

Intelligence, human capital, and economic growth: A Bayesian Averaging of Classical Estimates (BACE) approach

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Abstract Human capital plays an important role in the theory of economic growth, but it has been difficult to measure this abstract concept. We survey the psychological literature on cross-cultural IQ tests and conclude that intelligence tests provide one useful measure of human capital. Using a new database of national average IQ, we show that in growth regressions that include only robust control variables, IQ is statistically significant in 99.8% of these 1330 regressions, easily passing a Bayesian model-averaging robustness test. A 1 point increase in a nation's average IQ is associated with a persistent 0.11% annual increase in GDP per capita.

Keywords Intelligence · Human capital · Economic growth

JEL Classifications O47, J24, I20

1. Introduction

The concept of human capital holds an important place in the theory of economic growth. However, the question of just how to measure a nation's stock of human capital is an unresolved issue in empirical growth research. Mankiw, Romer, and Weil (1992) kindled interest in empirically testing a Solow model that included human capital. They used a nation's rate of secondary education enrollment as their proxy for human capital. Other researchers, notably Sala-i-Martin (1997a, b) and Sala-i-Martin, Doppelhofer, and Miller (henceforth SDM) (2004), have considered primary school enrollments as one reasonable measure of human capital. And the average years of schooling measures of Barro and Lee (1993, 1994) have also received wide attention in empirical research.

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While economists commonly use education as a proxy for human capital, this widespread practice has coexisted with longstanding doubts about using school enrollments as a measure of human capital. The ability to solve problems, to think creatively, to recall facts and to reinterpret those facts in the light of changing circumstances: these are some of the key elements that economists seem to be thinking of when we think about “human capital.” In describing human capital this way, we are setting aside discussion of job-specific human capital, the creation of which is analyzed in theoretical labor market models. General-purpose human capital has been the focus of growth research, and it is here that we place our focus in this paper. Fortunately for economists, psychologists spent the 20th century putting a great deal of energy into refining and improving upon one valuable technique for measuring this particular type of human capital: the intelligence test.

We use Lynn and Vanhanen’s (2002) new database of IQ tests from 81 countries—tests given across the entire 20th-century—to create estimates of what Lynn and Vanhanen call “national average IQ.” We use this national average IQ measure in growth regressions that also include as explanatory variables all three-variable combinations of the 21 growth variables that passed Sala-i-Martin’s (1997a, b) robustness test: this implies a total of 1330 regressions. We do so in order to create a high econometric hurdle for the IQ measure. By using such robust control variables, we are able to see if the strong bivariate IQ-growth relationship ($R^2 = 43\%$) vanishes when multiple robust regressors are included in the specification.

Out of these 1330 regressions, IQ is statistically significant at the 95% level in 99.8% of the regressions, and positive in all regressions. Thus, after giving traditional growth regressors every possibility to span the same econometric space as IQ, IQ is still remarkably robust. Given these strong results, IQ easily passes the BACE (Bayesian averaging of classical estimates) robustness tests proposed by SDM (2004).

We also evaluate the explanatory power of national average IQ in growth regressions that include Sala-i-Martin’s education measures. Among these 56 education-related regressions, IQ was statistically significant in every one, thus passing not only SDM’s BACE robustness test, but also Leamer’s (1983, 1985) more-demanding extreme bounds test. While one might expect that at least *some* linear combination of primary, secondary, and higher education measures could eliminate the statistical significance of IQ, we did not find this to be the case.

As an additional robustness check, we also show strong results for IQ when OECD countries are completely excluded from the sample. This evidence helps to address the concern that IQ tests are culturally biased in favor of people living in the developed world. And finally, we show that IQ passes Leamer’s extreme bounds test at the 1% level in 455 regressions that use as controls the 18 robust growth variables from SDM (2004).

Our IQ-based results bolster the conclusions of Hanushek and Kimko (2000), who found that international mathematics and science test scores from 31 countries were strongly positively correlated with growth. Hanushek and Kimko consider the math and science scores to be indicators of “labor quality.” It appears that national average IQ should likewise be considered as another robust measure of a nation’s labor quality.

Changes in this index of labor quality appear to have strong effects on a nation’s living standards. Results presented here, interpreted causally, imply that a 1-point increase in national average IQ will persistently raise a nation’s average growth rate by an average of 0.11% per year. As is always the case in growth regressions, it is not possible to determine whether this growth effect reflects transitory catch-up growth to a higher steady state level of GDP or a permanently higher rate of steady-state growth; we discuss the theoretical and quantitative implications of both possibilities below.

The relationship between IQ and growth appears to be economically large and statistically robust, and provides more reliable results than some other popular human capital measures.