below national IQ of 85. The problem is why the decline accelerates above national IQ level of 85 and turns the relationship partly curvilinear. The results of regression analysis provided two additional and important explanatory factors, which help to solve this problem. One is the anti-religious Communist heritage in contemporary and former socialist countries and another concerns secularization in many socioeconomically highly developed societies.

Because of anti-religious state policies in socialist countries and especially in the former Soviet Union, the level of religiosity declined in most of those countries more than expected on the basis of national IQ, and residuals became highly negative for most of them as indicated in previous sections. This illustrates the hostile impact of political and cultural climate on religiosity, although there has been some religious revival in some of these countries after the collapse of socialist systems (see Norris and Inglehart, 2004, pp. 111-132). In fact, residuals based on Religiosity are clearly positive for some former socialist countries like Croatia, Armenia, Bosnia & Herzegovina, Poland and Romania. In Poland, Yugoslavia and Romania, religious communities retained their independence much better than in the Soviet Union during the Communist period.

Secularization in Western Europe constitutes another factor which helps to explain the curvilinear relationship between national IQ and measures of religious beliefs. The exceptionally strong impact of secularization has reduced the level of religiosity in most Western European countries. The same has occurred in Japan. However, secularization has not yet spread equally to all countries of high national IQs. There are some highly religious countries like Cyprus, Malta, Poland and the United States with large positive residuals. In the end, only two additional factors - the heritage of the Communist political culture and the exceptionally strong level of secularization - are needed to explain most large negative deviations from the regression line.

We argue that the negative relationship between national IQ and the measures of religiosity is principally a consequence of secularization, which reflects the growth of scientific knowledge of natural phenomena. Differences in national IQs explain the uneven spread of secularization. More intelligent nations have been better able to adopt and accept scientific knowledge of nature than less intelligent nations, which tend to resort to a greater extent to religious explanations and to seek help from religious scriptures for practical problems of economic, political, and social life. It is possible that the level of secularization is even more strongly related to national IQ than our measures of religiosity indicate. In secularized countries many people may say that they believe in God, but it does not prevent them from believing in scientific knowledge of nature. Therefore, in secularized countries, there is not necessarily much practical difference between people who say that they believe in God and those who say that they do not believe in God. In highly religious countries, in which the level of secularization is low, religious scriptures and habits are taken more seriously, which may have hampered economic and social development.

Because the importance of religion is relatively strongly related to the level of national IQ, it cannot be expected that secularization will spread evenly around the world or that disbelief in God will rise in all countries to the same level as it is now in most secularized and socio-economically highly developed countries. One of the most remarkable results of this analysis is the observation that, according to our four variables, the level of religiosity is high in all countries at low levels of national IQ. This relationship will most probably persist, although it does not need to remain unchanged forever. Because the level of socioeconomic development has already risen significantly in some countries below national IQ of 85, it is reasonable to expect a process of secularization in such countries, which would gradually lower the level of religiosity. However, the correlations between national IQ and the measures of religiosity are so strong that it would be unrealistic to expect any large changes. It is likely that differences in national IQs will continue to cause significant national differences in the level of religiosity.

Chapter 11

Happiness

1. National IQ and Happiness. 2. New Global Comparisons. 3. Variables. 4. Correlation Analysis. 5. Frey's Arguments Tested. 6. Regression of Happiness on National IQ. 7. Discussion

The standard work on happiness and its correlates is Bruno Frey's *Happiness: A Revolution in Economics.* According to Frey (2008, p. 150), there is no association between intelligence and happiness in economically developed nations. He reports also that there is a low positive association (r = about 0.20) between income and happiness. He concludes that this is not because income as such confers happiness. This is evident because incomes have increased considerable in many countries since 1945, but surveys have shown that there has been no increase in happiness. The reason for the low positive association between income and happiness appears to be that one determinant of happiness is people's social status relative to others in the society in which they live, and people with higher incomes regard themselves as having higher social status.

1. National IQ and Happiness

Studies of the relation between national IQ and happiness and conditions associated with happiness are summarized in

Table 11.1. Row 1 gives a zero correlation of (0.03) between national IQ and happiness measured by the question "Taking all things together, would you say that you are - very happy - quite happy not very happy - not at all happy". The data are given by Veenhoven (2004). Row 2 gives a zero correlation (0.03) between national IQ and life satisfaction measured from the question "All things considered, how satisfied are you with your life now?" These data are also from Veenhoven (2004). This result is consistent with the zero correlation (0.03) of national IQ with the related variable of happiness given in row 1.

Rows 3 and 4 give low positive correlations of 0.12 and 0.25 between national IQ and subjective well-being. The correlations are not statistically significant. Subjective well-being is similar to happiness, so this confirms the results showing that happiness is not related to national IQ.

Table 11.1. Studies of the relation between national IQ, happiness and related conditions

	Variable	N countries	r x IQ	Reference
1	Happiness	62	.03	Lynn & Vanhanen, 2006
2	Life satisfaction	62	.03	Lynn & Vanhanen, 2006
3	Subjective well-being	51	.12	Meisenberg, 2004
4	Subjective well-being	50	.25	Lynn et al., 2007

These studies indicate that across nations there is no association between national IQ and happiness, or probably a weak positive relations suggested by the positive correlations given in rows 3 and 4. This zero or near zero correlation would be expected from Frey's work, because national IQs are strongly associated with per capita income, yet happiness has not increased within countries as national per capita income. However, Frey (p. 41) shows that across 63 nations in 2001-2003 there was a positive association among poorer nations with per capita incomes below $10,000. Among more affluent nations with per capita incomes above $10,000, there was no association between per capita income and happiness. The explanation for this is probably that in very poor nations, people suffer more from poor health and other effects of extreme poverty. Furthermore, very poor nations tend to be politically unstable and frequently have ethnic conflicts and civil wars, and these tend to produce unhappiness.

As national IQs are a major determinant of per capita income, we should expect from Frey's work that national IQs would be positively associated with happiness in nations with per capita incomes below $10,000, but in nations with per capita incomes above $10,000, there would be no association between national IQs and happiness.

2. New Global Comparisons

Happiness is a highly valued state of mind and condition of life. People would like to be happy rather than unhappy, and societies try to further the happiness of their members. Jeremy Bentham (1789) argued that we should aim at the "greatest happiness for the greatest number". From the perspective of this study, an interesting question is whether and to what extent the average happiness in nations is related to national IQ. Many other aspects of life and social conditions are, as indicated in the previous chapters of this study, moderately or strongly related to national IQ. More intelligent nations have in general been able to establish better conditions of life than less intelligent nations, which regularity has created and continually maintains many kinds of disparities and inequalities in the world. How is it with happiness? Are people in more intelligent nations happier than in less intelligent nations? What is the relative significance of some environmental variables? Is the degree of happiness more or less independent from any available explanatory variables? We already tested the relationship between national IQ and happiness in our previous book (Lynn and Vanhanen, 2006, pp. 97-99, 219-221) on the basis of Ruut Veenhoven's data on happiness and life satisfaction and found zero correlations. We had to conclude that human happiness and life satisfaction do not depend on national IQ. This negative conclusion, based on quite limited empirical evidence, may to have been premature. In this chapter, we try to find answers to these questions by using more extensive and more recent evidence on appropriate measures of happiness and environmental factors.

Empirical data on happiness in nations are based on survey studies which have been carried out after the Second World War and especially since the 1980s. Veenhoven has gathered the most extensive database on happiness in nations. The latest version of his study *World Database of Happiness, Distributional Findings in Nations* (2010) includes some survey data on happiness from almost all contemporary states. Veenhoven's starting point is the idea that utopian dreams about "The Ideal Society" have led into a search for "Optimal Societies", which satisfy human needs in the best possible ways. Societies in which people enjoy a good life are to be judged better than societies where living is poor. According to his definition, the livability of a society is "the degree to which the provisions and requirements of a society fit with its members' needs and capacities." From this perspective it is sensible to study happiness because livability of societies can be estimated by the happiness of its inhabitants, although it is not the only criterion of livability. He refers to health and satisfaction as the main criteria by which the livability of a society can be measured. Happiness is the ultimate measure of satisfaction. The happier the inhabitants are on average, the more livable the nation. In his study, happiness "is defined as the degree to which an individual judges the overall quality of his life-as-a-whole favorably." This kind of happiness can be measured by asking people how they feel about their life. So in principle, happiness is measurable, and it has been measured by surveys.

Veenhoven (2007, 2009) emphasizes that the word "happiness" refers to a degree, like the concepts of "length" or "weight". It describes the state of an individual person only. A nation cannot be said to be happy, but it can be said that most of its citizens consider themselves happy. There is no "objective" standard of happiness. It is enough that a person thinks that he/she is happy. Further, the word "happiness" is not used to characterize satisfaction with specific aspects of life, such as marriage or work. It refers to satisfaction with life-as-a-whole. The core meaning of happiness represents the combination of enduring satisfaction with life-as-a-whole. This is what he means with the word happiness. A synonym is "life-satisfaction". Veenhoven (2007, p. 8) notes that this "is the meaning the utilitarian philosophers had in mind when talking about happiness. When speaking about the ´sum´ of pleasures and pains they denoted a balance over time and thus a durable matter."

Veenhoven shows that average happiness differs markedly across nations, but he does not try to provide any theoretical explanation for significant differences in average happiness in nations. However, he examines the determinants of happiness in nations and presents extensive correlational findings about correlations between happiness and different measures of social conditions. According to his findings, average happiness is moderately correlated with measures of material affluence, security, freedom, equality, brotherhood, and justice. Veenhoven's conclusion is that these findings suggest a political agenda to further happiness in nations. The "available data suggest that most gains can be made by policies that focus on freedom and justice" whereas "economic growth is not likely to add much to happiness in affluent nations and neither is reduction of income differences or greater social security" (Veenhoven, 2007, pp. 23-

26; see also Veenhoven, 2009, Chapter 5).

Because more intelligent nations have in general been able to create better living conditions for their members than less intelligent nations, it is reasonable to assume that there should be a positive correlation between national IQ and measures of happiness and life satisfaction. In other words, we expect that national differences in happiness in nations are partly due to differences in national IQ. We try to test this hypothesis, but we try also to explore whether some determinants of happiness discussed by Veenhoven or some other measures of social conditions could explain as much or more of the differences in happiness and life satisfaction than national IQ. We try to find out how much some environmental variables are able to explain of the global variation in our measures of happiness independently from national IQ.

3. Variables

Veenhoven (2009, Chapter 6) notes that there is no international agency to collect the results of studies on happiness. He has derived his data from thousands of cross-national surveys as well as from periodical Quality-of-Life surveys in particular nations and from various national panel surveys. However, he has not yet found all relevant studies. Despite its shortcomings, Veenhoven's database provides the most extensive and reliable data on average happiness in nations. We use in this study three of Veenhoven's variables to measure average happiness and life satisfaction in nations.

Happiness-V. The first variable measures happiness and it is based on three questions of Veenhoven's (2010) database:

> Question-Type 111C, 4-step verbal happiness. Taking all things together, would you say you are?: - very happy, - quite happy. - not very happy, - not at all happy. Very

happy = 4.... not at all happy = 1. Results on range 0-10.

Question-Type 111D, 5-step verbal happiness. How happy do you feel as you live now? - very happy, - fairly happy, - neither happy nor unhappy, - fairly unhappy, - very unhappy. Very happy = 5 ...very unhappy = 1. Results on range 0-10.

Question-Type 31D, 11-step numeral Best-Worst possible Life. Suppose the top of the ladder represents the best possible life for you and the bottom of the ladder the worst possible life. Where on this ladder do you feel personally stand at the present time? Scores from 10 to 0. Results on range 0-10.

Veenhoven calculated the means of answers to these and some other questions separately for each country. The means were calculated separately on the original range of questions and on the range 0-10. We use the averages on the range 0-10 because they are comparable across questions. Data are available on one, two, or three questions from 148 countries, and they concern the latest year for which data were available on April 22-26, 2010, when data were downloaded (Veenhoven, 2010). If data were available on two or three questions, the average of them was calculated. Our data on Happiness is based on all three questions in 23 cases, on two questions in 84 cases, and on only one question in 41 cases. It is assumed that averages based on two or three questions indicate the level of happiness more reliably than data based on only one question. Most data are from the years 2006-2008, but there are also data from earlier years. Because the three questions differ from each other to some extent, the answers to them are not strictly comparable, but we assume that all of them measure approximately the same phenomenon.

Satisfaction-V. Our second variable measures life satisfaction. It can be regarded as a measure of happiness from a slightly different perspective. It is reasonable to assume that people tend to be the happier, the more satisfied they are to their life. This variable is based on four questions of Veenhoven's (2010) database.

> Question-Type: 121C. 4-step verbal life satisfaction. How satisfied are you with the life you lead? -very satisfied, -fairly satisfied, -not very satisfied, -not at all satisfied. Very = 4.... not at all satisfied = 1. Results on range 0-10.

> Question type: 121D. 5-step verbal life satisfaction. Overall, how satisfied are you with your present life? - very satisfied, -fairly satisfied, -neither satisfied nor dissatisfied, -fairly dissatisfied, -very dissatisfied. Very satisfied = 5... very dissatisfied = 1. Results on range 0-10.

> Question-Type: 122D. 10-step numeral life satisfaction. All things considered, how satisfied are you with your life as-a-whole now? Score 10 satisfied... score 1 dissatisfied. Results on range 0-10.

> Question-Type: 122E. 11-step numeral life satisfaction. All things considered, how satisfied or dissatisfied are you with your life as-a-whole these days? Scores from 10 very satisfied to 0 not satisfied. Results on range 0-10.

As in the case of the Happiness questions, the means of answers to these questions are calculated in Veenhoven's database separately for each country. We use results given on the range 0-10 because they are comparable across questions. Data on Satisfaction are available from 1-4 questions from 136 countries and they concern the latest year from which data were available on April 22-26, 2010, when the data were downloaded. Most data are from the years 2006-2008, but there are also data from earlier years and some data from 2009. If data are available on two, three, or four questions, the average of them was calculated. Our data on Satisfaction are based on all four questions in 12 cases, on three questions in 45 cases, on two questions in 38 cases, and only on one question in 41 cases. It is assumed that averages based on several questions indicate the level of life satisfaction more reliably than data based on only one question.

Satisfaction-GWP. *Human Development Report 2010* (Table 9) provides various data on perceptions of individual well-being and happiness from the period 2006-2009. Data are derived from Gallup World Poll database 2010. We use national data on overall life satisfaction (0, least satisfied, 10, most satisfied). According to this variable (Satisfaction-GWP), overall life satisfaction varies from 2.4 (Tanzania) to 8.5 (Costa Rica). This dataset covers 147 countries.

Feeling of happiness. World Values Survey (WVS 2005 Codebook, 2009) provides alternative survey data on average happiness in nations. WVS 2005 data files include data corresponding to 57 countries. This sample of countries is clearly biased. Developing countries and especially sub-Saharan African countries are underrepresented in the sample. Our data on the feeling of happiness are derived from WVS question V10: Feeling of Happiness.

> VlO. Taking all things together, would you say you are (read out and code one answer): 1 'Very happy', 2 'Quite happy'. 3 'Not very happy', 4 'Not at all happy'.

WVS 2005 Codebook (2009) presents data on the number of respondents and on the distribution of answers from "very happy" to "not at all happy" in 57 countries. It would be possible to base our variable on the percentages of "very happy" (WVS-1) or "quite happy" (WVS-2), but because the borderline between these two categories may have been vague and accidental for many respondents, we considered it

reasonable to combine the percentages of "very happy" and "quite happy" into a combined variable WVS-1+2. The fact that the percentage of "very happy" varies from
6.4 (Iraq) to 58.5 (Mexico) illustrates the accidental interpretation of the category "very happy". The percentage of "quite happy" varies from 28.4 (Ghana) to 77.1 (Hong Kong). In the case of the combined WVS-1+2, the percentage varies much less, from 51.8 (Moldova) to 97.3 (New Zealand). The extreme and probably partly accidental national variation in percentages of "very happy" and "quite happy" decreases their reliability as measures of happiness. The combination of the two percentages (WVS-1+2) may be a more reliable indicator of the average feeling of happiness in nations. Thus we have three WVS indicators of the average feeling of happiness (WVS-1, WVS-2, and WVS-1+2), but we assume that the combined variable WVS-1+2 measures the average national happiness more reliably than either of its two components.

So we have six variables to measure some aspects of happiness and life satisfaction. The intercorrelations of these six variables are given in Table 11.2. Veenhoven's Happiness and Satisfaction variables are strongly correlated (0.843) and they are strongly correlated also with Satisfaction-GWP, which indicates that they measure the same phenomenon, although from different perspectives. The correlation between WVS-1 and WVS-2 is clearly negative (-0.567), which implies that there has been accidental variation in the answers to "very happy" and "quite happy" questions. WVS-1+2 is moderately correlated with its two components (0.552 and 0.368). Happiness and Satisfaction variables are strongly correlated with WVS-1+2, whereas their correlations with WVS-1 and WVS-2 variables are much weaker. The low or only moderate correlations between Happiness and WVS-1 and WVS-2 as well as between Satisfaction variables and WVS-1 and WVS-2 imply that the reliability of WVS-1 and WVS-2 as measures of happiness is poor. Because most of their variation is independent from the variation in the two other measures of happiness, they cannot be regarded as reliable measures of happiness. Therefore we exclude WVS-1 and WVS-2 variables from further analyses and use only the combined WVS-1+2 variable.

Table 11.2. Intercorrelations of the six indicators of happiness and life satisfaction in various samples of countries

Variable	**WVS-1**	**WVS-2**	**WVS-1+2**	**Happiness-Veenhoven**	**Satisfaction-Veenhoven**	**Satisfaction-GWP**
WVS-1	1.000	-.567	.552	.573	.515	.437
		N=57	N=57	N=57	N=57	N=56
WVS-2		1.000	.368	.174	.153	.145
			N=57	N=57	N=57	N=56
WVS-1+2			1.000	.816	.727	.625
				N=57	N=57	N=56
Happiness-Veenhoven				1.000	.843	.846
					N=132	N=142
Satisfaction-Veenhoven					1.000	.954
						N=134
Satisfaction-GWP						1.000

All six indicators can be used to test the hypothesis, but the reliability of the two first variables is questionable for the reason that it has been difficult for people to make difference between "very happy" and "quite happy" alternatives consistently. Their combination WVS-1+2 seems to be a more reliable indicator of happiness, but the sample of 57 countries may be seriously biased. Therefore we should focus on the last three variables, each of which covers more than 100 countries.

4. Correlation Analysis

The hypothesis about the positive relationship between national IQ and average happiness in nations is tested by correlating national IQ with the four variables of happiness and life satisfaction (Table 11.3).

Table 11.3. National IQ correlated with the four indicators of happiness and life satisfaction in various samples of countries

Variable	N	Pearson correlation	Spearman rank correlation
Happiness-Veenhoven	148	.640	.619
Satisfaction-Veenhoven	136	.631	.608
Satisfaction-GWP	147	.648	.647
WVS-1+2	57	.373	.480

Table 11.3 includes correlations in the total group of countries. Correlations in the two other groups of countries (countries with more than one million inhabitants and countries with measured national IQs) are not reported in Table 11.3 because they do not differ significantly from the correlations in the total group of countries. Spearman rank correlations differ only slightly from the Pearson correlations.

The correlations between national IQ and the four dependent variables (Happiness-V, Satisfaction-V, Satisfaction-GWP, and WVS-1+2) support the hypothesis, although in the case of WVS-1+2 only weakly. On the basis of Veenhoven's data, average happiness tends to be clearly higher in more intelligent nations than in less intelligent nations. The explained part of variation in

Happiness rises to 41 per cent and in Satisfaction-V to 40 percent. Satisfaction-GWP is as strongly correlated with national IQ. The much weaker relationship between national IQ and WVS-1+2 may be partly due to the biased sample of countries which WVS-1+2 is based on. Besides, the values of WVS-1+2 are based on only one question, whereas the most values of happiness and satisfaction variables are averages of two, three, or four questions. As mentioned above, we explored the relationship between national IQ and human happiness and life satisfaction already in our previous book and found zero correlations, 0.03 and 0.03 (Lynn and Vanhanen, 2006, p. 219). A problem is why the zero correlations of our 2006 study have now turned moderately positive. In our 2006 study, data on Human Happiness and Life Satisfaction variables were derived from Veenhoven's *World Database of Happiness* (2004). Human Happiness was measured by question 111B: Taking all things together, would you say, you are - very happy - quite happy - not very happy - not at all happy. The sample of countries included 66 countries, and the sample was biased. Life Satisfaction was measured by question 122C: All things considered, how satisfied are you with your life as a whole now? 10 satisfied - 1 dissatisfied. The sample of 62 countries was seriously biased. It included only three countries below the national IQ level of 80. Zero correlations in our 2006 study seem to be due to several factors: (1) the measurement of Human Happiness and Life Satisfaction was limited to only one question in both cases, (2) the samples of countries were small (66 and 62), (3) the samples were seriously biased (low IQ countries were underrepresented), and (4) former socialist countries had extremely large negative residuals. In this new study the measurements of Happiness and Satisfaction are based on 1-3 and 1-4 questions respectively. The samples of countries are more than two times larger (148 and 136). Countries at all levels of national IQ are fairly represented in the samples. Negative residuals of former socialist countries are smaller than in our 2006 study.

Anyway, more than half of the variation in Happiness and Satisfaction variables remains unexplained. The question is whether some environmental variables could explain as much or more of the variation in dependent variables than national IQ and how much they are able to explain independently from national IQ. We checked the explanatory power of some environmental factors by correlating the four dependent variables with PPP-GNI-08, ID-08, Literacy-08, Life-08, and CPI-09. All these variables have been defined and used in previous chapters of this study. The results are reported in Table 11.4.

Table 11.4. The three indicators of happiness and satisfaction correlated in turn with PPP-GNI-08, ID-08, Literacy-08, Life-08, and CPI-09 in various groups of countries

Variable	**N**	**Happiness-V'hoven**	**N**	**Satisfaction-V'hoven**	**N**	**Satisfaction -GWP**	**N**	**WVS-1+2**
PPP-GNI-08	147	.697	135	.636	146	.650	57	.551
ID-08	145	.456	133	.533	145	.520	56	.333
Literacy-08	148	.541	136	.558	147	.600	57	.257
Life-08	148	.681	136	.716	147	.764	57	.473
CPI-09	145	.683	133	.644	144	.629	56	.555

The five environmental variables are correlated moderately with the first three dependent variables. Correlations with WVS-1+2 are smaller. It is evident that per capita income, democracy, literacy, long life expectancy, and a low level of corruption tend to increase the average happiness of people.

Because these environmental variables are moderately or strongly intercorrelated and because national IQ explains a significant part of the variation in all these five environmental variables, it is reasonable to ask how much they are able to explain of the variation in the three dependent variables independently from national IQ. Multiple regression analysis can be used to answer to this question. When national IQ, PPP-GNI-08, ID-08, Literacy-08, Life-08, and CPI-09 are used together to explain variation in Happiness-V, multiple correlation rises to 0.760 (N=143) and the explained part of variation to 58 per cent, which is 17 percentage points more than national IQ explains (41%). National IQ remains as the dominant independent explanatory factor, but the five environmental variables are able to explain a significant part of the variation in Happiness-V also independently from national IQ. In the case of Satisfaction-V, the corresponding multiple correlation is 0.731 (N=131), which means that the explained part of variation rises to 53 per cent, which is 13 percentage points more than national IQ explains (40%). In the case of Satisfaction-GWP, the corresponding multiple correlation rises to 0.750 and the explained part of variation to 56 per cent, which is 14 percentage points more than national IQ explains (42%). These results mean that more than 40 per cent of the variation in the three dependent variables remains still unexplained, and because national IQ explains approximately 40 percent of the variation in happiness and satisfaction variables, it is reasonable to expect that considerable disparities in the average happiness of nations will continue. In the case of WVS-1+2 variable, the corresponding multiple correlation rises to 0.642 and the explained part of variation to 39 per cent. It is 25 percentage points more than national IQ explains (14%). So in this case the independent explanatory power of environmental variables is much higher than in the three other cases, but 61 per cent of the variation in WVS-1+2 remains unexplained.

5. Frey's Arguments Tested

As noted above, Frey (2008) argues that there is no association between intelligence and happiness in economically developed nations and that there is only a low positive association between income and happiness. According to his study based on a sample of 63 nations, there was a positive association between income and happiness among poorer nations with per capita incomes below $10,000, whereas there was no association between income and happiness among more affluent nations with per capita incomes above $10,000. Our data based on more extensive samples of countries make it possible to test Frey's results and arguments (Table 11.5).

Table 11.5. PPP-GNI-08 correlated with Happiness-V and Satisfaction-V variables in the categories of PPP-GNI-08 above $10,000 and below $10,000 and in the total group of countries

Variable	**N**	**Happiness-V**	**N**	**Satisfaction-V**
PPP-GNI-08 > $10,000	65	.606	63	.485
PPP-GNI-08 < $10,000	82	.465	72	.539
All countries	147	.697	135	.636

The results of correlation analysis (Table 11.5) support Frey's argument about a positive association between per capita income and happiness among poorer nations with per capita incomes below $10,000, whereas they contradict his argument about the lack of positive association between per capita income and happiness among more affluent nations with per capita incomes above $10,000. In fact, correlations between per capita income and the two indicators of happiness are approximately as strong in both per capita subcategories of countries, and in the total group of countries correlations are clearly stronger than in the two subcategories. According to our variables, the positive association between per capita income and happiness is considerably stronger than Frey assumes and it seems to be approximately as strong among poor and more affluent countries. The correlation between national IQ and happiness is almost insignificant (0.227) in the group of countries above $10,000, which supports Frey's argument, whereas it is somewhat stronger (0.464) in the group of countries below $10,000.

6. Regression of Happiness on National IQ

Regression analysis can be used to disclose how well the average relationship between national IQ and the measures of happiness applies to single countries and which countries deviate most clearly from the regression line to positive or negative direction. Because the four measures of happiness and satisfaction are strongly intercorrelated (see Table 11.2), it is enough to limit this analysis to only one of them, to Veenhoven's Happiness variable. Figure 11.1 illustrates the results of the regression analysis of Happiness on national IQ, and the detailed results of this regression analysis for single countries are given in Table 11.6

Figure 11.1 illustrates the moderate and linear positive relationship between national IQ and Happiness. It is remarkable that the relationship seems to remain as strong at all levels of national IQ. Some of the most deviating countries are named in the figure. Are there any systematic differences in the character of large positive and negative outliers or is the variation more or less accidental? We can explore this question by separating the largest positive and negative outliers (see Table 11.6) from the countries closer to the regression line.

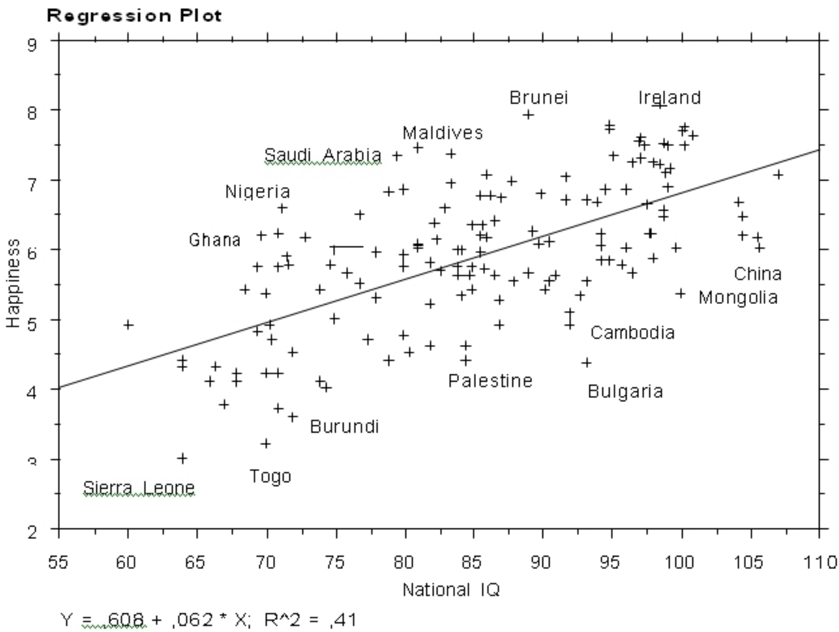

Figure 11.1. The results of regression analysis of Happiness on national IQ in the group of 148 countries

Table 11.6. The results of regression analysis of Happiness on national IQ in the group of 148 countries

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
1	Afghanistan	75.0	6.0	0.7	5.3
2	Albania	82.0	5.2	-0.5	5.7
2	Algeria	84.2	6.0	0.2	5.8
4	Andorra	97.0	7.5	0.9	6.6
5	Angola	71.0	4.2	-0.8	5.0
6	Antigua & Barbuda	74.0	-	-	-
7	Argentina	92.8	5.3	-1.1	6.4
8	Armenia	93.2	5.5	-0.9	6.4
9	Australia	99.2	7.5	0.7	6.8
10	Austria	99.0	7.1	0.3	6.8
11	Azerbaijan	84.9	5.6	-0.3	5.9
12	Bahamas	84.0	-	-	-
13	Bahrain	85.9	-	-	-
14	Bangladesh	81.0	6.1	0.5	5.6
15	Barbados	80.0	-	-	-
16	Belarus	95.0	5.8	-0.7	6.5
17	Belgium	99.3	7.1	0.3	6.8
18	Belize	76.8	6.5	1.1	5.4
19	Benin	71.0	3.7	-1.3	5.0

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
20	Bermuda	90.0	-	-	-
21	Bhutan	78.0	-	-	-
22	Bolivia	87.0	5.2	-0.8	6.0
23	Bosnia & Herzegovina	93.2	-	-	-
24	Botswana	76.9	5.5	0.1	5.4
25	Brazil	85.6	6.8	0.9	5.9
26	Brunei	89.0	7.9	1.8	6.1
27	Bulgaria	93.3	4.4	-2.0	6.4
28	Burkina Faso	70.0	5.3	0.3	5.0
29	Burundi	72.0	3.6	-1.5	5.1
30	Cambodia	92.0	4.9	-1.4	6.3
31	Cameroon	64.0	4.3	-0.3	4.6
32	Canada	100.4	7.7	0.9	6.8
33	Cape Verde	76.0	-	-	-
34	Central African Rep.	64.0	4.4	-0.2	4.6
35	Chad	66.0	4.1	-0.6	4.7
36	Chile	89.8	6.1	-0.1	6.2
37	China	105.8	6.0	-1.2	7.2
38	Colombia	83.1	6.6	0.8	5.8
39	Comoros	77.0	-	-	-

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
40	Congo, Dem. Rep	68.0	4.2	-0.6	4.8
41	Congo, Republic	73.0	-	-	-
42	Cook Islands	89.0	-	-	-
43	Costa Rica	86.0	7.1	1.1	6.0
44	Côte d'Ivoire	71.0	5.8	0.8	5.0
45	Croatia	97.8	6.2	-0.5	6.7
46	Cuba	85.0	6.3	0.4	5.9
47	Cyprus	91.8	6.7	0.4	6.3
48	Czech Republic	98.9	6.5	-0.3	6.8
49	Denmark	97.2	7.6	1.0	6.6
50	Djibouti	75.0	5.0	-0.3	5.3
51	Dominica	67.0	-	-	-
52	Dominican Republic	82.0	5.8	0.1	5.7
53	Ecuador	88.0	5.5	-0.6	6.1
54	Egypt	82.7	5.7	0	5.7
55	El Salvador	78.0	6.0	0.5	5.5
56	Equatorial Guinea	69.0	-	-	-
57	Eritrea	75.5	-	-	-
58	Estonia	99.7	6.0	-0.8	6.8
59	Ethiopia	68.5	5.4	0.5	4.9
60	Fiji	85.0	-	-	-

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
61	Finland	100.9	7.6	0.7	6.9
62	France	98.1	7.2	0.5	6.7
63	Gabon	69.0	-	-	-
64	Gambia	62.0	-	-	-
65	Georgia	86.7	5.6	-0.5	6.0
66	Germany	98.8	6.5	-0.2	6.7
67	Ghana	69.7	6.2	1.3	4.9
68	Greece	93.2	6.7	0.3	6.4
69	Grenada	74.0	-	-	-
70	Guatemala	79.0	6.8	1.3	5.5
71	Guinea	66.5	4.3	-0.4	4.7
72	Guinea-Bissau	69.0	-	-	-
73	Guyana	81.0	6.0	0.6	5.6
74	Haiti	67.0	3.8	-1.0	4.8
75	Honduras	81.0	6.0	0.4	5.6
76	Hong Kong	105.7	6.2	-1.0	7.2
77	Hungary	98.1	5.9	-0.8	6.7
78	Iceland	98.6	8.1	1.4	6.7
79	India	82.2	6.4	0.7	5.7
80	Indonesia	85.8	6.3	0.4	5.9
81	Iran	85.6	5.9	0	5.9

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
82	Iraq	87.0	4.9	-1.1	6.0
83	Ireland	94.9	7.8	1.3	6.5
84	Israel	94.6	6.8	0.3	6.5
85	Italy	96.1	6.9	0.3	6.6
86	Jamaica	71.0	6.2	1.2	5.0
87	Japan	104.2	6.7	-0.4	7.1
88	Jordan	86.7	6.4	0.4	6.0
89	Kazakhstan	85.0	5.4	-0.5	5.9
90	Kenya	74.5	4.0	-1.2	5.2
91	Kiribati	85.0	-	-	-
92	Korea, North	104.6	-	-	-
93	Korea, South	104.6	6.2	-0.9	7.1
94	Kuwait	85.6	6.2	0.3	5.9
95	Kyrgyzstan	74.8	5.8	0.5	5.3
96	Laos	89.0	5.6	-0.5	6.1
97	Latvia	95.9	5.8	-0.8	6.6
98	Lebanon	84.6	4.6	-1.3	5.9
99	Lesotho	66.5	-	-	-
100	Liberia	68.0	4.1	-0.7	4.8
101	Libya	85.0	-	-	-
102	Liechtenstein	100.3	-	-	-
103	Lithuania	94.3	6.0	-0.5	6.5

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
104	Luxembourg	95.0	7.7	1.2	6.5
105	Macao	99.9	-	-	-
106	Macedonia	90.5	5.5	-0.7	6.2
107	Madagascar	82.0	4.6	-1.1	5.7
108	Malawi	60.1	4.9	0.6	4.3
109	Malaysia	91.7	7.0	0.7	6.3
110	Maldives	81.0	7.4	1.8	5.6
111	Mali	69.5	5.7	0.8	4.9
112	Malta	95.3	7.3	0.8	6.5
113	Mariana Islands	81.0	-	-	-
114	Marshall Islands	84.0	-	-	-
115	Mauritania	74.0	4.1	-1.1	5.2
116	Mauritius	88.0	-	-	-
117	Mexico	87.8	7.0	0.9	6.1
118	Micronesia	84.0	-	-	-
119	Moldova	92.0	5.1	-1.2	6.3
120	Mongolia	100.0	5.3	-1.5	6.8
121	Montenegro	85.9	5.7	-0.2	5.9
122	Morocco	82.4	6.1	0.4	5.7
123	Mozambique	69.5	4.8	-0.1	4.9
124	Myanmar (Burma)	85.0	5.7	-0.2	5.9

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
125	Namibia	70.4	4.9	-0.1	5.0
126	Nepal	78.0	5.3	-0.2	5.5
127	Netherlands	100.4	7.5	0.7	6.8
128	Netherlands Antilles	87.0	-	-	-
129	New Caledonia	85.0	-	-	-
130	New Zealand	98.9	7.5	0.7	6.8
131	Nicaragua	84.0	5.6	-0.2	5.8
132	Niger	70.0	4.2	-0.8	5.0
133	Nigeria	71.2	6.6	1.6	5.0
134	Norway	97.2	7.3	0.6	6.7
135	Oman	84.5	-	-	-
136	Pakistan	84.0	5.8	0	5.8
137	Palestine	84.5	4.4	-1.5	5.9
138	Panama	80.0	6.8	1.2	5.6
139	Papua New Guinea	83.4	-	-	-
140	Paraguay	84.0	6.0	0.2	5.8
141	Peru	84.2	5.3	-0.5	5.8
142	Philippines	86.1	6.2	0.2	6.0
143	Poland	96.1	6.0	-0.6	6.6
144	Portugal	94.4	6.2	-0.3	6.5
145	Puerto Rico	83.5	7.4	1.6	5.8

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
146	Qatar	80.1	-	-	-
147	Romania	91.0	5.6	-0.7	6.3
148	Russia	96.6	5.7	-0.9	6.6
149	Rwanda	76.0	5.6	0.3	5.3
150	St Helena	86.0	-	-	-
151	St Kitts & Nevis	74.0	-	-	-
152	St Lucia	62.0	-	-	-
153	St Vincent & Grenadines	71.0	-	-	-
154	Samoa (Western)	88.0	-	-	-
155	Sao Tome & Principe	67.0	-	-	-
156	Saudi Arabia	79.6	7.3	1.7	5.6
157	Senegal	70.5	4.7	-0.3	5.0
158	Serbia	90.3	5.4	-0.8	6.2
159	Seychelles	84.4	-	-	-
160	Sierra Leone	64.0	3.0	-1.6	4.6
161	Singapore	107.1	7.1	-0.2	7.3
162	Slovakia	98.0	6.2	-0.5	6.7
163	Slovenia	97.6	6.6	-0.1	6.7
164	Solomon Islands	83.0	-	-	-
165	Somalia	72.0	-	-	-

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
166	South Africa	71.6	5.9	0.8	5.1
167	Spain	96.6	7.2	0.6	6.6
168	Sri Lanka	79.0	4.4	-1.1	5.5
169	Sudan	77.5	4.7	-0.7	5.4
170	Suriname	89.0	-	-	-
171	Swaziland	75.4	-	-	-
172	Sweden	98.6	7.2	0.5	6.7
173	Switzerland	100.2	7.7	0.9	6.8
174	Syria	82.0	-	-	-
175	Taiwan	104.6	6.5	-0.6	7.1
176	Tajikistan	80.0	4.7	-0.9	5.6
177	Tanzania	73.0	6.2	1.1	5.1
178	Thailand	89.9	6.8	0.6	6.2
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	-	-	-
181	Togo	70.0	3.2	-1.8	5.0
182	Tonga	86.0	-	-	-
183	Trinidad & Tobago	86.4	6.8	0.8	6.0
184	Tunisia	85.4	-	-	-
185	Turkey	89.4	6.2	0	6.2
186	Turkmenistan	80.0	5.9	0.3	5.6

	Country	National IQ	Happiness	Residual Happiness	Fitted Happiness
187	Uganda	71.7	5.8	0.7	5.1
188	Ukraine	94.3	5.8	-0.7	6.5
189	United Arab Emirates	87.1	6.7	0.7	6.0
190	United Kingdom	99.1	6.9	0.1	6.8
191	United States	97.5	7.5	0.8	6.7
192	Uruguay	90.6	6.1	-0.1	6.2
193	Uzbekistan	80.0	5.7	0.1	5.6
194	Vanuatu	84.0	-	-	-
195	Venezuela	83.5	7.0	1.2	5.8
196	Vietnam	94.0	6.7	0.3	6.4
197	Yemen	80.5	4.5	-1.1	5.6
198	Zambia	74.0	5.4	0.2	5.2
199	Zimbabwe	72.1	4.5	-0.6	5.1

Table 11.6 reports the results of the regression analysis for single countries and indicates deviations from the regression line by residuals. Let us use residuals ±1.0 or higher to separate the most extremely deviating countries from the less deviating ones (one standard deviation is 0.8). For most countries, residuals are smaller than ±1.0, but there are also many highly outlying countries, which contradict the hypothesis.

The group of large positive outliers includes the following 18 countries: Belize, Brunei, Costa Rica, Denmark, Ghana, Guatemala, Iceland, Ireland, Jamaica, Luxembourg, the Maldives, Nigeria, Panama, Puerto Rico, Saudi Arabia, South Africa, Tanzania, and Venezuela. Are there any common factors which could explain their outlying positions?

It is difficult to find any common explanatory factor, which could explain their deviations from the regression line. These countries are distributed around the world. Four of them are socio- economically highly developed Western European democracies (Denmark, Iceland, Ireland and Luxembourg) and six others are Central American and Caribbean countries (Belize, Costa Rica, Guatemala, Jamaica, Panama and Puerto Rico). Venezuela is the only South American country. Brunei and Saudi Arabia are wealthy oil producing countries, whereas Ghana, Nigeria, South Africa and Tanzania are sub-Saharan African countries, and the Maldives is a small island country. It is remarkable that Asian countries are almost completely missing from this category of positive outliers and that the two oil countries are the only autocracies in this group. Some variation in the values of Happiness is probably due to measurement errors, which implies that the position of some countries in this category may be accidental. It is difficult to find any reasonable factor which could explain, for example, the great difference between Niger and Nigeria. The value of Happiness is only 4.2 for Niger, whereas it is 6.6 for Nigeria (see Table 11.6).

The group of large negative outliers (residual -1.0 or higher) includes the following 20 countries: Argentina, Benin, Bulgaria, Burundi, Cambodia, China, Haiti, Hong Kong, Iraq, Kenya, Lebanon, Madagascar, Mauritania, Moldova, Mongolia, Palestine, Sierra Leone, Sri Lanka, Togo and Yemen.

Geographically large negative outliers differ considerably from large positive ones. The group does not include any Western European country and only two Latin American and Caribbean countries (Argentina and Haiti). Socio-economically highly developed countries (except Hong Kong), oil exporting countries, and tourist countries are missing from this category, whereas it includes eight Asian and seven sub-Saharan African countries. Most of these countries (especially Burundi, Cambodia, Iraq, Kenya, Lebanon, Mauritania, Palestine, Sierra Leone and Sri Lanka) have suffered from civil wars, which may have lowered the feeling of happiness. Bulgaria and Moldova are former socialist European countries. Poverty and civil wars are local factors which have probably tended to lower happiness in most of these countries.

7. Discussion

The observation that more intelligent nations have in many fields of life been able to establish and maintain better living conditions and social structures than less intelligent nations led us to hypothesize that there should be a positive relationship between national IQ and happiness. The problem was to find appropriate variables by which to measure happiness in nations.

Veenhoven's *World Database of Happiness* (2009) provides the most extensive collection of data on average happiness in nations. We derived from his database two indicators of happiness. The first variable (Happiness) combines the means of happiness on range 0-10 based on three alternative questions on happiness. Our Happiness variable covers 148 countries. It was assumed that the means of happiness based on three different questions would be sufficiently comparable to be combined into the same variable. The second variable (Satisfaction) combines the means of four questions concerning life satisfaction. Satisfaction-GWP constitutes an alternative indicator of life satisfaction. Data on Satisfaction-GWP are derived from the Gallup World Poll database (HDR 2010).

World Values Survey (*WVS 2005 Codebook*) provides data on Feeling of Happiness (V10) in nations. We derived from their question V10 a combined indicator WVS-1+2, which combines percentages of "very happy" and "quite happy" answers. It was found that percentages of "very happy" (WVS-1) and "quite happy" (WVS-2) used separately would be unreliable measures of happiness because their correlations with our other measures of happiness are low, whereas their combination WVS-1+2 is strongly correlated with Happiness and Satisfaction.

By using four alternative variables to measure happiness, we wanted to check whether the relationship between national IQ and average happiness in nations is more or less independent from the variable used to measure happiness. The results of empirical analysis show that the relationship between national IQ and Happiness is positive as hypothesized (0.640, N=148) and moderately strong. The correlations between national IQ and Satisfaction (0.632, N=136) and Satisfaction-GWP (0.648, N=147) are approximately the same. WVS-1+2 is also positively correlated with national IQ, but the correlation (0.373, N=57) is much weaker. Thus the results of empirical analysis support the hypothesis, although only slightly in the case of WVS-1+2.

In addition, we wanted to check to what extent some environmental variables could explain the variation in dependent variables independently from national IQ. It was found that they are capable to explain a significant part of the variation in Happiness, Satisfaction, and WVS-1+2 variables independently from national IQ as the following summary of the results based on our socio- biological research formula indicates:

Happiness (N=148) = (national IQ 41% + PPP-GNI-08, ID-08, Literacy-08, Life-08, CPI-09 17%) + unexplained variation 42%.

Satisfaction (N=136) = (national IQ 40% + PPP-GNI-08, ID-08, Literacy-08, Life-08, CPI-09 13%) + unexplained variation 47%.

Satisfaction-GWP = (national IQ 42% + PPP-GNI-08, ID-08, Literacy-08, Life-08, CPI-09 14%) + unexplained variation 44%.

WVS-1+2 (N=57) = (national IQ 14% + PPP-GNI-08, ID-08, Literacy-08, Life-08, CPI-09 25%) + unexplained variation 61%.

It is obvious that the average level of happiness in nations is dependent both on national IQ and on various environmental variables independently from national IQ. People in more intelligent nations tend to be happier than people in less intelligent nations, but the high levels of per capita income, democracy, and literacy, as well as long life expectancy and low level of corruption tend also to increase average happiness in nations. However, a significant part of the variation remains unexplained, more than half in the case of WVS-1+2. This means that the happiness and life satisfaction of many people is independent from national IQ and environmental social conditions. Many people can feel themselves happy or unhappy both in rich and poor countries as well as in democracies and autocracies, or in highly corrupt and in less corrupt countries.

Probably the explanation for a slightly stronger positive association between national IQ and happiness in poor nations with per capita incomes below $10,000 than in more affluent nations with per capita income above $10,000 is not that low IQs as such are responsible for unhappiness, but that low IQs are a major determinant of poverty and conditions that poverty produces, such as poor health, high mortality, political instability and extremes of wealth and poverty.

The results of this analysis support our basic hypothesis that the quality of many kinds of human conditions, which are under human control, are significantly dependent on the average level of national IQ. This means that great global disparities in human conditions will most probably continue and that human ability to equalize human conditions in different parts of the world remain quite limited.

Chapter 12

Indexes of Human Conditions

1. Previous Indexes of Human Conditions. 2. Index of Human Conditions (IHC). 3. Correlation Analysis. 4. Regression of IHC on National IQ. 5. Regression of Newsweek-10 on National IQ. 6. Conclusion

In the previous chapters we have observed that many kinds of social indicators measuring global differences in human conditions are moderately or strongly correlated with national IQ. These results support our central argument about the importance of national IQ as the most significant explanatory factor behind global inequalities in human conditions. However, correlations vary significantly from one variable to another and the results of regression analyses differ correspondingly depending on the variables used. Consequently, it is not easy to get an overall view on the importance of national IQ as an explanatory factor or on the relative differences between countries in their overall level of prosperity and wellbeing. Therefore it is useful to construct a composite index of human conditions and to see how it is correlated with national IQ.

Gross domestic product (GDP) per capita (see Chapter 4) has traditionally been used to measure relative differences in the wealth of nations, or in the material standards of living, but it excludes many other aspects of wellbeing and quality of life. As *The Economist* (September 19th, 2009, p.79) noted, man does not live by GDP alone: "How well off people feel also depends on things GDP does not capture, such as health or whether they have a job." Social scientists have been looking at other measures of wellbeing, and the French President Sarkozy appointed in 2008 a commission to seek a better way to measure differences in national wellbeing and in the quality of life. The commission came to the conclusion that finding a single measure for that purpose seems too ambitious. That sounds right, but, in fact, there are already some composite indexes which try to capture various aspects of the quality of life and to measure global disparities in human conditions.

1. Previous Indexes of Human Conditions

The best known overall measure of human wellbeing is UNDP's (United Nations Development Programme) Human Development Index (HDI), which has been published annually since 1990. It is a composite index measuring average achievement in three basic dimensions of human development - a long and healthy life, access to knowledge and a decent standard of living. "A long and healthy life" is measured by life expectancy at birth. "Access to knowledge" is measured by adult literacy rate and by combined gross enrolment ratios in primary, secondary and tertiary education. "A decent standard of living" is measured by GDP per capita (PPP US$). Data on HDI cover nearly all UN member states along with Hong Kong Special Administrative Region of China. In this study, we use the latest HDI data published in *Human Development Report 2010* (Table 1). The data cover 169 countries, and the values of HDI-10 vary from Zimbabwe's 0.140 to Norway's 0.938.

The Legatum Prosperity Index published by the British Legatum Institute since 2007 is a new global assessment of prosperity based upon both wealth and wellbeing. It attempts to provide a comprehensive measurement of prosperity using a combination of variables based on economic wealth and quality of life. The Legatum Prosperity Index provides the rank orders of countries according to eight sub-indexes, each of which represents a fundamental aspect of prosperity: Economy, Entrepreneurship & Opportunity, Governance, Education, Health, Safety & Security, Personal Freedom, and Social Capital. It provides also an overall rank of countries, which is calculated by averaging its 8 sub-index scores. The eight sub-indexes are based on many variables which indicate fundamental aspects of prosperity. The 2010 Legatum Prosperity Index covers (Legatum-10) 110 countries. In the overall rank order, Norway is the first and Zimbabwe the last country (see *The 2010 Legatum ProsperityIndex*,http://www.prosperity.com/downloads/2010LegatumProsperityIndexBrochure.pdf. The Legatum Prosperity Index captures significantly more aspects of material wealth and quality of life than HDI, but it covers only 110 countries. Many African countries, in particular, are missing from the index.

The ranking list of the best countries in the world published in *Newsweek* (August 23&30, 2010) represents a new attempt to measure national differences in living conditions by an index combining several indicators. *Newsweek's* overall list of the world's top 100 countries is intended to answer a question: "if you were born today, which country would provide you the very best opportunity to live a healthy, safe, reasonably prosperous, and upwardly mobile life?" *Newsweek* compiled an index based on five categories of national wellbeing - education, health, quality of life, economic competitiveness, and political environment - and ranked 100 countries. Their list (Newsweek-10) represents a snapshot of how countries looked in 2008 and 2009. Finland, Switzerland and Sweden rank at the top of the list, and Cameroon, Nigeria and Burkina Faso are at the bottom of the list.

In our 2006 book (Lynn and Vanhanen, 2006), we constructed a composite Index of the Quality of Human Conditions (QHC), which was intended to measure the average level of human conditions in a country. It combines five variables: (1) PPP GNI per capita 2002, (2) adult literacy rate, (3) gross tertiary enrolment ratio, (4) life expectancy at birth, and (5) the Index of Democratization 2002. It was assumed that a combination of these five variables provides a more valid measure for the average quality of human conditions than any of the single variables alone. Some of the five variables are the same as in HDI, but gross tertiary enrolment ratio and the level of democratization are different variables.

2. Index of Human Conditions (IHC)

For the purposes of this study, we have constructed a slightly different composite Index of Human Conditions (IHC). It combines seven variables measuring the prosperity and wellbeing of nations from different perspectives: (1) PPP GNI per capita 2008, (2) Index of Democratization 2008 (ID-08), (3) Corruption Perceptions Index 2009 (CPI-09), (4) adult literacy rate (Literacy-08), (5) tertiary enrolment ratio (Tertiary), (6) life expectancy at birth 2008 (Life-08), and (7) infant mortality rate per 1,000 live births (IMR-08). These seven variables were selected because they measure national wellbeing and human conditions from clearly different perspectives - from the perspectives of wealth, democracy, education, and health - and because statistical data on these variables are available from nearly all countries of the world. There would be other measures of human conditions as previous chapters indicate, but a problem with several of them is that statistical data are missing from many countries. We wanted to select variables for which data are available for nearly all countries of the world and which measure human conditions from different perspectives. The problem is how to combine the seven variables into a composite index. There would be different ways to combine these variables. Because we want to give to each variable equal weight in the index, the original data are used as percentages or have been transformed into comparable percentages.

PPP-GNI-08. Data on PPP GNI per capita in 2008 (see Chapter 4) were transformed into percentages by calculating the percentage of a country's per capita income from US 40,000 dollars. Per capita income in 2008 was higher than 40,000 dollars for Bermuda, Brunei, Hong Kong, Kuwait, Luxembourg, Macao, the Netherlands, Norway, Qatar, Singapore and the United States, but 40,000 dollars is used as the cutting point in order to reduce the impact of extreme cases. Consequently, the percentage of per capita income (PPP-GNI-08%) is not higher than 100 percent for any country. The values of PPP-GNI-08% vary from 1 to 100, and this variable covers 197 countries.

ID-08. The level of democratization (see Chapter 5) is measured by the Index of Democratization in 2008 (ID-08). The ID values vary from 0 (several countries) to 44.9 (Belgium and Denmark). In order to increase the variation of this variable, the ID values were multiplied by 2. After this transformation, the range of ID-08% extends from zero to 90 (Belgium and Denmark). The data on this variable cover 188 countries.

CPI-09. Data on Corruption Perceptions Index (see Chapter 5) were transformed into comparable percentages by multiplying the original data (CPI-09) by 10. The values of CPI-09% vary from 11 to 94 and they cover 180 countries.

Literacy-08. The original data on adult literacy rate (see Chapter 3) are already percentages. They vary from 26 (Mali) to 100 and they cover 197 countries.

Tertiary-09. The original data on gross enrollment ratio in tertiary education (see Chapter 3) are percentages. They vary from 0 (Malawi) to 96 and cover 192 countries.

Life-08. The original data on life expectancy at birth in 2008 (see Chapter 6) are years and they vary from 43 (Djibouti) to 83 (Andorra and Japan). In this case, the original years are used as percentages, although the range extends only from 43 to 83. The data on this variable cover 197 countries.

IMR-08. The original data on infant mortality rate per 1,000 live births (IMR-08) given in Chapter 7 were first transformed into percentages by calculating the percentage of IMR-08 from 120. The percentage is 100 for countries for which IMR-08 is 120 or higher (Afghanistan, Angola, Chad, Congo, D.R. and Sierra Leone). The inverse percentage is used to indicate the infant survival rate (ISR-08%). For example, IMR-08 for Algeria is 36 and its percentage from 120 is 30. Consequently, the inverse percentage (ISR-08%) is 70. It should be noted that the values of ISR-08% indicate the relative differences between countries, not the actual percentages of survived infants. Inverse percentages are used in the calculation of IHC for the reason that national IQ is assumed to correlate positively with ISR-08%, whereas its correlation with infant mortality rate would be negative. The values of ISR-08% vary from 0 to 98 and they cover 197 countries.

After these transformations, we have seven variables whose ranges vary from 43-83 in the case of Life-08 to 1-100 in the case of PPP-GNI-08%. The seven variables are combined into an Index of Human Conditions (IHC) by calculating the mean of the seven percentages. Countries for which data are available for less than six variables (Bermuda, Cook Islands, the (Northern) Mariana Islands, Netherlands Antilles, New Caledonia, Palestine, St Helena and Tibet) were excluded from this data set. Consequently, data cover 191 countries, but in the cases of Andorra, Antigua & Barbuda, the Bahamas, Belize, Fiji, Grenada, Hong Kong, North Korea, Liechtenstein, Macao, the Marshall Islands, Micronesia, Puerto Rico and St Kitts & Nevis data on IHC-07 are based on only six variables. The IHC's values vary from 15.4 (Somalia) to 90.3 (Denmark).

The seven components of IHC are intended to measure the quality of human conditions from different perspectives.

Therefore it is interesting to see how strongly the variables are correlated with each other. In Table 12.1 the intercorrelations of the seven components are given for the group of 176 countries for which data on all variables are available. Table 12.1 shows that most of the seven components of IHC are only moderately correlated with each other, which means that they measure human conditions from clearly different perspectives. The weakest correlation is between Literacy-08 and ID-08% (0.455) and the strongest between Life-08 and ISR-08% (0.913). All components are strongly correlated with the composite index IHC.

Table 12.1. Intercorrelations of IHC and its seven components in the group of 176 countries

Variable	**PPP-GNI-08%**	**ID-08%**	**CPI-09%**	**Literacy-08**	**Tertiary-09**	**Life-08**	**ISR-08%**	**IHC**
PPP-GNI-08%	1.000	.523	.829	.547	.689	.692	.643	.866
ID-08%		1.000	.584	.455	.610	.551	.513	.732
CPI-09%			1.000	.476	.595	.637	.622	.828
Literacy-08				1.000	.627	.708	.791	.768
Tertiary-09					1.000	.710	.705	.856
Life-08						1.000	.913	.869
ISR-08%							1.000	.872
IHC								1.000

3. Correlation Analysis

In the previous chapters we have tested the hypothesis of the positive relationship between national IQ and human conditions by using approximately 40 indicators which measure global disparities in human conditions from various perspectives. The results of statistical analyses indicate that differences in all kinds of human conditions are significantly related to differences in national IQs. Therefore it is reasonable to assume that different composite indexes of human wellbeing, prosperity, and human conditions should also be positively related to national IQ no matter what indicators are used in those indexes. This central hypothesis will be tested by correlating national IQ with our Index of Human Conditions (IHC), the Human Development Index (HDI-10), the Legatum Prosperity Index, and *Newsweek*'s ranking list of the best countries in the world 2010. Correlations should be relatively strong. Weak or zero correlations would falsify our hypothesis.

Let us first examine the correlations between national IQ and the seven components of IHC given in Table 12.2. All correlations are moderate or strong. The weakest correlations are in the cases of ID-08% and CPI-09% and strongest in the cases of Tertiary-09 and Life-08. In the Pearson correlations, the explained part of variation in the components of IHC varies from 26 to 60 per cent. Most Spearman rank-order correlations are clearly stronger.

Table 12.2. National IQ correlated with the seven components of IHC in the total groups of countries

Variable	N	Pearson correlation	Spearman rank correlation
PPI-GNI-08%	197	.661	.714
ID-08%	188	.511	.501
CPI-08%	180	.586	.570
Literacy=08	197	.638	.691
Tertiary-09	192	.773	.803
Life-08	197	.759	.766
ISR-08%	197	.727	.795

Let us next see how strongly our composite Index of Human Conditions (IHC) and the three other indexes of human development, prosperity, and wellbeing are correlated with each other (Table 12.3). As noted earlier, the four indexes are based on quite different measures of human conditions. Table 12.3 illustrates their intercorrelations.

Table 12.3 Intercorrelations of IHC, HDI-10, Legatum-10, and Newsweek-10 in various samples of countries

Index	IHC	HDI-10	Legatum-10	Newsweek-10
IHC	1.000	.940 (N=169)	-.917(N=110)	-.959(N=100)
HDI-10		1.000	-.908(N=108)	-.931(N=98)
Legatum-10			1.000	-.934(N=92)
Newsweek-10				1.000

We can see from Table 12.3 that the four composite indexes are strongly intercorrelated, although they are to a significant extent based on different measures of human conditions. Their strong intercorrelations imply that different aspects of human development, prosperity, and wellbeing tend to correlate strongly with each other and that it does not make much difference how single indicators are combined into an index. The covariation of indexes varies from 82 per cent in the case of HDI-10 and Legatum-10 to 92 per cent in the case of IHC and Newsweek-10. Until now it has not been possible to construct measures of human conditions which would clearly contradict each other.

The hypothesis on the positive impact of national IQ on human conditions is tested by correlating national IQ with the four alternative composite indexes of human conditions (Table 12.4).

Table 12.4. National IQ correlated with four indexes of human conditions in three groups of countries

Dependent variable	N	Pearson correlation	Spearman rank correlation
Total group of countries			
IHC	191	.804	.803
HDI-10	169	.838	.851
Legatum-10	110	-.767	-.784
Newsweek-10	100	-.848	-.861
Group of countries (inhabitants >1 million)			
IHC	153	.855	.864
HDI-10	144	.851	.864
Legatum-10	108	-.768	-.786
Newsweek-10	98	-.852	-.868
Group of countries with measured IQs			
IHC	151	.825	.829
HDI-10	137	.838	.840
Legatum-10	106	-.779	-.794
Newsweek-10	97	-.847	-.862

Table 12.4 shows that the results of correlation analysis support strongly the hypothesis about the impact of national IQ on human conditions, human development, and prosperity. The composite index IHC is clearly more strongly related to national IQ than any of its seven components (cf. Table 12.2, which implies that IHC may indicate better the national variation in human conditions than any of its components. All correlations are strong. In the Pearson correlations, the explained part of variation varies from 59 to 73 percent depending on an index and on the sample of countries. Spearman rank correlations are somewhat higher than Pearson correlations. Most correlations are slightly higher in the group of countries over one million inhabitants than in the total group of countries. This difference in

the strength of correlations implies that exceptional local and external factors may have been more significant in small countries than in more populous countries.

All correlations are not strictly comparable for the reason that the strength of correlations depends also on the sample of countries. However, the correlations between national IQ and IHC, HDI-10, and Newsweek-10 do not differ much from each other, whereas the correlations between national IQ and Legatum-10 are clearly weaker.

It has been much easier to measure global differences in the wealth and wellbeing of nations and to agree on the results of such measurements than to invent theoretical and testable explanations for these inequalities and disparities. As far as we know, economics, sociology, or political science have not yet produced any theoretical explanation which could be tested by global empirical evidence. Studies have usually been limited to describing global disparities in economic development and in various other aspects of human conditions, or have discussed the best ways to reduce global inequalities or to further economic development. The initial causes of global inequalities have not been analyzed (cf. Echeverri-Gent, 2009, p. 633). Empirical tests have been limited to measuring relationships between various social and economic indicators. Per capita income, for example, correlates significantly with the level of literacy, but it would not be justified to claim that per capita income provides a causal explanation for the level of literacy. It would be as reasonable to argue that the level of literacy explains the variation in per capita income. Besides, both variables are strongly correlated with national IQ. The same concerns many other social indicators which are moderately or strongly intercorrelated. An explanatory factor should be independent from the dependent variable in such a way that the variation in the dependent variable does not affect the variation in the explanatory variable. It has been difficult to find such explanatory factors.

We have used national IQ as the central explanatory factor in our previous studies (see Lynn and Vanhanen, 2002, 2006). According to our interpretation, national IQ is more or less independent from contemporary social conditions for the reason that differences in national IQs are based partly, although not entirely, on genetic differences between populations, and those differences probably evolved thousands of years before the emergence of differences in contemporary social conditions. The use of national IQ as an explanatory factor is based on the assumption that global disparities in human conditions are principally due to the evolved diversity of individuals and of human populations. National IQ reflects the genetic diversity of populations. More intelligent nations have been able to create better living conditions for themselves than less intelligent nations, although, of course, differences in geographical circumstances and exceptional local factors have also impacted on human conditions. These arguments led us to hypothesize that various measures of development and wellbeing must correlate with national IQ and that national IQ is the principal causal factor in these relationships.

Social scientists have until now systematically refrained from taking into account the evolved genetic diversity of individuals and populations. They have wanted to believe that there cannot be any genetic differences between populations which could affect differences in social conditions and that various environmental factors are sufficient to explain enormous global disparities in human conditions. The fact is, however, that they have not been able to indicate any environmental factor(s) which could explain the enormous developmental differences between nations and which could be tested by global empirical evidence. Gradually it starts to become apparent that the evolved genetic diversity of individuals and populations should be taken into account in attempts to explain persistent global disparities in human conditions.

From this perspective, it is interesting to note that *Nature* published on October 8, 2009, an article "Let's celebrate human genetic diversity" written by Bruce T. Lahn and Lanny Ebenstein. They emphasize that science is finding evidence of genetic diversity among groups of people as well as among individuals and they note that, in the natural world, genetic diversity is a source of evolutionary resilience and adaptability. Therefore it should be taken into account, including that at the group level (Lahn and Ebenstein, 2009). Our argument is that national IQ measures one important aspect of group diversity.

In this chapter we have tested our hypothesis on the impact of genetic diversity of populations on human conditions by measuring group diversity by national IQ and differences in human conditions by our Index of Human Conditions (IHC) and by three alternative indexes of human development and conditions. As Table 12.4 indicates, national IQ correlates strongly with IHC in the three groups of countries. The same is true in the cases of HDI-10, Legatum-10, and Newsweek-10 indexes. The explained part of variation in various indexes rises to over 60 and even over 70 per cent, which represents an exceptionally high level of explanation. Most of the unexplained variation is probably due to exceptional local and historical factors, perhaps also to geographical differences.

4. Regression of IHC on National IQ

National IQ explains 65 percent of the variation in the Index of Human Conditions (IHC) in the total group of countries and 73 percent in the smaller sample of countries with more than one million inhabitants, but correlations do not tell how well the average relationship applies to single countries. It is obvious that many countries deviate significantly from the average relationship in a positive or negative direction. Regression analysis, in which national IQ is the independent variable and IHC is the dependent variable, helps to locate the most deviating single countries. Figure 12.1 summarizes the results of the regression analysis of IHC on national IQ in the total group of 191 countries. Detailed results for single countries are given in Table 12.5.

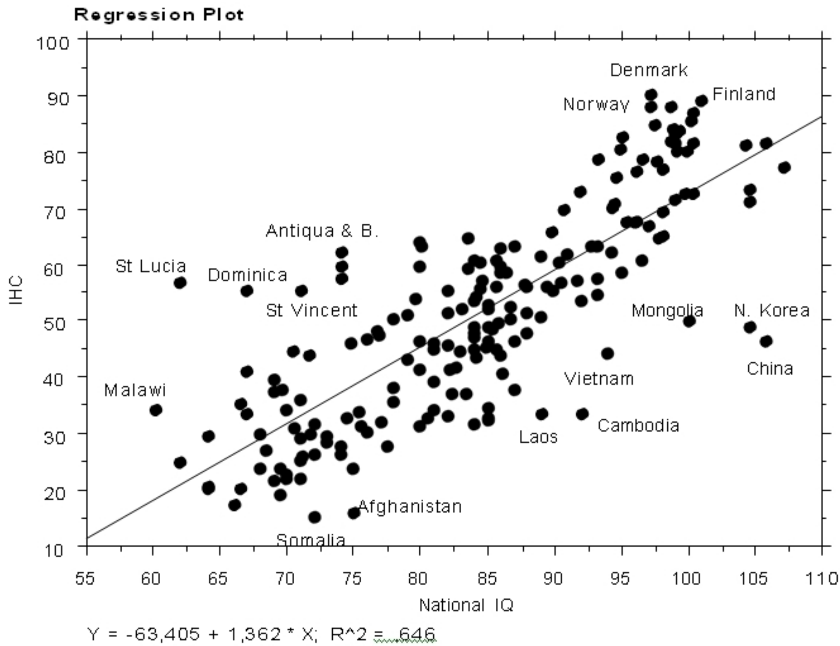

Figure 12.1. The results of regression analysis of the Index of Human Conditions (IHC) on national IQ in the total group of 191 countries

We can see from Figure 12.1 that the relationship between national IQ and IHC is strong and approximately linear, although most IHC values start to rise more than expected on the basis of the regression equation above the national IQ level of 90. Several highly deviating countries weaken the overall correlation. Some of the largest positive and negative outliers are named in the figure. It is easy to note that there are significant differences in the nature of large positive and negative outliers. Small Caribbean tourist countries and socioeconomically highly developed Western democracies seem to dominate in the category of large positive outliers, whereas socialist and former socialist countries and some countries ravaged by civil wars dominate in the group of large negative outliers. The examination of the nature of the most deviating countries may provide hints about factors which have been related to the level of IHC independently from national IQ. These preliminary observations on the nature of the most deviating countries refer to the impact of exceptional local, historical, and geographical factors, which are largely independent from national IQ. We will discuss the nature and impact of these factors in greater detail on the basis of the detailed results of this regression analysis reported in Table 12.5.

Table 12.5. The results of regression analysis of IHC on national IQ for single countries in the total group of 191 countries

	Country	National IQ	IHC	Residual IHC	Fitted IHC
1	Afghanistan	75.0	16.1	-22.6	38.7
2	Albania	82.0	55.4	7.2	48.2
2	Algeria	84.2	43.8	-7.4	51.2
4	Andorra	97.0	67.0	-1.7	68.7
5	Angola	71.0	22.3	-11.0	33.3
6	Antigua & Barbuda	74.0	62.2	24.8	37.4

	Country	National IQ	IHC	Residual IHC	Fitted IHC
7	Argentina	92.8	63.3	0.3	63.0
8	Armenia	93.2	54.7	-8.8	63.5
9	Australia	99.2	83.8	12.1	71.7
10	Austria	99.0	83.0	11.6	71.4
11	Azerbaijan	84.9	45.6	-6.6	52.2
12	Bahamas	84.0	61.0	10.0	51.0
13	Bahrain	85.9	60.0	6.4	53.6
14	Bangladesh	81.0	34.4	-12.5	46.9
15	Barbados	80.0	64.3	18.8	45.5
16	Belarus	95.0	58.7	-7.2	65.9
17	Belgium	99.3	83.8	12.0	71.8
18	Belize	76.8	48.2	7.0	41.2
19	Benin	71.0	29.3	-4.0	33.3
20	Bermuda	90.0	-	-	-
21	Bhutan	78.0	35.8	-7.0	42.8
22	Bolivia	87.0	46.7	-8.4	55.1
23	Bosnia & Herzegovina	93.2	57.6	-5.9	63.5
24	Botswana	76.9	47.6	6.3	41.3
25	Brazil	85.6	56.4	3.3	53.1
26	Brunei	89.0	61.6	3.8	57.8
27	Bulgaria	93.3	63.6	0	63.6

	Country	National IQ	IHC	Residual IHC	Fitted IHC
28	Burkina Faso	70.0	22.1	-9.8	31.9
29	Burundi	72.0	26.4	-8.2	34.6
30	Cambodia	92.0	33.7	-28.2	61.9
31	Cameroon	64.0	29.6	5.9	23.7
32	Canada	100.4	81.8	8.5	73.3
33	Cape Verde	76.0	47.0	6.9	40.1
34	Central African Republic	64.0	20.7	-3.0	23.7
35	Chad	66.0	17.7	-8.8	26.5
36	Chile	89.8	66.1	7.2	58.9
37	China	105.8	46.4	-34.3	80.7
38	Colombia	83.1	52.3	2.6	49.7
39	Comoros	77.0	32.4	-9.0	41.4
40	Congo, Dem. Rep	68.0	24.1	-5.1	29.2
41	Congo, Republic	73.0	29.8	-6.2	36.0
42	Cook Islands	89.0	-	-	-
43	Costa Rica	86.0	58.8	5.1	53.7
44	Côte d'Ivoire	71.0	25.4	-7.9	33.3
45	Croatia	97.8	65.0	-4.8	69.8
46	Cuba	85.0	52.4	0.1	52.3
47	Cyprus	91.8	73.0	11.4	61.6
48	Czech Republic	98.9	71.7	0.4	71.3

	Country	National IQ	IHC	Residual IHC	Fitted IHC
49	Denmark	97.2	90.3	21.4	68.9
50	Djibouti	75.0	24.1	-14.6	38.7
51	Dominica	67.0	55.4	27.6	27.8
52	Dominican Republic	82.0	51.7	3.5	48.2
53	Ecuador	88.0	51.7	-4.7	56.4
54	Egypt	82.7	42.0	-7.2	49.2
55	El Salvador	78.0	50.6	7.8	42.8
56	Equatorial Guinea	69.0	37.7	7.2	30.5
57	Eritrea	75.5	31.4	-8.0	39.4
58	Estonia	99.7	72.7	0.4	72.3
59	Ethiopia	68.5	27.3	-2.6	29.9
60	Fiji	85.0	46.5	-5.8	52.3
61	Finland	100.9	89.3	15.3	74.0
62	France	98.1	77.0	6.8	70.2
63	Gabon	69.0	39.6	9.1	30.5
64	Gambia	62.0	25.1	4.1	21.0
65	Georgia	86.7	52.6	-2.0	54.6
66	Germany	98.8	84.4	13.3	71.1
67	Ghana	69.7	38.0	6.5	31.5
68	Greece	93.2	79.0	15.5	63.5
69	Grenada	74.0	57.8	20.4	37.4

	Country	National IQ	IHC	Residual IHC	Fitted IHC
70	Guatemala	79.0	43.4	-0.8	44.2
71	Guinea	66.5	20.3	-6.8	27.1
72	Guinea-Bissau	69.0	21.8	-8.7	30.5
73	Guyana	81.0	46.1	-0.8	46.9
74	Haiti	67.0	33.7	5.9	27.8
75	Honduras	81.0	39.4	-7.5	46.9
76	Hong Kong	105.7	81.7	1.2	80.5
77	Hungary	98.1	69.6	-0.6	70.2
78	Iceland	98.6	82.0	11.2	70.8
79	India	82.2	41.4	-7.1	48.5
80	Indonesia	85.8	49.8	-3.6	53.4
81	Iran	85.6	45.3	-7.8	53.1
82	Iraq	87.0	38.0	-17.1	55.1
83	Ireland	94.9	80.8	15.0	65.8
84	Israel	94.6	75.6	10.2	65.4
85	Italy	96.1	76.6	9.2	67.4
86	Jamaica	71.0	36.1	2.8	33.3
87	Japan	104.2	81.3	2.8	78.5
88	Jordan	86.7	50.6	-4.0	54.6
89	Kazakhstan	85.0	49.1	-3.2	52.3
90	Kenya	74.5	33.0	-5.0	38.0
91	Kiribati	85.0	32.7	-19.6	52.3

	Country	National IQ	IHC	Residual IHC	Fitted IHC
92	Korea, North	104.6	49.0	-30.0	79.0
93	Korea, South	104.6	71.3	-7.7	79.0
94	Kuwait	85.6	60.8	7.7	53.1
95	Kyrgyzstan	74.8	46.1	7.7	38.4
96	Laos	89.0	33.8	-24.0	57.8
97	Latvia	95.9	67.7	0.5	67.2
98	Lebanon	84.6	57.3	5.5	51.8
99	Lesotho	66.5	35.3	8.2	27.1
100	Liberia	68.0	30.0	0.8	29.2
101	Libya	85.0	53.1	0.8	52.3
102	Liechtenstein	100.3	72.7	-0.5	73.2
103	Lithuania	94.3	70.1	5.1	65.0
104	Luxembourg	95.0	82.8	16.9	65.9
105	Macao	99.9	80.2	7.6	72.6
106	Macedonia	90.5	57.1	-2.7	59.8
107	Madagascar	82.0	33.3	-14.9	48.2
108	Malawi	60.1	34.4	16.0	18.4
109	Malaysia	91.7	57.3	-4.2	61.5
110	Maldives	81.0	45.0	-1.9	46.9
111	Mali	69.5	19.3	-11.9	31.2
112	Malta	95.3	67.8	1.4	66.4
113	Mariana Islands	81.0	-	-	-

	Country	National IQ	IHC	Residual IHC	Fitted IHC
114	Marshall Islands	84.0	49.2	-1.8	51.0
115	Mauritania	74.0	26.6	-10.8	37.4
116	Mauritius	88.0	56.3	-0.1	56.4
117	Mexico	87.8	56.7	0.6	56.1
118	Micronesia	84.0	53.7	2.7	51.0
119	Moldova	92.0	53.6	-8.3	61.9
120	Mongolia	100.0	50.3	-22.5	72.8
121	Montenegro	85.9	63.0	9.4	53.6
122	Morocco	82.4	37.4	-11.4	48.8
123	Mozambique	69.5	24.0	-7.2	31.2
124	Myanmar (Burma)	85.0	33.1	-19.2	52.3
125	Namibia	70.4	44.7	12.2	32.5
126	Nepal	78.0	38.3	-4.5	42.8
127	Netherlands	100.4	87.0	13.7	73.3
128	Netherlands Antilles	87.0	-	-	-
129	New Caledonia	85.0	-	-	-
130	New Zealand	98.9	81.8	10.5	71.3
131	Nicaragua	84.0	47.4	-3.6	51.0
132	Niger	70.0	22.8	-9.1	31.9
133	Nigeria	71.2	26.3	-7.2	33.5
134	Norway	97.2	88.3	19.4	68.9

	Country	National IQ	IHC	Residual IHC	Fitted IHC
135	Oman	84.5	55.8	4.2	51.6
136	Pakistan	84.0	31.7	-19.3	51.0
137	Palestine	84.5	-	-	-
138	Panama	80.0	59.7	14.2	45.5
139	Papua New Guinea	83.4	37.3	-12.9	50.2
140	Paraguay	84.0	48.0	-3.0	51.0
141	Peru	84.2	54.6	3.4	51.2
142	Philippines	86.1	41.0	-12.8	53.8
143	Poland	96.1	67.6	0.2	67.4
144	Portugal	94.4	71.0	5.9	65.1
145	Puerto Rico	83.5	64.7	14.4	50.3
146	Qatar	80.1	63.3	17.6	45.7
147	Romania	91.0	62.0	1.5	60.5
148	Russia	96.6	61.0	-7.1	68.1
149	Rwanda	76.0	30.3	-9.8	40.1
150	St Helena	86.0	-	-	-
151	St Kitts & Nevis	74.0	59.8	22.4	37.4
152	St Lucia	62.0	57.0	36.0	21.0
153	St Vincent & Grenadines	71.0	55.7	22.4	33.3
154	Samoa (Western)	88.0	48.0	-8.4	56.4
155	Sao Tome & Principe	67.0	41.1	13.3	27.8

	Country	National IQ	IHC	Residual IHC	Fitted IHC
156	Saudi Arabia	79.6	54.0	9.0	45.0
157	Senegal	70.5	31.1	-1.5	32.6
158	Serbia	90.3	60.6	1.1	59.5
159	Seychelles	84.4	60.4	8.9	51.5
160	Sierra Leone	64.0	20.4	-3.3	23.7
161	Singapore	107.1	77.3	-5.1	82.4
162	Slovakia	98.0	65.1	-4.9	70.0
163	Slovenia	97.6	78.4	8.9	69.5
164	Solomon Islands	83.0	44.8	-4.8	49.6
165	Somalia	72.0	15.4	-19.2	34.6
166	South Africa	71.6	44.0	9.9	34.1
167	Spain	96.6	78.7	10.6	68.1
168	Sri Lanka	79.0	51.4	7.2	44.2
169	Sudan	77.5	27.8	-14.3	42.1
170	Suriname	89.0	50.8	-7.0	57.8
171	Swaziland	75.4	34.0	-5.3	39.3
172	Sweden	98.6	88.3	17.5	70.8
173	Switzerland	100.2	85.6	12.6	73.0
174	Syria	82.0	45.7	-2.5	4.2
175	Taiwan	104.6	73.3	-5.7	79.0
176	Tajikistan	80.0	41.6	-3.9	45.5
177	Tanzania	73.0	28.8	-7.2	36.0

	Country	National IQ	IHC	Residual IHC	Fitted IHC
178	Thailand	89.9	55.4	-3.6	59.0
179	Tibet	92.0	-	-	-
180	Timor-Leste	85.0	34.7	-17.6	52.3
181	Togo	70.0	34.4	2.5	31.9
182	Tonga	86.0	44.1	-9.6	53.7
183	Trinidad & Tobago	86.4	58.7	4.5	54.2
184	Tunisia	85.4	48.7	-4.2	52.9
185	Turkey	89.4	56.3	-2.0	58.3
186	Turkmenistan	80.0	46.7	1.2	45.5
187	Uganda	71.7	30.1	-4.1	34.2
188	Ukraine	94.3	62.3	-2.7	65.0
189	United Arab Emirates	87.1	63.6	8.4	55.2
190	United Kingdom	99.1	80.1	8.6	71.5
191	United States	97.5	84.8	15.5	69.3
192	Uruguay	90.6	70.0	10.0	60.0
193	Uzbekistan	80.0	31.6	-13.9	45.5
194	Vanuatu	84.0	45.3	-5.7	51.0
195	Venezuela	83.5	59.6	9.3	50.3
196	Vietnam	94.0	44.6	-20.0	64.6
197	Yemen	80.5	32.8	-13.4	46.2
198	Zambia	74.0	28.1	-9.3	37.4

	Country	National IQ	IHC	Residual IHC	Fitted IHC
199	Zimbabwe	72.1	31.8	-3.0	34.8

Residuals given in Table 12.5 show how well the average relationship between national IQ and IHC applies to single countries. Small residuals indicate that the actual level of IHC does not differ much from the level predicted on the basis of the regression equation. We do not need to pay particular attention to the countries with small residuals because their deviations from the regression line may be due to measurement errors and various accidental and local factors, whereas it is justifiable to examine in greater detail the countries for which residuals are large. These countries are exceptions to the hypothesis, and it would be useful to find out what factors might explain their deviations and whether there are some systematic differences between large positive and negative outliers. Let us use a residual ±12.0 (one standard deviation is 11.1) to separate the most extremely deviating countries from the countries closer to the regression line. Large residuals imply a significant impact of other factors on the level of IHC. Consequently, the examination of countries with large positive and negative residuals may provide hints about the nature of other causal factors.

Countries with large positive residuals

Positive residuals are large (+12.0 or higher) for 26 countries: Antigua & Barbuda, Australia, Barbados, Belgium, Denmark, Dominica, Finland, Germany, Greece, Grenada, Ireland, Luxembourg, Malawi, Namibia, the Netherlands, Norway, Panama, Puerto Rico, Qatar, St Kitts & Nevis, St Lucia, St Vincent & the Grenadines, Sao Tome & Principe, Sweden, Switzerland and the United States. Do these countries have some common characteristics which might explain their large positive residuals? It is easy to note that they do not constitute a random sample of the 191 countries. This group of 26 large positive outliers includes clearly different types of countries.

Half of these countries (13) are European and European offshoot highly developed market economies and democracies. Eleven of them constitute a geographically coherent group of Northern and Western European countries. Because of their high level of national IQ, IHC values are expected to be high for these countries, but they are much higher than expected on the basis of the regression equation. An explanation for their large positive residuals may be that Western Europe with European offshoot countries constitute the core region of scientific and technological inventions and development. These local and historical factors together with a long established market economy and democracy may be enough to explain large positive residuals in these 13 countries. Positive residuals are significant (8.0 or higher) also for Austria, Canada, Iceland, Italy, New Zealand, Slovenia, Spain and the United Kingdom. The question is on the impact of exceptional local factors. Many other market economies and democracies in other parts of the world do not have large positive residuals. Israel should be added to this group of positive outliers because of its population's historical connections with Europe and North America.

Eight small Caribbean tourist countries (Antigua & Barbuda, Barbados, Dominica, Grenada, Puerto Rico, St Kitts & Nevis, St Lucia and St Vincent & the Grenadines) constitute another geographically coherent group of large positive outliers. The level of national IQ is low in these countries, but they have been able to raise the level of IHC much higher than expected on the basis of the regression equation. Their geographical position has favored foreign investments in tourist industries and services. As a consequence, these countries are socioeconomically much more developed and wealthier than sub-Saharan African countries at about the same level of national IQ. Thus the explanation for their outlying position seems to be the exceptional success of tourist industries in these countries, which has been supported by extensive foreign investments, technologies and management as emphasized in connection with several other variables in previous chapters. The question again is of an exceptional local factor or a combination of a favorable geographical position and foreign investments in tourism. In the case of Puerto Rico, its connection with the United States has supported socioeconomic development.

Qatar is an oil exporting country, which has benefitted from its natural resources and from extensive foreign investments in its oil industries. Residuals are clearly positive also for several other oil exporting countries (Bahrain, Gabon, Kuwait, Oman, Saudi Arabia and the United Arab Emirates). It is common for them that because of their oil and gas reserves, foreign companies of high IQ countries have supported the establishment of oil and gas industries, which has raised per capita income and furthered socioeconomic development in these countries. It is important to note that the much higher than expected level of IHC in these countries, as well as in the Caribbean tourist countries, is principally due to investments and technologies from countries of higher national IQs.

The four other positive outliers (Malawi, Namibia, Panama and Sao Tome & Principe) are more problematic cases. Malawi's large positive residual is partly due to the fact that its national IQ (60) is exceptionally low. Namibia's socioeconomic development may have benefitted from the contributions of its significant white minority. In Panama, the Canal is an exceptional local factor that has benefitted socioeconomic development.

The examination of large positive outliers leads to the conclusion that three exceptional local factors - the combination of market economy and democracy in Western Europe and European offshoot countries, tourism in the Caribbean countries, and exploitation of oil reserves in oil- producing countries - seem to explain the much higher than expected level of IHC in nearly all of these countries. It should be noted that these are exceptional local factors and that the two latter factors have been heavily dependent on the investments and technologies provided by high IQ countries. Therefore it is not reasonable to expect any significant decline of IHC values in these countries.

Countries with large negative residuals

Negative residuals are large (-12.0 or higher) for 21 countries: Afghanistan, Bangladesh, Cambodia, China, Djibouti, Iraq, Kiribati, North Korea, Laos, Madagascar, Mongolia, Myanmar, Pakistan, Papua New Guinea, the Philippines, Somalia, Sudan, Timor-Leste, Uzbekistan, Vietnam and Yemen. The nature of large negative outliers differs markedly from the nature of large positive outliers. The group does not include any economically highly developed Western European country, nor any Caribbean tourist country or Latin American country, and of oil-producing countries it includes only Iraq. It is possible to separate three different groups of large negative outliers. Six of these countries are contemporary socialist countries (China, North Korea, Laos and Vietnam) or former socialist countries (Mongolia and Uzbekistan). It is obvious that the Communist heritage, the combination of command economy and autocracy, has hampered socioeconomic development and kept the level of IHC much lower than expected on the basis of their national IQs (see Figure 12.1). The same observation has already been made in several previous chapters. It should be noted that the question concerns an exceptional local and historical factor. However, the impact of the Communist heritage will certainly weaken in the future as a consequence of market economy reforms and democratization, which means that we can expect a decline of negative residuals in at least some of these countries. Human potential for socioeconomic development is enormous especially in China and North Korea. In fact, residuals are already positive or only slightly negative for most former socialist countries.

It is characteristic for 11 other large negative outliers that they have suffered from serious ethnic conflicts and/or civil wars. Eight of them are Asian and Oceanian countries (Afghanistan, Cambodia, Iraq, Myanmar, Pakistan, the Philippines, Timor-Leste and Yemen) and three others are sub-Saharan African countries (Djibouti, Somalia and Sudan). This is also a local factor limited to particular countries and a factor which does not need to remain permanent. We can expect negative residuals to decline in countries which are able to establish ethnic peace because it would make possible a normal socioeconomic development.

Bangladesh, Kiribati, Madagascar, and Papua New Guinea are separate cases without any common characteristics. Bangladesh is an extremely poor and overcrowded South Asian country. Kiribati and Papua New Guinea are geographically isolated Oceanian countries. Madagascar's large negative residual is due to the fact that national IQ is for Madagascar (82) much higher than for other sub-Saharan African countries.

It has been possible to separate two exceptional local factors - the Communist heritage and serious ethnic conflict and/or civil war - which seem to have hampered socioeconomic development and reduced the level of IHC in most of these countries. They are quite different from the factors which have supported socioeconomic development and which are related to large positive residuals.

Moderate outliers

The rest of the 191 countries (144) deviate less than ±12.0 IHC index points from the regression line. Small deviations from the regression line may be due to measurement errors or accidental factors, and it is not necessary to seek any additional explanations for them, but it is reasonable to ask whether moderate deviations are related to more or less similar factors as large positive and negative outliers. For this purpose we define as "moderate deviations" countries whose residuals vary from ±8.0 to ±11.9. It is interesting to see whether the characteristics of moderately positive and negative outliers differ from each other as systematically as the characteristics of large positive and negative outliers.

Positive residuals are moderate (from 8.0 to 11.9) for the following 20 countries (see Table 12.5): Austria, the Bahamas, Canada, Cyprus, Gabon, Iceland, Israel, Italy, Lesotho, Montenegro, New Zealand, Saudi Arabia, the Seychelles, Slovenia, South Africa, Spain, the United Arab Emirates, the United Kingdom, Uruguay and Venezuela.

The characteristics of 17 of these 20 countries are similar as for the large positive outliers discussed above. Austria, Canada, Cyprus, Iceland, Italy, New Zealand, Slovenia, Spain and the United Kingdom are European and European offshoot market economies and democracies. Israel and Uruguay are similar countries. The Bahamas and the Seychelles are tourist countries, and Gabon, Saudi Arabia, the United Arab Emirates and Venezuela are oil exporting countries. The other three countries (Lesotho, Montenegro and South Africa) do not have any common characteristics which could explain their moderate positive residuals.

Negative residuals are moderate (from -8.0 to -11.9) for the following 18 countries: Angola, Armenia, Bolivia, Burkina Faso, Burundi, Chad, the Comoros, Eritrea, Guinea-Bissau, Mali, Mauritania, Moldova, Morocco, Niger, Rwanda, Samoa, Tonga, and Zambia.

Most of these countries have similar characteristics as the large negative outliers discussed above. Armenia and Moldova are former socialist countries. Angola, Burundi, Chad, Comoros, Eritrea, Mali, Mauritania and Rwanda have suffered from serious ethnic conflicts and/or civil wars. Samoa and Tonga are isolated Pacific island states. It may be significant that 13 of these 18 moderate negative outliers are sub-Saharan African countries.

5. Regression of Newsweek-10 on National IQ

The results of correlation analyses show that the three alternative indexes of human development - HDI-10, Legatum-10, and Newsweek-10) - are extremely strongly correlated with our Index of Human Conditions (IHC) and that they, except Legatum-10, are approximately as strongly related to national IQ as our IHC (see Tables 12.3 and 12.4). Therefore it would be interesting to compare the results also at the level of single countries. To what extent are the same countries large positive or negative outliers on the basis of HDI-10, Legatum-10, and Newsweek-10 as on the basis of IHC? This comparison is limited to Newsweek's ranking of countries, but because of the strong intercorrelations between the alternative indexes, the results would probably be closely similar on the basis of HDI-10 and Legatum-10. Figure 12.2 summarizes the results of the regression analysis of Newsweek-10 on national IQ.

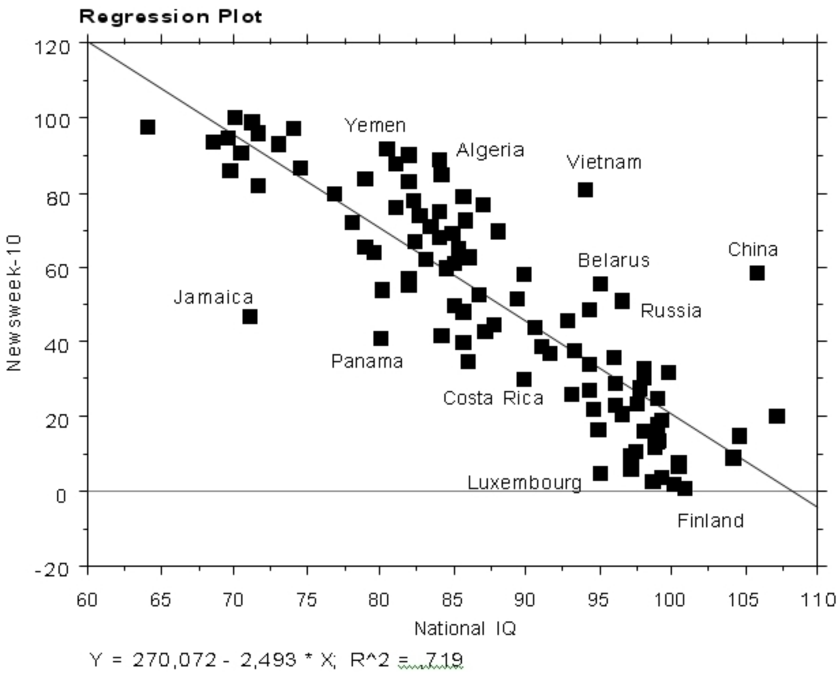

Figure 12.2. The results of regression analysis of Newsweek-10 on national IQ in the group of 100 countries

Figure 12.2 illustrates the strong and negative relationship between national IQ and the Newsweek's ranking of countries. Most countries are close to the linear regression line. Because of the negative relationship, positive residuals indicate that the rank of countries is lower than expected on the basis of regression equation, and negative residuals indicate that the rank of countries is higher than expected. Consequently, countries with large negative residuals should be compared with countries with large positive residuals in Figure 12.1 and countries with large positive residuals should be compared with large negative outliers in Figure 12.1. Let us use one standard deviation (±15) to separate large outliers from the countries closer to the regression line.

The group of large negative outliers (residual -15 or higher) includes the following 16 countries: Australia, Chile, Costa Rica, Denmark, Finland, Ireland, Jamaica, Kuwait, Luxembourg, Norway, Panama, Peru, Qatar, Sweden, Switzerland and the United States. Eleven of these countries are the same as large positive outliers on the basis of IHC (Australia, Denmark, Finland, Ireland, Luxembourg, Norway, Panama, Qatar, Sweden, Switzerland and the United States), which indicates that the two regression analyses have produced closely but not completely similar results. Despite the extremely strong correlation between IHC and Newsweek-10 (-.959) in this group of 100 countries, the results deviate more or less from each other in several cases. Chile, Costa Rica, Jamaica, Kuwait, and Peru are large outliers on the basis of Newsweek-10 but not on the basis of IHC.

The group of large positive outliers (residual +15 or higher) includes the following 15 countries: Algeria, Bangladesh, Belarus, Bolivia, China, Ecuador, Indonesia, Iran, Madagascar, Pakistan, Russia, Singapore, Syria, Vietnam, and Yemen. Only six of these countries are the same as large negative outliers on the basis of IHC (Bangladesh, China, Madagascar, Pakistan, Vietnam and Yemen). For the other nine countries residuals on the basis of IHC are negative but smaller than -15.

It is remarkable that the results of the two regression analyses are not clearly opposite for any country, although there are significant differences in the size of residuals in single cases. IHC and Newsweek's ranking of countries are based on different indicators of human conditions and wellbeing, but the two indexes have produced closely similar rankings of countries, and both indexes are strongly correlated with national IQ.

6. Discussion

Our purpose in this chapter has been to summarize our arguments about the causal impact of national IQ on human conditions and on the level of national wellbeing by constructing a composite Index of Human Conditions (IHC) and by testing the hypothesis by empirical evidence. IHC is intended to constitute an overall measure of the quality of human conditions and wellbeing. It is based on seven indicators measuring human conditions from the perspectives of per capita income, democracy, education, and health conditions. The seven basic indicators (PPP-GNI-08, ID-08, CPI-09, Literacy-08, Tertiary-09, Life-08 and IMR-08) cover some crucial aspects of human wellbeing and life conditions and they are moderately or strongly intercorrelated. Statistical data on these seven components of IHC are available for nearly all countries of the world. Of course, there are other variables measuring human wellbeing from different perspectives, but a problem with several of them is that statistical data are missing for many countries. Nevertheless, we think that the seven selected components of IHC take into account the most crucial aspects of measureable human conditions. The composite index IHC is probably a better overall measure of human conditions than any single variable.

Our IHC is not the only possible composite index of human development, prosperity, and human conditions. There are at least three other indexes intended to measure human development (UNDP's Human Development Index), prosperity (the Legatum Prosperity Index), and the best countries in the world (Newsweek's ranking of 100 countries). We wanted to compare the results of these other indexes with the results of our IHC in order to see to what extent the classifications of countries on different indexes differ from each other and how strongly they are correlated with national IQ.

The fact that national IQ explains 65 percent of the variation in IHC in the total group of 191 countries and 73 percent in the group of 153 countries with population of more than one million inhabitants supports strongly our central hypothesis. Consequently, enormous disparities in human conditions measured by IHC can be traced principally to differences in national IQs, but the unexplained part of variation indicates that national IQ is not the only causal factor. The investigation of the most outlying countries disclosed that some exceptional local factors are connected with large deviations in many cases. Large deviations do not seem to be accidental or inexplicable. It was noted that large positive residuals are related to three different exceptional local factors. The much higher than expected level of IHC in Western European and European offshoot countries is related to the successful combination of market economy and democracy. Foreign investments in tourist industries seem to explain the much higher than expected level of IHC in the Caribbean tourist countries. Foreign investments in oil and gas industries explain the higher than expected IHC in several oil-producing countries. On the other hand, the legacy of socialist economic and political systems seems to explain large negative residuals for several contemporary or former socialist countries, and serious ethnic or other civil wars characterize many other countries with large negative residuals. These exceptional local factors are principally independent from national IQ.

The observation that the three different and alternative indexes of human conditions (HDI-10, Legatum-10, and Newsweek-10) are strongly correlated with our IHC (see Table 12.3) indicates that different ways to measure human conditions tend to produce closely similar rankings of countries. It reflects the fact that different indicators of human conditions are moderately or strongly intercorrelated. Researchers have not yet invented measures of human conditions which would clearly contradict each other. The three alternative indexes of human conditions are approximately as strongly correlated with national IQ as our IHC.

One significant finding of this analysis is that most of the large positive and negative deviations seem to be due to some exceptional local and historical factors, which are relevant only for some particular countries or groups of countries. Until now it has not been possible to find any universal and measureable factor which could explain a significant part of the variation in IHC independently from national IQ. This leads to the conclusion that we should expect the continuation of large global disparities in human conditions because their causal roots lie to a significant extent in evolved human diversity measured by national IQ and in exceptional local and historical factors which it is not easy to change.

Chapter 13

The Evolutionary Psychology of National IQ Differences

1. Evolution of Race Differences in Intelligence. 2. Geography, Climate and National Differences in Intelligence. 3. Other Hypothesized Causal Variables of National IQ. 4. Conclusions.

In this chapter we consider the problem of how to explain the national differences in intelligence. For this we have to turn to evolutionary psychology.

1. Evolution of Race Differences in Intelligence

In our previous work we have proposed the theory that population differences in IQ evolved in response to the cognitive demands in cold winters (Lynn, 2006). To summarize this theory, the human species (*Homo sapiens*) evolved around 150,000 years ago in equatorial East Africa (Relethford, 1988). Around 100,000 years ago groups of *Homo sapiens* began to migrate from equatorial Africa and settled in North Africa and in southwest Asia. By 60-40,000 years ago they were established throughout Asia, the Indonesian archipelago and Australia. By about 35,000 years ago they had settled in Europe, and subsequently they colonized the Americas and the Pacific islands (Foley, 1987; Mellars and Stringer, 1999; Cavalli-Sforza, 2000).

When these peoples settled in the temperate and colder latitudes of North Africa, Asia and Europe, they encountered the problem of survival during the winter and spring. This was a problem because the first humans that evolved in equatorial East Africa subsisted largely on plant foods, of which numerous species were available throughout the year (Lee, 1968; Tooby and de Vore, 1989). In temperate and cold environments plant foods are not available for a number of months in the winter and spring. Thus, "plant foods are often available only during short seasons" (Gamble, 1993, p. 117) and compared to warmer environments there would have been fewer edible plant species, and a concomitant requirement for increased reliance on animals... and the obvious problem of keeping warm, including the likely necessity of controlling and even making fire. In effect, these northern temperate environments "pushed the envelope" of Homo's adaptation (Wynn, 2002, p. 400).

These peoples that migrated into North Africa, Asia, Europe and the Americas needed to hunt large animals for food, and to make clothes, shelters and fires to keep warm. These problems would have exerted selection pressure for enhanced intelligence. The colder the winters, the stronger this selection pressure would have been and the higher the intelligence that evolved. These peoples evolved larger brain size to accommodate greater intelligence. A review of the association between brain size and intelligence in humans has shown that they are correlated at 0.40 (Vernon, Wickett, Bazana and Stelmack, 2000). There is therefore an association across the races for the severity of the winter temperatures to which they were exposed, brain size and IQs. This is shown in Table 13.1. Column 2 gives present-day coldest winter monthly temperatures given in the *Encyclopaedia Britannica* and by Templer and Arikawa (2006) and are averages of the regions inhabited by the races. Column 3 gives the coldest winter monthly temperatures during the main Würm glaciation, which lasted between approximately 28,000 and 10,000 years ago and during which winter temperatures fell by about 5 degrees centigrade in the northern hemisphere but not in the southern hemisphere (Foley, 1987; Roberts, 1989). Column 4 gives average brain sizes calculated from data for approximately 20,000 crania given in Smith and Beals (1990), and column 5 gives average IQs. It is apparent that there is a general correspondence between the coldest winter monthly temperatures, brain sizes and IQs. The Northeast Asians were exposed to the lowest winter temperatures, have the largest brain sizes and the highest IQs, followed by the Europeans, Native Americans, and North Africans and South Asians. In the next four races this linear trend becomes irregular. The Southeast Asians and the Pacific Islanders in tropical and sub-tropical regions have larger brain sizes and higher IQs than the South Asians and North Africans, and the sub-Saharan Africans. The explanation for this anomaly is that the Southeast Asians and the Pacific Islanders are to some degree interbred with the Northeast Asians (Cavalli-Sforza, Menozzi and Piazza, 1996) and this has raised their IQs and brain size. Another anomaly is that the sub-Saharan Africans inhabit cooler regions than the Southeast Asians but have smaller brain sizes and lower IQs. The explanation for this anomaly is that the sub-Saharan Africans evolved in the tropical region of equatorial east Africa and it has only been in the last few centuries that they have spread south into the more temperate regions of southern Africa. A further anomaly is that the Australian Aborigines inhabit a relatively warm region but have small brain sizes and low IQs. The explanation for this anomaly is that these were a small isolated population numbering only around 300,000 at the time of European colonization, so the mutant alleles for higher IQs did not appear in them. Finally, the pygmies of the tropical rain forest of equatorial west Africa inhabit a hot region, and have the smallest brain sizes and lowest IQs. The brain size of the pygmies is given by Beals, Smith and Dodd (1984) and the IQ of the pygmies is given in Lynn (2011).

Table 13.1. Race differences in winter temperatures (degrees centigrade), brain size and IQ

Race	Winter temp.	Würm temp.	Brain size	IQ
Northeast Asians	-6	-11	1,416	105
Europeans	0	-5	1,369	99
Native Americans	7	5	1,366	86
South Asians & North Africans	12	7	1,293	84
Sub-Saharan Africans	17	17	l,280	67
Australians	17	17	1,225	62
Southeast Asians	20	20	1,332	87
Pacific Islanders	23	23	1,317	85
Pygmies	21	21	1,080	53

These results showing larger brain sizes in populations that evolved in colder environments have been confirmed by Ash and Gallup (2007) in an analysis of a sample of 109 fossilized hominid skulls. They found that approximately 22% of the variance in cranial capacity (brain size) could be accounted for by variation in equatorial distance such that cranial capacity was larger with greater distance from the equator. They also found that cranial capacities were highly correlated with paleo-climatic changes in temperature, as indexed by oxygen isotope data and sea-surface temperature, and that 52% of the variance in the cranial capacity could be accounted by the temperature variation at 100 ka intervals. Further support for these results has been reported by Bailey and Geary (2009). They examined 175 skulls dated between 1.9 million years ago and 10,000 years ago and reported a correlation of -0.41 between their size (cubic capacity) and the temperature of their locations, showing greater brain size in lower temperature environments, and a correlation of -0.61 between their size (cubic capacity) and latitude, showing larger brain size in latitudes more distant from the equator. This study shows that larger brain size (conferring greater intelligence) evolved before 10,000 years ago in the peoples inhabiting colder environments.

A more recent study providing additional confirmation for these results has been published by Pearce and Dunbar (2011). They measured the brain size of 55 skulls from twelve populations from around the world and found that brain size was correlated with distance from the equator at 0.82.

Brain size is the determinant of intelligence at a magnitude of approximately 0.40. The research on this issue has been reviewed by Vernon, Wickett, Bazana and Stelmack (2000), who report 54 studies that used an external measure of head size. All of these reported a positive relationship and the overall correlation was 0.18. They also report 11 studies of normal populations that measured brain size by CT (computerized axial tomography) and MRI (magnetic resonance imaging), which give a more accurate measure of brain size, and for which there was a correlation of 0.40. Vernon et al. conclude that the most reasonable interpretation of the correlation is that brain size is a determinant of intelligence. Larger brains have more neurons and this gives them greater processing capacity. A further study published subsequent to this review found a correlation for 40 subjects between brain size measured by MRI and intelligence of 0.44 (Thompson, Cannon, Narr, et al., 2001). It has been shown that the association between brain volume and intelligence is of genetic origin (Posthuma, De Ceus, Baaré, et al., 2002).

It has now become widely accepted that this evidence for race differences in intelligence and brain size indicates that these race differences have a genetic basis. As Hunt (2011, p. 434) has recently written "the 100% environmental hypothesis cannot be maintained".

2. Geography, Climate and National Differences in Intelligence

We can predict from these studies that there should be positive associations between national IQs and latitude and with the coldness of winter temperatures. A number of studies confirming this are summarized in Table 13.2. Row 1 shows a negative correlation of -0.61 between national IQ and low winter temperature. The negative correlation shows that national IQs are higher in countries with lower winter temperature. Row 2 shows a negative correlation of -0.40 between national IQ and low summer temperature. The explanation for this is that countries that have low winter temperatures also tend to have low summer temperatures. But the higher correlation of national IQ with low winter temperatures suggests that this is the crucial factor.

Table 13.2. Climatic correlates of national IQ

	Variable	**N countries**	**r x IQ**	**Reference**
1	Temperature : winter low	129	-.61	Templer & Arikawa, 2006

	Variable	N countries	r x IQ	Reference
2	Temperature : summer low	129	-.40	Templer & Arikawa, 2006
3	Temperature : mean annual	192	-.63	Kanazawa, 2008
4	Temperature : mean annual	172	-.66	Vanhanen, 2009
5	Latitude	90	.72	Templer, 2008
6	Latitude	192	.68	Kanazawa, 2008
7	Latitude	192	.68	Dama, 2011
8	Skin color	129	.92	Templer & Arikawa, 2006
9	Skin color	129	.91	Templer, 2008
10	Skin color	90	.84	Templer, 2008
11	Skin color	113	.92	Rushton & Templer, 2009
12	Skin reflectance	58	.89	Meisemberg, 2004
13	Skin reflectance	57	.69	Lynn at al., 2007
14	Skin reflectance	90	.87	Templer, 2008

Row 3 shows a negative correlation of -0.63 between national IQ and mean annual temperature based on a much larger number of 192 countries comprising virtually all the countries in the world. Row 4 provides a further confirmation of this negative correlation (-0.66) between national IQ and mean temperature based on a sample of 172 countries.

Positive correlations of 0.72, 0.68 and 0.68 between national IQ and latitude are shown in rows5, 6 and 7. The positive correlations show that national IQs are higher in countries with higher latitudes measured as distance from the equator. These are the European, North American and Northeast Asian countries in the northern hemisphere and the countries inhabited mainly by Europeans in the southern hemisphere (i.e. Australia, New Zealand, Argentina, Chile and Uruguay).

These studies have been extended to an examination of the relation between national IQ and skin color and skin reflectance. Rows 8 through 11 show positive correlations ranging between 0.84 and 0.92 between national IQ and skin color, showing that lighter skinned populations have higher IQs. The explanation of this is that lighter skin evolved in colder climates to facilitate the absorption of vitamin D from sunlight.

Rows 12 through 14 show positive correlations ranging between 0.69 and 0.89 between skin reflectance and national IQ. Skin reflectance is the amount of light reflected off the skin so the lighter the skin the greater the reflectance. Hence the European and Northeast Asian peoples who have the lightest skins have the greatest skin reflectance and this gives rise to the positive association across countries of skin reflectance with national IQ.

3. Other Hypothesized Causal Variables of National IQ

Studies of other hypothesized causal correlates of national IQ are summarized in Table 13.3. Row 1 shows a positive correlation of 0.23 between national IQ and longitude reported by Kanazawa (2008). His theory is that higher intelligence evolved in environments that were novel and these were more distant from the evolutionary environment in sub-Saharan Africa in which humans evolved. In further support of this theory, he reports (row

2) a higher correlation of 0.45 between national IQ and a more accurate measure of distance from the evolutionary environment.

Row 3 shows a negative correlation of -0.76 between national IQ and consanguinity measured by the inbreeding coefficient defined as the probability that an individual has received both alleles of a pair from an identical ancestor. High inbreeding coefficients are present in countries where marriages between cousins are common, and the negative correlation across countries shows that national IQ are lower in these countries.

Row 4 shows a confirmation of the negative correlation between national IQ and consanguinity (inbreeding depression) on a larger sample of countries (n=72, r = -0.62) and assessed by the percentage of consanguineous marriages. The author notes that this is predictable from the known effect of inbreeding depression on reducing IQ at the individual level. However, he notes also that the effect of inbreeding depression in reducing IQ at the individual level is quite small and was estimated by Jensen (1983) at approximately 3 IQ points. Hence, he concludes that the direct causal effect of the percentage of consanguineous marriages in reducing national IQ must also be quite small.

Row 5 shows a high negative correlation of -0.89 between national IQ and the intensity and prevalence of infectious diseases. The authors propose that the widespread presence of infectious diseases impairs the intelligence of populations in low IQ countries. We accept that this is likely the case, but we suggest that the relationship between national IQs and the intensity of infectious diseases is a likely two way causal relationship. The intensity of infectious diseases is a determinant of low IQs, as the authors argue, but low national IQs are also a cause of widespread infectious diseases. Europeans have used their high IQs to overcome the problem of infectious diseases. In the 18th century, the British physician Edward Jenner discovered in 1796 that immunization, consisting of vaccination with cow pox, gave protection against small pox, and this has eliminated small pox. In the 19th century, Europeans figured out that cholera was spread by contaminated drinking water. This was discovered in London in 1854 by John Snow. Europeans solved the problem of cholera by providing clean drinking water. Subsequently, many other infectious diseases such as measles have been greatly reduced by immunization. In recent decades, HIV has been a serious infectious disease, and it has a high infection rate in low IQ countries, especially in southern Africa, where it is present in around 20% to 30% of the population. This may be partly attributable to the low IQ of the population who do not understand the way the infection is contracted, and have erroneous beliefs about how to prevent infection. More generally, people with high IQ are better able to avoid infectious diseases through hygienic measures, a prudent lifestyle (for example avoiding HIV infection), and the establishment of effective health care systems. Thus, we suggest that the causal sequence is not only from infectious diseases to national IQ, but also from low national IQ to a high prevalence of infectious diseases.

Table 13.3. Other hypothesized causal correlates of national IQ

Variable	**N countries**	**r x IQ**	**Reference**
Longitude	192	.23	Kanazawa, 2008
Distance evolutionary environment	192	.45	Kanazawa, 2008
Consanguinity	35	-.76	Saadat, 2008
Inbreeding depression	72	-.62	Woodley, 2009
Infectious diseases	184	.89	Eppig et al., 2010

4. Conclusions

In previous chapters we have presented intelligence as a determinant of individual and national differences in numerous economic and social phenomena, while in this concluding chapter we have considered the causes of national differences in intelligence. We therefore propose a three stage causal model in which geographic and climatic factors have been responsible for differences in national IQs, and differences in national IQs are responsible for significant proportions of the variance in national differences in educational, economic and a large number of other social phenomena. We consider the geographic and climatic correlates of national IQs consisting of latitude and low winter temperatures as causal to national IQs because we regard national IQs as having evolved over millions of years as adaptations to the cognitive demands of different geographic and climatic environments. These geographic and climatic conditions have been responsible for the national IQs that are present today, and these national IQs contribute to the explanation of national differences in numerous social phenomena. We therefore present our study as an integration of evolutionary psychology with individual and national differences in intelligence, and with a wide range of economic and social phenomena. We believe our results establish intelligence as a fundamental unifying and explanatory construct for the social sciences.

Appendix 1

National IQs

National IQs are presented in the Table below. These IQs have been obtained from the administration of tests of intelligence and the IQs have been calculated in relation to a British mean of 100 and standard deviation of 15. All IQs have been adjusted for Flynn effects, i.e. secular increases in IQ. Flynn effect adjustments up to the year 1980 are 3 IQ points per decade (Flynn, 1987) for all tests except the Progressive Matrices, for which they are 2 IQ points per decade reported for Britain by Lynn and Hampson (1986). The same adjustments are made for children from 1980 onwards, but for those aged 14 years and above no adjustments have been made because for these IQ ceased to increase in Britain (Lynn, 2009).

Where data for more than one study in a country have been reported, the mean of the two studies is given, while where there are three or more studies, median IQs are given in the last row for each nation as the best estimates of the national IQs derived from intelligence tests. IQs of multi-racial societies are calculated by weighting the IQs of the races by their proportion in the population given in Philips (1996). Descriptions of many of the studies and how the IQs are calculated are given in Lynn (2006). This source gives an IQ of 91 for Arctic peoples and is adopted as the IQ for Greenland.

Country	Age	N	Test	IQ	Reference
Argentina	9-15	1,680	SPM	93	Rimoldi, 1948
Argentina	5-11	420	CPM	98	Raven et al., 1998
Argentina	10	4,000	V/M	93	UNESCO, 1998
Argentina	14	1,740	SPM	102	Raven, 2008
Argentina	13-30	1,695	SPM	96	Flynn & Rossi-Casé, 2011
Argentina: median	-	-	-	96	
Armenia	5-10	311	DAM	92	Dennis, 1957
Australia	9-13	35,000	Otis	97	McIntyre, 1938
Australia	18	6,700	SPM	100	Craig, 1974
Australia	5-0	700	CPM	98	Raven et al., 1995
Australia	8-17	4,000	SPM	100	Raven et al., 2000
Australia	6-11	618	CPM	93	Cotton et al., 2005
Australia: median	-	-	-	98	
Austria	14	67	SPM	98	Moyles & Wolins, 1973
Austria	Adults	187	CF	101	Buj, 1981
Austria: mean	-	-	-	99.5	
Bahrain	19-29	100	PMA	81	Khaleefa & Al Gharaibeh, 2002
Bangladesh	67	672	MMSE	81	Lynn, 2007a
Barbados	9-15	207	WISC-R	80	Galler et al., 1986

Appendix 1

Country	Age	N	Test	IQ	Reference
Belgium	7-13	944	CPM	99	Goosens, 1952a
Belgium	10-16	920	CF	103	Goosens, 1952b
Belgium	Adults	247	CF	99	Buj, 1981
Belgium: median	-	-	-	99	
Bermuda	7/11	161	WISC-R	88	Sandoval et al., 1983
Bermuda	4	125	SB	92	Scarr & McCartney,
Bermuda: mean	-	-	-	90	
Bolivia	10	4,000	V/M	87	UNESCO, 1998
Bosnia	12-16	605	SPM	94	Djapo & Lynn, 2010
Botswana	17-20	140	SPM	71	Lynn, 2010
Brazil	14	160	SPM	88	Natalicio, 1968
Brazil	7-11	505	CPM	84	Angelini et al., 1988
Brazil	5-11	1,131	CPM	90	Angelini et al., 1988
Brazil	5-11	1,547	CPM	85	Angelini et al., 1988
Brazil	10	4,000	V/M	92	UNESCO, 1998
Brazil	9-10	1,676	SPM	86	Fernandez, 2001
Brazil	7-15	833	SPM	89	Colom & Flores-Mendoza, 2007
Brazil: median	-	-	-	88	
Bulgaria	Adults	215	CF	94	Buj, 1981
Bulgaria	11-17	1,456	CF	91	Lynn et al., 1998
Bulgaria: mean	-	-	-	92.5	

Country	Age	N	Test	IQ	Reference
Cameroon	Adults	80	CPM	64	Berlioz, 1955
Canada	5-17	407	MAT	100	Naglieri & Bardos, 1988
Canada	6-10	629	MAT	100	Tamaoka et al., 1993
Canada	7/12	313	SPM	97	Raven et al., 1996
Canada	6-16	2,200	WISC-3	100	Prifitera et al., 1998
Canada: median	-	-	-	100	
Central African	Adults	1,149	SPM	64	Latouche & Dormeau, 1956
Chile	21	178	3DW	99	Broer, 1996
Chile	10	4,000	V/M	92	UNESCO, 1998
Chile	5/11	2,210	CPM	88	Marincovich et al., 2000
Chile	11/18	2,003	SPM	90	Marincovich et al., 2000
Chile: median	-	-	-	91	
China	6/16	660	WISC-R	107	Dan et al., 1990
China	5/15	5,108	SPM	101	Lynn, 1991
China	14/15	297	Various	103	Li et al., 1996
China	6/12	269	SPM	104	Geary et al., 1997
China	4	60	Arithmetic	109	Ginsburg et al., 1997
China	6/13	463	DAM	103	Cox et al., 1998
China	6/8	160	SPM	107	Cox et al., 1998
China	17	218	SPM	103	Geary et al., 1999
China	19	218	SPM	113	Geary et al., 1999

Country	**Age**	**N**	**Test**	**IQ**	**Reference**
China	6/8	300	BTBC-R	107	Zhou & Boehm, 2001
China: median	-	-	-	105.5	
Colombia	4	120	QR	84	Ginsburg et al., 1997
Colombia	10	4,000	V/M	83	UNESCO, 1998
Colombia: mean	-	-	-	83.5	
Congo - Brazzaville	17-29	320	SPM	64	Ombredane et al., 1957
Congo - Brazzaville	Adults	580	SPM	75	Latouche & Dormeau, 1956
Congo - Brazzaville	Adults	1,596	SPM	74	Latouche & Dormeau, 1956
Congo - Brazzaville	8	73	SPM	73	Nkaya et al., 1994
Congo - Brazzaville	13	88	SPM	73	Nkaya et al., 1994
Congo - Braz: median	-	-	-	73	
Congo - Zaire	6-30	693	CPM	73	Ombredabe et al., 1956
Congo - Zaire	Adults	67	SPM	82	Verhagen, 1956
Congo - Zaire	17-29	320	SPM	69	Ombredane et al., 1957
Congo - Zaire	10-15	222	SPM	68	Laroche, 1959
Congo - Zaire	8	47	KABC	62	Boivin & Giordani, 1993
Congo - Zaire	7-12	95	KAB	68	Boivin et al., 1995

Country	Age	N	Test	IQ	Reference
Congo - Zaire	7-9	130	KAB	65	Giordani et al., 1996
Congo - Zaire	7-9	139	KAB	61	Conant et al., 1999
Congo - Zaire	7-9	183	CPM	74	Kashala et al., 2005
Congo Zaire: median	-	-	-	68	
Cook Islands	4/6	110	PIPS	89	St George, 1974
Costa Rica	5-16	231	PM	86	Rindermann & Pieber, 2011
Croatia	13-16	299	SPM	90	Sorokin, 1954
Croatia	Adults	525	CF	104	Buj, 1981
Croatia	7-14	999	SPM	99	Lugomer & Zarevski, 1985
Croatia: median	-	-	-	99	
Czech Rep.	Adults	363	CF	98	Buj, 1981
Czech Rep.	5-11	832	CPM	96	Raven et al., 1995
Czech Rep.	11	64	SPM	100	Persaud, 1972
Czech Rep.: median	-	-	-	98	
Denmark	5-11	628	SPM	97	Vejleskov, 1968
Denmark	Adults	122	CF	99	Buj, 1981
Denmark: mean	-	-	-	98	
Dominica	3	64	PPVT	67	Wein & Stevenson, 1972
Dominican Republic	10	4,000	V/M	82	UNESCO, 1998

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Country	Age	N	Test	IQ	Reference
Ecuador	6/7	48	DAM	89	Dodge et al., 1969
Ecuador	17	120	WISC-R	88	Fierro-Benitez et al., 1989
Ecuador	5/17	104	MAT	82	Proctor et al., 2000
Ecuador: median	-	-	-	88	
Egypt	6/10	206	DAM	77	Dennis, 1957
Egypt	12/15	111	CCT	81	Sadek, 1972
Egypt	6-12	129	SPM	83	Abdel-Khalek, 1988
Egypt: median	-	-	-	81	
Eritrea	4-7	148	CPM	85	Wolff et al., 1995
Eritrea	11	152	SPM	66	Wolff & Fessada, 1999
Eritrea : mean	-	-	-	76	
Estonia	12/18	2,689	SPM	100	Lynn et al., 2002
Estonia	7/11	1,835	SPM	98	Lynn et al., 2003
Estonia: mean	-	-	-	99	
Ethiopia	5-14	162	CPM	64	About et al., 1991
Ethiopia	15	250	SPM	68	Kaniel & Fisherman, 1991
Ethiopia	15	250	SPM	65	Lynn. 1994b
Ethiopia	14-16	46	SPM	69	Kozulin, 1998
Ethiopia	6-7	29	CPM	86	Tzuriel & Kaufman, 1999
Ethiopia	7-11	108	CPM	70	Ayalew, 2005
Ethiopia: median	-	-	-	69	

Country	Age	N	Test	IQ	Reference
Fiji	8/13	216	QT	85	Chandra, 1975
Finland	7	755	CPM	98	Kyöstiö, 1972
Finland	Adults	120	CF	96	Buj, 1981
Finland: mean	-	-	-	97	
France	6-9	618	CPM	97	Bourdier, 1964
France	6-11	328	CMM	102	Dague et al., 1964
France	Adults	1,320	CF	94	Buj, 1981
France	6-16	1,120	WISC-3	98	Georgas et al., 2003
France	16-89	1,104	WAIS-3-P	101	Roivainen, 2010
France: median	-	-	-	98	
Gambia	17	579	CPM	64	Jukes et al., 2006
Gambia	17	532	CPM	60	Jukes & Grigorenko, 2010
Gambia: mean	-	-	-	62	
Germany	7-11	454	SPM	90	Kurth, 1969
Germany	5-7	563	CPM	99	Winkelman, 1972
Germany	11-15	2,068	SPM	105	Raven, 1981
Germany	11-15	1,000	SPM	99	Raven, 1981
Germany	Adults	1,320	CF	107	Buj, 1981
Germany	7	200	CPM	97	Guthke & Al-Zoubi, 1987
Germany	6-10	3,,607	CPM	101	Raven et al., 1995
Germany	5-10	980	CPM	97	Raven et al., 1995

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Country	Age	N	Test	IQ	Reference
Germany	6-16	990	WISC-3	99	Georgas et al., 2003
Germany	16-89	1,897	WAIS-3-P	101	Roivainen, 2010
Germany: median	-	-	-	99	
Ghana	8-15	2,894	SPM	70	Bulley, 1973
Ghana	18-30	2,164	SPM	77	Bulley, 1973
Ghana	Adults	226	CF	76	Buj, 1981
Ghana	15	1,693	CPM	62	Glewwe & Jacoby, 1992
Ghana	9-18	1,563	CPM	67	Heady, 2003
Ghana: median	-	-	-	70	
Greece	9-14	400	WISC	88	Fatouros, 1972
Greece	6-12	227	DAM	97	Georgas & Georgas, 1972
Greece	Adults	220	CF	95	Buj, 1981
Greece	6-17	731	MAT	89	Petrogiannis et al., 1999
Greece	6-16	990	WISC-3	92	Georgas et al., 1973
Greece: median	-	-	-	92	
Greenland	-	-	-	91	Lynn (2006)
Guatemala	6/12	256	DAM	79	Johnson et al., 1967
Guinea	5-14	50	AAB	63	Nissen et al., 1935
Guinea	Adults	1,144	SPM	70	Faverge & Falmagne, [illegible]
Guinea: mean	-	-	-	67	

Country	Age	N	Test	IQ	Reference
Honduras	10	4,000	V/M	81	UNESCO, 1998
Hong Kong	9/11	1,007	CCT	105	Godman, 1964
Hong Kong	16	5,209	AH4	106	Vernon, 1982
Hong Kong	10	1,000	SPM	109	Chan &Vernon,1988
Hong Kong	6/13	13,822	SPM	103	Lynn, Pagliari & Chan, 1988
Hong Kong	6/15	4,500	SPM	110	Lynn, Pagliari & Chan, 1988
Hong Kong	10	197	SPM	108	Lynn, Pagliari & Chan, 1988
Hong Kong	9	376	CCF	104	Lynn, Hampson & Lee, 1988
Hong Kong	9	479	SPM	122	Chan et al., 1991
Hong Kong	15	341	APM	120	Lynn & Chan, 2003
Hong Kong: median	-	-	-	106	
Hungary	Adults	260	CF	98	Buj, 1981
Hungary	18	7,588	SPM+	95	Dobrean et al., 2008
Hungary : mean	-	-	-	96.5	
Iceland	6-16	665	SPM	101	Pind et al., 2003
India	5/11	1,339	CPM	88	Gupta & Gupta, 1966
India	14/17	1,359	SPM	87	Chopra, 1966
India	12/14	5,607	CPM	81	Sinha, 1968
India	5/10	1,050	CPM	82	Rao & Reddy, 1968
India	15	3,536	SPM	84	Majumdar & Nundi, 1971
India	10/16	180	SPM	79	Mohanty & Babu, 1983

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Country	Age	N	Test	IQ	Reference
India	13	100	SPM	78	Agrawal et al., 1984
India	9/12	748	WISC-R	79	Afzal, 1988
India	5/12	500	CPM	86	Bhogle & Prakash, 1992
India	6-12	29	CPM	82	Jyothi et al., 1993
India	11/15	569	SPM	82	Raven et al., 1996
India	7-11	828	CPM	80	Barnabus et al., 1995
India	7-15	8,040	SPM	88	Raven et al., 2000
India	11-15	569	SPM	81	Raven et al., 2000
India: median	-	-	-	82	
Indonesia	5-12	1,149	DAM	86	Thomas & Shah, 1961
Indonesia	5-20	163	CPM	87	Bleichrodt et al., 1980
Indonesia	4	139	PPVT	87	Soewondo et al., 1989
Indonesia	6/8	483	CPM	87	Hadidjaja et al., 1998
Indonesia: median	-	-	-	87	
Iran	15	627	SPM	84	Valentine, 1959
Iran	14	250	AH4	83	Mehryer et al., 1972
Iran	6/11	1,600	BG	89	Yousefi et al., 1992
Iran	6/10	1,195	DAM	80	Mehryer et al., 1987
Iran: median	-	-	-	83.5	
Iraq	14/17	204	SPM	87	Abdul-Hubb, 1972
Iraq	18/35	1,185	SPM	87	Abdul-Hubb, 1972

Country	Age	N	Test	IQ	Reference
Iraq: mean	-	-	-	87	
Ireland	10-13	96	MH	90	Macnamara, 1964
Ireland	Adults	75	CF	97	Buj, 1981
Ireland	6-12	1,361	SPM	97	O'Connor et al., 1988
Ireland	9	191	SPM	87	Lynn & Wilson, 1990
Ireland	9-12	2,029	SPM	96	Jeffers & Fitzgerald, 1991
Ireland	6/12	1,361	SPM	93	Carr, 1993
Ireland	9/12	2,029	SPM	91	Carr, 1993
Ireland	6/12	1,361	SPM	93	Carr, 1993
Ireland	9/12	2,029	SPM	91	Carr, 1993
Ireland	23-49	10,000	SPM	95	Raven et al., 2000
Ireland	6	200	WPPSI	92	Lynn, 2012
Ireland: median	-	-		93	
Israel	13/14	200	WISC	95	Ortar, 1952
Israel	11-15	267	SPM	95	Moyles & Wolins, 1971
Israel	10-12	180	LT	97	Miron, 1977
Israel	10/12	268	SPM	95	Globerson, 1983
Israel	11	2,781	SPM	89	Lancer & Rim,1984
Israel	5	52	CPM	96	Tzuriel & Caspi, 1992
Israel	9-15	1,740	SPM	90	Lynn, 1994

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Country	Age	N	Test	IQ	Reference
Israel	13	-	SPM	96	Kazulin, 1998
Israel: median	-	-	-	95	
Italy	11-16	2,432	SPM	103	Tesi & Young, 1962
Italy	6-11	700	CPM	95	Galeazzi et al., 1979
Italy	Adults	1,380	CF	102	Buj, 1981
Italy	6-11	476	CPM	103	Prunetti, 1985
Italy	6-11	459	CPM	99	Prunetti, 1985
Italy	15-80	138	CPM	76	Basso et al., 1987
Italy	18	5,370	CF	90	Pace & Sprini, 1998
Italy	6-11	1,384	CPM	95	Belacchi et al., 2008
Italy: median	-	-	-	97	
Ivory Coast	7-14	67	Piagetian	71	Dasen & Ngini, 1979
Jamaica	15	31	WISC-R	67	Grantham-McGregor et al., 1994
Jamaica	25	54	PPVT	60	Grantham-McGregor et al., 1994
Jamaica	9/10	30	PPVT	71	Smeon et al., 1989
Jamaica: median	-	-	-	67	
Japan	5/15	1,070	WISC	102	Lynn, 1977a
Japan	35	316	WAIS	102	Lynn, 1977a
Japan	5/10	760	MFFT	107	Salkind et al., 1978
Japan	10	212	Kyoto	106	Lynn & Dziobon, 1980
Japan	8/11	97	WRAT	108	Tarnopol & Tarnopol, 1980

Country	Age	N	Test	IQ	Reference
Japan	9	223	CEFT	112	Bagley et al., 1983
Japan	4/9	347	CMMS	107	Misawa et al., 1984
Japan	6/11	480	Various	105	Stevenson et al., 1985
Japan	6/16	1,100	WISC-R	103	Lynn & Hampson, 1986
Japan	4/6	600	WPPSI	105	Lynn & Hampson, 1987
Japan	14	2,100	Kyoto	104	Lynn et al., 1987a
Japan	13/15	178	DAT	104	Lynn et al., 1987b
Japan	2/8	548	McCarthy	103	Ishikuma et al., 1988
Japan	6/12	142	KABC	101	Kaufman et al., 1989
Japan	16	175	AMM	113	Mann et al., 1990
Japan	9	444	SPM	110	Shigehisa & Lynn, 1991
Japan	5/7	454	CCAT	109	Takeuchi & Scott, 1992
Japan	6/12	451	MAT	105	Tamaoka et al., 1993
Japan	14/15	239	Various	103	Li et al., 1996
Japan	6/17	93	Gen info	100	Chen et al., 1996
Japan	19	72	GMRT	102	Flaherty, 1997
Japan	7/11	60	DAM	102	Cox et al., 2001
Japan	17	1,119	Gen info	105	Evans et al., 2002
Japan: median	-	-	-	105	
Jordan	6/12	210	KABC	84	El-Mneizel, 1987
Jordan	8-13	151	Piagetian	82	Za'rour & Khuri, 1977

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Country	Age	N	Test	IQ	Reference
Jordan	11-40	2,542	APM	86	Lynn & Abdel-Khalek, 2009
Jordan: median	-	-	-	84	
Kenya	Adults	205	CPM	69	Boissiere et al., 1985
Kenya	6-10	1,222	CPM	78	Costenbader & Ngari, 2000
Kenya	12-15	85	CPM/MH	67	Sternberg et al., 2001
Kenya	7	537	CPM	87	Daley et al., 2003
Kenya	7	118	CPM	76	Daley et al., 2003
Kenya	6	184	KAB	63	Holding et al., 2004
Kenya	6-14	628	CPM	74	Neumann et al., 2007
Kenya: median	-	-	-	74	
Korea, South	2/12	440	KABC	113	Moon, 1988
Korea, South	9	107	SPM	109	Lynn & Song, 1994
Korea, South	4	56	Arith	103	Ginsburg et al., 1997
Korea,	6-16	2,231	WISC-3	100	Georgas et al., 2003
Korea, S.: median	-	-	-	106	
Kuwait	6-15	6,529	SPM	86	Abdel-Khalek & Lynn, 2006
Kuwait	7-17	8,410	SPM	87	Abdel-Khalek & Raven, 2008
Kuwait: mean	-	-	-	86.5	
Laos	8	22	KABC	90	Boivin et al., 1996
Laos	8	22	KABC	88	Boivin et al., 1996

Country	Age	N	Test	IQ	Reference
Laos: mean	-	-	-	89	
Lebanon	5/10	502	DAM	82	Dennis, 1957
Libya	6-11	600	CPM	86	Lynn et al., 2008a
Libya	8-17	1,600	SPM	78	Al-Shahomee & Lynn, 2010
Libya	6-16	870	WISC-R	85	Lynn et al., 2008b
Libya: median	-	-	-	85	
Lithuania	8-12	259	CPM	90	Lynn & Kazlauskaite, 2002
Lithuania	6-16	381	WISC-3	92	Georgas et al., 2003
Lithuania	8-12	1,067	CPM	96	Gintilienë & Butkienë, 2005
Lithuania: median	-	-	-	92	
Madagascar	Adults	147	CPM	82	Raveau et al., 1976
Malawi	7-14	268	CPM	60	Van der Vijver, 2009
Malaysia	7/12	5,412	SPM	92	Chaim, 1994
Malaysia	20	175	EFT	85	Kuhnen et al., 2001
Malaysia: mean	-	-	-	93.5	
Mali	9-12	746	CPM	74	Fontaine, 1963
Mali	Adults	790	SPM	68	Fontaine, 1963
Mali	Adults	270	SPM	71	Fontaine, 1963
Mali	8-85	413	CPM	64	Bellis et al., 1988
Mali: median	-	-	-	70	

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Country	Age	N	Test	IQ	Reference
Malta	5	134	CPM	97	Martinelli & Lynn, 2005
Mariana Islands	6/16	200	Arthur	81	Joseph & Murray, 1951
Marshall Islands	12/18	407	CF	84	Jordheim & Olsen, 1963
Mexico	6/13	520	DAM	87	Modiano,1962
Mexico	7/10	920	SPM	88	Lynn et al., 2005
Mexico	10	4,000	V/M	88	UNESCO, 1998
Mexico: median	-	-	-	88	
Mongolia	5-14	4,694	SPM	100	Lynn, 2007b
Morocco	Children	177	RAKIT	75	Resing et al., 1986
Morocco	Children	76	RAKIT	79	Resing et al., 1986
Morocco	11	720	CITO	84	Pieke, 1988
Morocco	5/8	94	LPTP	85	Hamers et al., 1966
Morocco	Adults	167	GATB	84	Te Nijenhuis, 1997
Morocco	Adults	202	SPM	84	Diaz et al., 2010
Morocco: median	-	-	-	84	
Mozambique	20	149	CPM	64	Kendall, 1976
Namibia	7-12	116	CPM	71	Veii & Everatt, 2005
Netherlands	Adults	333	CF	107	Buj, 1981
Netherlands	5-10	1,920	CPM	99	Raven et al., 1995
Netherlands	6-12	4,032	SPM	101	Raven et al., 1996
Netherlands	6-16	1,100	WISC-3	101	Georgas et al., 2003

Country	Age	N	Test	IQ	Reference
Netherlands: median	-	-	-	100	
Netherlands Antilles	9-11	97	CPM	87	van de Vijfeijken et al., 1997
Nepal	4/16	807	DAM	78	Sundberg & Ballinger, 1968
New Caledonia	5/10	-	-	85	Cottereau-Reiss & Lehalle, 1988
New Zealand-whites	9/15	26,000	OTIS	99	Redmond & Davies, 1940
New Zealand-whites	9/17	3,108	SPM	101	Reid & Gilmore, 1989
New Zealand-whites	8/9	1,692	WISC-R	102	Fergusson & Horwood, 1997
NZ - Maoris	-	-	-	90	Lynn, 2006
New Zealand: median	-	-	-	99	
Nigeria	26	30	DAM	67	Haward & Roland, 1954
Nigeria	Children	480	Leone	70	Ferron, 1965
Nigeria	Adults	86	SPM	64	Wober, 1969
Nigeria	6-13	375	CPM/PMA	69	Fahrmeier, 1975
Nigeria	5-7	150	SPM	87	Okunrotifa,1976
Nigeria	9-10	88	SPM	83	Nwuga, 1977
Nigeria	9-10	165	SPM	80	Nwuga, 1977
Nigeria	11-12	120	SPM	72	Maqsud, 1980a
Nigeria	11-17	98	WISC-R	73	Ani et al., 1998

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Country	Age	N	Test	IQ	Reference
Nigeria	11	402	SPM	69	Ijarotimi & Ijadunola, 2007
Nigeria: median	-	-	-	71	
Norway	Adults	100	CF	100	Buj, 1981
Oman	5-11	1,042	CPM	87	Khaleefa et al., 2010
Oman	9-18	5,139	SPM	81	Abdel-Khalek &
Oman: mean	-	-	-	84.5	
Pakistan	15	349	CEFT	84	Alvi et al., 1986
Pakistan	6-8	140	SPM	84	Rahman et al., 2002
Pakistan	12-18	1,662	SPM	82	Ahmad et al., 2008
Pakistan	18-45	2,016	SPM	86	Ahmad et al., 2008
Pakistan: median	-	-	-	84	
Palestine	6-16	639	WISC-R	86	Lieblich & Kugelmas, 1981
Papua N.G.	17/18	152	SOP	82	Waldron & Gallimore, 1973
Papua N.G.	7/10	241	BG	83	Robin & Shea, 1983
Papua N.G: mean	-	-	-	82.5	
Paraguay	10	4,000	V/M	84	UNESCO, 1998
Peru	10	4,000	V/M	83	UNESCO, 1998
Peru-Amerindian	8/11	4,382	CPM	87	Raven et al., 1995
Peru-Amerindian	6/7	300	WISC	85	Llanos, 1974
Peru: median	-	-	-	85	

Country	Age	N	Test	IQ	Reference
Philippines	12-13	203	SPM	86	Florens & Evans, 1972
Philippines	12	2,406	NNAT	94	Vista & Care, 2010
Philippines: mean	-	-	-	90	
Poland	Adults	835	CP	106	Buj, 1981
Poland	6-15	4,006	SPM	92	Jaworowska & Szustrova, 1991
Poland	15-79	660	SPM	92	Raven et al., 2000
Poland	5-10	756	CPM	102	Raven, 2008
Poland	18	395	SPM+	90	Dobrean et al., 2008
Poland : median	-	-	-	92	
Portugal	Adults	242	CF	101	Buj, 1981
Portugal	6-12	807	CPM	88	Simoes, 1989
Portugal: median	-	-	-	94.5	
Puerto Rico	5/11	2,400	CPM	83	Raven et al., 1995
Puerto Rico	8/15	2,911	PM	84	Raven & Court, 1989
Puerto Rico: mean	-	-	-	83.5	
Qatar	10/13	273	SPM	78	Bart et al., 1987
Qatar	6-11	1,135	SPM	88	Khaleefa & Lynn, 2008d
Qatar: mean	-	-	-	83	
Romania	6-10	300	CPM	94	Zahirnic et al., 1974
Romania	7-18	1,310	SPM+	88	Dobrean et al., 2008

Country	Age	N	Test	IQ	Reference
Romania: mean	-	-	-	91	
Russia	14-15	432	SPM	97	Lynn, 2001
Russia	27-55	745	CF	96	Grigorenko & Sternberg, 2001
Russia: mean	-	-	-	96.5	
Rwanda	5-17	148	Piagetian	76	Laurendeau-Bendavid, 1977
Saudi Arabia	8-14	3,967	SPM	80	Abu-Hatab et al., 1977
Saudi Arabia	8-24	4,659	SPM	78	Abdel-Khalek & Lynn, 2009
Saudi Arabia: mean	-	-	-	79	
Senegal	7-14	559	DAM	67	Bardet et al., 1960
Senegal	5-12	58	KABC	74	Boivin, 2002
Senegal: means	-	-	-	70.5	
Serbia	15	76	CPM	89	Moyles & Wolins, 1973
Serbia	30	608	SPM	88	Rushton & Cvorovic, 2009
Serbia	4-11	2,334	CPM	98	Fajgelj et al., 2010
Serbia: median	-	-	-	89	
Sierra Leone	Adults	122	CPM	64	Berry, 1966
Sierra Leone	Adults	33	CPM	64	Binnie-Dawson, 1984
Sierra Leone: mean	-	-	-	64	

Country	Age	N	Test	IQ	Reference
Singapore	13	337	SPM	103	Lynn, 1977b
Singapore	15	459	APM	114	Lim, 1994
Singapore: mean	-	-	-	108.5	
Slovakia	5-11	823	CPM	96	Raven et al., 1995
Slovakia	11-18	1,291	SPM	100	Raven et al., 2000
Slovakia	2-7	252	SON-R	98	Dockal, 2009
Slovakia: median	-	-	-	98	
Slovenia	8-18	1,556	SPM	96	Raven et al., 2000
Slovenia	6-16	1,080	WISC-3	95	Georgas et al., 2003
Slovenia	6-11	1,730	CPM	103	Boben, 2003
Slovenia	11-17	610	SPM+	96	Boben, 2008
Slovenia	13-19	1,363	APM	99	Boben, 2008
Slovenia: median	-	-	-	96	
S. Africa-whites	15	1,056	SPM	94	Owen, 1992
S. Africa-blacks	10/12	293	AAB	65	Fick, 1929
S. Africa-blacks	12-14	80	KB	68	Dent, 1937
S. Africa-blacks	10-16	532	Non-verbal	72	Fick, 1939
S. Africa-blacks	8/16	1,008	SPM	75	Notcutt, 1950
S. Africa-blacks	Adults	703	SPM	70	Notcutt, 1950
S. Africa-blacks	6-10	1,076	DAM	75	Hunkin, 1950

Appendix 1

Country	Age	N	Test	IQ	Reference
S. Africa-blacks	10-12	278	NVR	74	Lloyd & Pidgeon, 1961
S. Africa-blacks	25	140	WAIS-R	69	Avenant, 1988
S. Africa-blacks	5-13	415	DAM	75	Richter et al., 1989
S. Africa-blacks	9	350	SPM	67	Lynn & Holmshaw, 1990
S. Africa-blacks	16	1,096	SPM	68	Owen, 1992
S. Africa-blacks	15-16	1,093	JAT	68	Lynn & Owen, 1994
S. Africa-blacks	13	49	WISC-R	70	Murdoch, 1994
S. Africa-blacks	17-20	140	SPM	77	Maqsud, 1997
S. Africa-blacks	43	157	WAIS-R/ WISC-3	68	Nell, 2000
S. Africa-blacks	16	17	SPM	68	Sonke, 2000
S. Africa-blacks	8	63	WPPSI/ WCST	71	Akande, 2000
S. Africa-blacks	14	152	WCST/ WISC-R	65	Skuy et al., 2001
S. Africa-blacks	17	100	WCST/ WISC-R/DAM	65	Skuy et al., 2001
S. Africa-blacks	30	196	WAIS-3	82	Claassen et al., 2001
S. Africa-blacks	8-10	806	CPM	68	Jinnabhai et al., 2004
S. Africa-blacks	19	711	CPM	71	Vass, 1992
S. Africa-blacks	11	379	CPM	71	Knoetze et al., 2005

Country	Age	N	Test	IQ	Reference
S. Africa-blacks	6-12	1,333	CPM	71	Linstrom et al., 2006
S. Africa-blacks	9	340	SPM	69	Malda et al., 2010
S. Africa-colored	10/12	6,196	AAB	83	Fick, 1929
S. Africa.-colored	13	815	GSAT	86	Claassen, 1990
S. Africa-colored	15	778	SPM	80	Owen, 1992
S. Africa-Indians	18	284	GFT	88	Taylor & Radford, 1986
S. Africa-Indians	6/8	600	ISAIS	86	Landman, 1988
S. Africa-Indians	15	1,063	SPM	91	Owen, 1992
S. Africa-Indians	15	1,063	JAT	83	Lynn & Owen, 1994
South Africa: median	-	-	-	72	
Spain	Adults	848	CF	98	Buj, 1981
Spain	6-9	854	CPM	97	Raven et al., 1995
Spain	11/18	3,271	APM	102	Albade Paz & Monoz, 1993
Spain	Adults	202	RPM	97	Diatz et al., 2010
Spain	16/69	1,369	WAIS-3-P	94	Roivainen, 2010
Spain: median	-	-	-	97	
Sri Lanka	8	46	CTMM	79	Strauss, 1954
St Lucia	4	60	PPVT	62	Murray, 1983

Appendix 1

Country	Age	N	Test	IQ	Reference
St Vincent	8/11	174	CPM	71	Durbrow et al., 2002
Suriname	30	535	GATB	89	Te Nijenhuis & van der Frier, 1997
Sudan	7-16	291	Various	69	Fahmy, 1964
Sudan	6	80	DAM	64	Badri, 1965a
Sudan	9	293	DAM	74	Badri, 1965b
Sudan	8-12	148	SPM	72	Ahmed, 1989
Sudan	Adults	77	ETMT	76	Stanczak et al., 2001
Sudan	6-9	1,683	CPM	81	Khatib et al., 2006
Sudan	4-10	1,345	DAM	83	Khaleefa et al., 2008a
Sudan	9-25	6,202	SPM	79	Khaleefa et al., 2008b
Sudan	7-11	3,185	SPM	79	Irwing et al., 2008
Sudan	50	801	WAIS-R	86	Khaleefa et al. 2009a
Sudan	50	801	WAIS-R	84	Khaleefa et al., 2009b
Sudan	9-18	1,006	SPM	67	Khaleefa et al., 2009
Sudan: median	-	-	-	77.5	
Sweden	6-14	1,106	WISC-P	97	Skandinaviska Test, 1970
Sweden	Adults	205	CF	104	Buj, 1981
Sweden	6-16	2,231	WISC-3	99	Georgas et al., 2003
Sweden: median	-	-	-	99	
Switzerland	Adults	163	CF	101	Buj, 1981
Switzerland	6-10	200	CPM	101	Raven et al., 1995

Country	Age	N	Test	IQ	Reference
Switzerland	9-15	246	SPM	104	Spicher, 1993
Switzerland: median	-	-	-	101	
Syria	7	241	CPM	83	Guthke & Al-Zoubi, 1987
Syria	7-18	3,489	CPM	83	Khaleefa & Lynn, 2008a
Syria: mean	-	-	-	83	
Taiwan	16	1,290	CCT	102	Rodd, 1959
Taiwan	6/8	1,865	CPM	102	Hsu, 1971
Taiwan	9/10	1,384	SPM	110	Hsu et al., 1973
Taiwan	6/7	43,825	CPM	105	Hsu, 1976
Taiwan	8/11	193	WRAT	107	Tarnopol & Tarnopol, 1980
Taiwan	6/11	480	Various	104	Stevenson et al., 1985
Taiwan	6/8	764	CPM	105	Rabinowitz et al., 1991
Taiwan	6/11	169	Gen info	100	Chen et al., 1996
Taiwan	9/12	2,476	CPM	105	Lynn, 1997
Taiwan	6-15	118	SPM	105	Lai et al., 2001
Taiwan	17	1,469	Gen info	107	Evans et al., 2002
Taiwan	6-17	6,290	SPM	109	Lynn, Chen & Chen, 2011
Taiwan: median	-	-	-	105	
Tanzania	Adults	179	CPM	60	Boissiere et al., 1985
Tanzania	13-17	2,959	SPM	78	Klingelhofer, 1967
Tanzania	11-13	458	WCST	72	Sternberg et al., 2002

Appendix 1

Country	Age	N	Test	IQ	Reference
Tanzania: median	-	-	-	72.5	
Thailand	6-11	104	Piagetian	87	Opper, 1977
Thailand	8-10	2,268	SPM	91	Pollitt et al., 1989
Thailand	-	-	TONI-2	88	Sungthong et al., 2002
Thailand: median	-	-	-	88	
Tibet	12-17	80	SPM	92	Lynn, 2008
Tonga	8-9	80	PAT	86	Beck & St.George, 1983
Trinidad	-	-	PISA 2006	87	Lynn & Meisenberg, 2010
Tunisia	20	509	SPM	84	Abdel-Khalek & Raven, 2008
Turkey	11-12	92	D 48	84	Kagitcibasi, 1972
Turkey	6-15	2,272	SPM	90	Sahin & Duzen, 1994
Turkey	7-9	180	DAM	96	Ucman, 1972
Turkey	6-15	2,397	SPM	87	Duzen et al., 2008
Turkey: median	-	-	-	88.5	
Uganda	11	514	DAM	82	Minde & Kantor, 1976
Uganda	14	-	SPM	66	Heyneman, 1977
Uganda	11	2,019	CPM	73	Heyneman & Jamison, 1980
Uganda	11	50	Matrices	71	Vernon, 1969
Uganda: median	-	-	-	72	

Country	Age	N	Test	IQ	Reference
Ukraine	14-17	132	SPM	95	Prozorovskaya et al., 2010
United Arab Emirates	6-11	4,496	CPM	83	Khaleefa & Lynn, 2008b
United Kingdom	Adults	1,405	CF	100	Buj, 1981
United Kingdom	6-15	3,250	SPM	100	Raven et al., 1998
UK: mean	-	-	-	100	
United States	11	1,000	SB	100	Scottish Council, 1933
United States	11	1,215	TM	97	Scottish Council, 1949
United States	14/18	10,000	DAT	98	Lynn et al., 1987b
United States	18/70	625	SPM	98	Raven et al., 1996
United States	16/89	2,450	WAIS-3-P	98	Roivainen, 2010
US: median	-	-	-	98	
Uruguay	-	-	-	96	Risso, 1961
Venezuela	10	4,000	V/M	84	UNESCO, 1998
Vietnam	12/16	391	SPM	94	Flynn, 1991
Western Samoa	5/7	80	Verbal	90	Clay, 1971
Western Samoa	8/9	80	PAT	86	Beck & St.George,1983
Western Samoa	9/17	65	SPM	88	Reid & Gilmore, 1989
Western Samoa: median	-	-	-	89	

Country	Age	N	Test	IQ	Reference
Yemen	6-11	1,000	CPM	85	Al-Heeti et al., 1997
Yemen	6-11	986	CPM	81	Khaleefa & Lynn, 2008c
Yemen: mean	-	-	-	83	
Zambia	15	759	SPM	75	MacArthur et al., 1964
Zambia	16	292	SPM	75	MacArthur et al., 1964
Zambia	Adults	152	SPM	64	Pons, 1974
Zambia	Adults	1,011	SPM	80	Pons, 1974
Zambia: median	-	-	-	75	
Zimbabwe	15	200	SPM	72	Irvine, 1969
Zimbabwe	12-14	204	WISC-R	71	Zindi, 1994
Zimbabwe: mean	-	-	-	71.5	

Appendix 2

A summary of Angus Maddison's estimates of per capita GDP (1990 international dollars) over the period 1-2030 AD and estimates for single countries based on regional averages

Region/country	1	1500	1820	1913	1990	2030
Western Europe	**576**	**771**	**1,202**	**3,457**	**15,912**	**31,389**
Austria	425	707	1,218	3,465	(15,965)	(31,389)
Belgium	450	875	1,319	4,220	(15,695)	(31,389)
Denmark	400	738	1,272	3,912	(15,965)	(31,389)
Finland	400	453	781	2,111	(15,965)	(31,389)
France	473	727	1,135	3,485	18,093	34,462
Germany	408	688	1,077	3,648	15,929	30,179
Italy	809	1,100	1,117	2,564	(15,695)	30,661
Netherlands	425	761	1,838	4,049	17,262	(31,389)
Norway	400	610	801	2,447	(15,965)	(31,389)
Sweden	400	695	1,198	3,096	(15,965)	(31,389)
Switzerland	425	632	1,090	4,266	(15,965)	(31,389)
UK	400	714	1,706	4,921	16,430	33,593

Region/country	1	1500	1820	1913	1990	2030
12 country average	**599**	**798**	**1,243**	**3,688**	**-**	**-**
Portugal	450	606	923	1,250	(15,965)	(31,389)
Spain	498	661	1,008	2,056	12,055	25,832
Other	**539**	**472**	**711**	**1,840**	**-**	**-**
West European average	**576**	**771**	**1,202**	**3,457**	**-**	**-**
Western Offshoots	**400**	**400**	**1,202**	**5,233**	**22,345**	**-**
USA	400	400	1,257	5,301	23,201	45,774
Other western offshoots	**400**	**400**	**761**	**4,752**	**-**	**36,025**
Canada	(400)	(400)	904	4,447	18,872	(36,025)
Australia	(400)	(400)	518	5,157	17,106	36,710
New Zealand	(400)	(400)	400	5,152	13,909	(36,025)
West	**569**	**753**	**1,202**	**3,988**	**-**	**-**
E. Europe & former USSR	**406**	**498**	**686**	**1,558**	**-**	**-**
Eastern Europe	**412**	**496**	**683**	**1,695**	**5,440**	**11,054**
Albania	(412)	(496)	(683)	(1,695)	2,499	(11,054)
Bulgaria	(412)	(496)	(683)	(1,695)	5,597	(11,054)
Czechoslovakia	(412)	(496)	(683)	(1,685)	8,512	-
Czech Rep.	-	-	-	-	8,895	(11,054)
Slovakia		-	-		-	(11,054)

Region/country	**1**	**1500**	**1820**	**1913**	**1990**	**2030**
Hungary	(412)	(496)	(683)	(1,695)	6,459	(11,054)
Poland	(412)	(496)	(683)	(1,695)	5,113	(11,054)
Romania	(412)	(496)	(683)	(1,695)	3,511	(11,054)
Yugoslavia	(412)	(496)	(683)	(1,695)	5,720	(11,054)
Slovenia	-	-	-	-	10,160	(11.054)
Other former Yugoslavia	**-**	**-**	**-**	**-**	**5,226**	**-**
Former USSR	**400**	**499**	**688**	**1,488**	**–**	**7,614**
Armenia	(400)	(499)	(688)	(1,488)	6,066	(7,614)
Azerbaijan	(400)	(499)	(688)	(1,488)	4,639	(7,614)
Belarus	(400)	(499)	(688)	(1,488)	7,184	(7,614)
Estonia	(400)	(499)	(688)	(1,488)	10,820	(7,614)
Georgia	(400)	(499)	(688)	(1,488)	7,616	(7,614)
Kazakhstan	(400)	(499)	(688)	(1,488)	7,458	(7,614)
Kyrgyzstan	(400)	(499)	(688)	(1,488)	3,602	(7,614)
Latvia	(400)	(499)	(688)	(1,488)	9,916	(7,614)
Lithuania	(400)	(499)	(688)	(1,488)	8,663	(7,614)
Moldova	(400)	(499)	(688)	(1,488)	6,165	(7,614)
Russian Fed.	(400)	(499)	(688)	(1,488)	7,778	16,007
Tajikistan	(400)	(499)	(688)	(1,4889	2,976	(7,614)
Turkmenistan	(400)	(499)	(688)	(1,488)	3,626	(7,614)
Ukraine	(400)	(499)	(688)	(1,488)	6,027	(7,614)

Region/country	1	1500	1820	1913	1990	2030
Uzbekistan	(400)	(499)	(688)	(1,488)	4,241	(7,614)
Asia	**456**	**568**	**581**	**-**	**-**	**8,292**
Japan	400	500	669	1,387	18,789	30,072
Burma	(425)	(554)	504	785	778	
China	450	600	600	552	1,871	15,763
Hong Kong	(425)	(554)	600	1,279	17,541	(8,292)
India	450	550	533	673	1,309	7,089
Bangladesh	-	-	-	-	640	(8,292)
Pakistan	-	-	-	-	954	(8,292)
Indonesia	(425)	565	612	904	2,526	6,924
Malaysia	(425)	(554)	603	900	5,132	(8,292)
Nepal	(425)	(554)	397	539	808	(8,292)
Philippines	(425)	(554)	584	988	2,224	(8,292)
South Korea	(425)	600	600	869	8,704	30,661
North Korea	(425)	600	600	869	2,841	(8,292)
Singapore	(425)	(554)	500	1,279	14,220	(8,292)
Sri Lanka	(425)	(554)	550	1,234	2,448	(8,292)
Thailand	(425)	(554)	570	841	4,633	14,014
Taiwan	(425)	(554)	550	747	9,886	33,666
Total 16 Asian countries	**-**	**-**	**580**	**679**	**2,707**	**-**
Afghanistan	(425)	(554)	(556)	(682)	604	(8,292)

Region/country	**1**	**1500**	**1820**	**1913**	**1990**	**2030**
Cambodia	(425)	(554)	(556)	(682)	880	(8,292)
Laos	(425)	(554)	(556)	(682)	929	(8,292)
Mongolia	(425)	(554)	(556)	(682)	1,333	(8,292)
Vietnam	(425)	(554)	527	727	1,025	(8,292)
23 small Asian countries	**-**	**-**	**556**	**752**	**2,254**	**-**
Total 29 east Asia countries	-	**-**	**556**	**752**	**1,339**	**-**
Total 45 east Asia countries	-	**-**	**580**	**682**	**2,647**	**-**
Other East Asia	**425**	**554**	**568**	**842**	**-**	**-**
Average east Asia	**-**	**567**	**580**	**-**	**-**	**-**
Arabia	400	550	550	600	8,993	(8,292)
Bahrain	400	550	550	600	4,104	(8,292)
Iran	500	600	588	1,000	3,503	10,789
Iraq	500	550	588	1,000	2,458	(8,292)
Israel	-	-	-	-	12,968	(8,292)
Jordan	550	600	590	1,000	3,792	(8,292)
Kuwait	400	550	550	600	6,121	(8,292)
Lebanon	550	600	657	1,350	1,938	(8,292)
Oman	400	600	550	600	6,479	(8,292)
Qatar	400	550	550	600	6,804	(8,292)
Syria	550	600	658	1,350	5,701	(8,292)

Region/country	**1**	**1500**	**1820**	**1913**	**1990**	**2030**
Turkey	550	600	643	1,213	5,445	13,111
UAR	400	550	550	600	13,070	(8,292)
Yemen	400	550	550	600	2,272	(8.192)
Palestine	550	600	614	1,250	3,806	(8,292)
Other west Asia	**-**	**590**	**607**	**-**	**-**	**-**
Total 15 west Asian countries	**-**	**-**	**607**	**1,042**	**4,863**	**-**
West Asia	**522**	**590**	**607**	**1,042**	**-**	**-**
Asian average (excl. Japan)	**457**	**572**	**577**	**658**	**-**	**-**
Latin America	**400**	**416**	**691**	**1,494**	**5,072**	**8,648**
Argentine	(400)	(410)	(712)	3,797	6,436	(8,648)
Brazil	(400)	400	646	811	4,923	8,316
Chile	(400)	(410)	694	2,988	6,402	(8,648)
Colombia	(400)	(410)	(712)	1,236	4,840	(8,648)
Mexico	400	425	759	1,732	6,985	10,668
Peru	(400)	(410)	(712)	1,032	3,021	(8,648)
Uruguay	(400)	(410)	(712)	3,310	6,474	(8,648)
Venezuela	(400)	(410)	460	1,104	8,313	(8,648)
Average 8 countries	**-**	**-**	**712**	**1,618**	**5,465**	**-**
Bolivia	(400)	(410)	(661)	(1,618)	2,197	(8,648)
Costa Rica	(400)	(410)	(661)	(1,618)	4,747	(8,648)

Region/country	**1**	**1500**	**1820**	**1913**	**1990**	**2030**
Cuba	(400)	(410)	(661)	(1,618)	2,948	(8,648)
Dominican Rep.	(400)	(410)	(661)	(1,618)	2,473	(8,648)
Ecuador	(400)	(410)	(661)	(1,618)	3,903	(8,648)
El Salvador	(400)	(410)	(661)	(1,618)	2,119	(8,648)
Guatemala	(400)	(410)	(661)	(1,618)	3,631	(8,648)
Haiti	(400)	(410)	(661)	(1,618)	1,032	(8,648)
Honduras	(400)	(410)	(661)	(1,618)	1,857	(8,648)
Jamaica	(400)	(410)	700	608	3,786	(8,648)
Nicaragua	(400)	(410)	(661)	(1,618)	1,438	(8,648)
Panama	(400)	(410)	(661)	(1,618)	4,471	(8,648)
Paraguay	(400)	(410)	(661)	(1,618)	3,287	(8,648)
Puerto Rico	(400)	(410)	(661)	(1,618)	10,539	(8,648)
Trinidad & Tobago	(400)	(410)	(661)	(1,618)	9,272	(8,648)
Average 15 countries	**-**	**-**	**636**	**1,038**	**3,292**	**-**
Total 24 small Caribbean	**-**	**-**	**636**	**1,174**	**4,844**	-
Other Latin America	**400**	**410**	**661**	**-**	-	-
30 Caribbean countries	**-**	**410**	**635**	**-**	-	-
Africa	**472**	**414**	**420**	**637**	**1,449**	**2,027**
Egypt	600	500	475	902	(1,449)	(2,027)

Region/country	1	1500	1820	1913	1990	2030
Algeria	(479)	(430)	430	1,163	(1,449)	(2,027)
Morocco	(479)	(430)	430	710	(1,449)	(2,027)
Libya	(479)	(430)	(430)	(637)	(1,449)	(2,027)
Tunisia	(479)	(430)	430	883	(1,449)	(2,027)
Other N. Africa	**479**	**430**	**430**	**-**	**-**	**-**
Chad	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Mauritania	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Mali	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Niger	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Benin	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Burkina Faso	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Cape Verde	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Cote d'Ivoire	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Gambia	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Ghana	(400)	(415)	(415)	781	(1,449)	(2,027)
Guinea	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Guinea-Bissau	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Liberia	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Nigeria	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Senegal	(400)	(415)	(415)	(637)	(1,449)	(2,027)

Region/country	1	1500	1820	1913	1990	2030
Sierra Leone	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Togo	(400)	(415)	(415)	(637)	(1,449)	(2,027)
Sahel and West Africa	**400**	**415**	**415**	**-**	**-**	**-**
Burundi	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Djibouti	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Ethiopia & Eritrea	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Kenya	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Rwanda	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Sudan	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Somalia	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Tanzania	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Uganda	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Cameroon	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Central African Republic	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Congo	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Equatorial Guinea	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Gabon	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Sao Tome & Principe	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Comoros	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Mauritius	(400)	(400)	(415)	(637)	(1,449)	(2,027)

Region/country	**1**	**1500**	**1820**	**1913**	**1990**	**2030**
Seychelles	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Angola	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Malawi	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Zaire	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Zambia	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Zimbabwe	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Mozambique	(400)	(400)	(415)	(637)	(1,449)	(2,027)
South Africa	(400)	(400)	(415)	1,602	(1,449)	(2,027)
Swaziland	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Lesotho	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Namibia	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Botswana	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Madagascar	(400)	(400)	(415)	(637)	(1,449)	(2,027)
Rest of Africa	**400**	**400**	**415**	**-**	**-**	**-**
World	**467**	**566**	**667**	**1,526**	**-**	**11,814**

Maddison's regional estimates, which are not used in statistical analysis, are printed in bold, and our estimates for single countries based on Maddison's regional averages are given in brackets.

Source:
Maddison, 2007.

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