Will the intelligent inherit the earth?
IQ and time preference in the global economy

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Abstract

Social science research has shown that intelligence is positively correlated with patience and frugality, while growth theory predicts that more patient countries will save more. This implies that if nations differ in national average IQ, countries with higher average cognitive skills will tend to hold a greater share of the world's tradable assets. I provide empirical evidence that in today's world, countries whose residents currently have the highest average IQs have higher savings rates, higher ratios of net foreign assets to GDP, and higher ratios of U.S. Treasuries to GDP. These nations tend to be in East Asia and its offshoots. The relationship between national average IQ and net foreign assets has strengthened since the end of Bretton Woods.

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"The desire to accumulation would then seem to derive strength, chiefly from…[t]he extent of the intellectual powers, and the consequent habits of reflection, and prudence, in the minds of the members of society." (Rae 1834, 124)

"The disturbing result, however, is that all countries except the most patient one must eventually be credit constrained." (Barro and Sala-i-Martin 2004, 173)

1. Introduction

Why do some countries save more than others? This question has motivated a vast literature spanning the fields of international economics and economic growth. In this paper, I propose a new answer to this question: that national savings rates differ across countries in part because rates of time preference differ across countries. And time preference differs across countries in part because psychometric intelligence, a key predictor of patient behavior, differs persistently across countries (Wicherts et al., 2010a,b; Jones and Schneider, 2010).

The thesis can be summed up quite simply: Because high IQ groups are more patient, and because more patient groups are more frugal, high IQ groups should be more frugal. The first premise is well-documented in empirical social science; the second premise flows from economic theory; and the empirical results of this paper show that the conclusion is well-supported in cross-country data.

I merely take a stylized fact from the world of behavioral economics and psychology—that high-IQ individuals are more patient, less impulsive—and draw the relevant implications from an open-economy Ramsey growth model, which I then compare to cross-country data on savings rates, foreign asset ownership, and national average IQ estimates. I use the average IQ estimates of Lynn and Vanhanen (2006), used repeatedly in the economics and psychology literatures (*inter alia*, Ram 2007; Weede and Kampf 2002; Potrafke 2012; Whetzel and

McDaniel 2006). This paper is thus another contribution to the emerging field of behavioral macroeconomics.

Recent evidence from Caselli and Feyrer (2007) suggests that across countries, the marginal product of capital is “essentially equalized: the return from investing in capital is no higher in poor countries than in rich countries” (537); their findings are “remarkably consistent with the view that international financial markets do a very efficient job at allocating capital across countries” (585). Thus, capital flows across countries may be free enough to approximate the open-economy benchmark. In such a world, differences in national time preference will be a major cause of differences in own-country savings rates but will not be a major cause of differences in own-country capital stocks: differences in national time preference will instead cause differences in net foreign asset holdings. In the frictionless Ramsey model, the most patient country owns all the world’s assets in steady-state; the introduction of frictions weakens this theoretical result but preserves the positive correlation between patience and net asset holdings. I present evidence that holdings of net foreign assets as well as holdings of one particular low-risk asset—U.S. Treasuries—are higher in high average IQ countries.

I make no claim that all differences in national average IQ are permanently intractable, nor that they explain 100% of the difference in savings rates across countries. Instead, I claim that differences in measured cognitive skills—whether proxied by IQ tests, or by math and science tests—are an overlooked driver of cross country differences in savings and hence in national wealth.

I begin by discussing the microeconomic and psychological literatures showing a link between patience and IQ. While the IQ-patience link has been repeatedly documented across the social sciences, quantitative measures that focus on long-term decisions are rarer. I find that the micro-level parameters are large enough to matter: peer effects of frugality (found for car purchases by Grinblatt, Keloharju, and Ikaheimo, 2008 and Kuhn et al., 2011) would strengthen this relationship.

I discuss in some detail the open-economy Ramsey model's implications for a world where nations differ in rates of time preference (Barro and Sala-i-Martin, 2004, pps. 161-190), spelling out the predicted relationships among national IQ, savings rates, and foreign asset holdings. I then turn to evidence that the highest-average-IQ countries—those in East Asia—both have high average savings rates and own a disproportionate share of the world's foreign assets. The relationship between national average IQ and net foreign asset holdings has strengthened over time, as one would expect if credit frictions have fallen since then end of Bretton Woods.

John Rae (1834) provides a precursor of the approach presented here: Chapter Six of his treatise (cited in Becker and Mulligan, 1997, and Frederick et al., 2002) focuses on individual determinants of savings, including differences in rates of time preference, while his Chapter Seven draws out the cross-country implications. The present paper is the first to formally quantify the link running from cognitive skills to time preference to national savings rates and net foreign asset accumulation.

2. IQ and Time Preference at the Individual Level.

Psychologists have known for decades that higher IQ is associated with greater patience, which they often refer to as lower "delay discounting." (for a review and meta-analysis, see Shamosh and Gray, 2008; for a broad review of IQ's behavioral correlates see Jensen, 1998, c. 9). A recent meta-analysis of 24 studies by Shamosh and Gray concluded: "[A]cross studies, higher intelligence was associated with lower D[elay] D[iscounting]…" Their meta-study drew on experiments with preschool children and college students, drug addicts and relatively healthy populations: With few exceptions, they found a reliable relationship between measured intelligence and patience. And recent work by economists (Frederick, 2005; Benjamin et al. 2006; Burks et al, 2009; Chabris et al., 2007) has demonstrated that low-IQ individuals tend to act in a more "behavioral," more impulsive fashion when facing decisions between smaller rewards sooner versus larger rewards later.

A famous series of studies known as the "Marshmallow experiments" (Mischel et al., 1972; Shoda et al., 1990) illustrates the link between intelligence and delayed gratification. In these studies, small children are placed in a room, where an adult gives them one treat, such as a marshmallow. The adult tells the child that if she waits until the adult returns to eat the marshmallow, she will get a second marshmallow. Shoda and coauthors found that children who waited longer in the 1972 experiment had higher SAT scores in the 1980's; psychologists consider SAT a proxy for IQ (*inter alia*, Frey and Detterman, 2004).[1]

Why are intelligence and patience reliably correlated? Psychologists Shamosh and Gray suggest one channel: Through the ability to keep multiple facts simultaneously in one's mind. One subsection of many IQ tests---and one correlate of overall intelligence regardless of testing method—is memory span, the ability to recall a list of numbers or letters a few moments after hearing them. An even stronger correlate of overall intelligence is reverse memory span, the ability to recite such a list in reverse. Since considering the opportunity cost of consuming now versus later requires keeping four hypothetical situations in mind (consuming vs. not consuming

[1] Since the period of delay in this experiment was only a few minutes, if one were to use the Mischel et al. experiments to estimate the relationship between time preference and IQ, small differences in IQ would predict astronomical changes in annual rates of time preference.

now; not consuming vs. consuming later), memory span provides one cognitive foundation for the IQ-patience relationship. Further work can investigate other possible channels.

Psychological and behavioral economic research establishes that IQ and patience have a statistically significant positive relationship; but macroeconomists need more: they need to know whether the relationship is economically significant (McCloskey and Ziliak, 1996). It would be valuable to have a parameter that summarizes how much a one point increase in IQ reduces a person's rate of time preference, ρ, measured for decisions that involve reasonably long periods of a year or more (For reference, note that a one standard deviation difference in IQ within a country is defined as 15 IQ points within the U.S. or U.K). Currently, three such annual estimates exist of the quantitative influence of IQ on ρ, or $\frac{\partial \rho}{\partial IQ}$. I will summarize these estimates, drawn from two studies: an econometric estimate from Warner and Pleeter (2001) and two experimental measures from Dohmen et al. (2010). I additionally present an estimate of decisions spanning a month-long horizon: because the estimate involves front-end delay, this reduces the influence of short-run hyperbolic discounting.

Warner and Pleeter used the results from a unique, high-stakes event to estimate the link between cognitive skill and time preference: The downsizing of the U.S. military at the end of the Cold War. At that time, the military offered over some enlisted personnel a choice between a lump-sum payment and an annuity; the typical lump-sum offer was $25,000, so this was a genuine high-stakes choice. The break-even discount rate averaged close to 18%. Their sample contained over 65,000 enlisted personnel, and they used a wealth of personal characteristics as regressors to estimate the determinants of the personal discount rate.

Among the characteristics were four categories of AFQT (Armed Forces Qualifying Test) score, the score used in the NLSY. The top two "Mental Groups" had statistically significantly lower discount rates: Mental Group I, whose scores were 1.5 to 2.3 standard deviations above the mean, had a discount rate 1.6% lower than Mental Group IV. Mental Group II, 0.5 to 1.5 standard deviations above the mean, had a discount rate 0.6% lower than Mental Group IV. Both were significant at the 5% level. Mental Group III was statistically indistinguishable from group IV, and because the Group III coefficient was itself negligible (+0.2%), I assume that III and IV combined have identical discount rates.

These estimates almost surely understate the influence of general mental ability on time preference, because many of the other statistically significant control variables included in the regression—a career in electronics or medicine, income, college education, and the like—are in themselves tests of mental ability (Gordon, 1997). Thus, the regression is implicitly including multiple "IQ tests," and our AFQT measure is only one among the throng.[2]

As a result, our parameter of interest, $\frac{\partial \rho}{\partial IQ}$, surely understates the true parameter value. I assume normality in order to estimate the midpoint between Mental Group I and the combination of Mental Groups III and IV. Because the military does not accept applicants below the 10th IQ percentile, groups III and IV span a range from the 10th to the 69th percentile, and yielding a midpoint of -0.27σ. Mental Group I has a midpoint of +1.8σ, so a 2.07σ rise in mental ability appears to cause a 1.6% fall in the discount rate. Thus, I arrive at a parameter estimate:

$$\frac{\partial \rho}{\partial IQ} = (-1.6\%/2.07\sigma)/15 = -0.05\%,$$

or a fall in five basis points per year per IQ point.

[2] Zax and Rees (2002) make a different but related point about including IQ with other controls as explanatory variables: Because IQ causes education, some of the effect of education should be attributed to IQ. This is similar to tracking capital accumulation that is driven by increases in TFP: In a causal framework (rather than an accounting framework) increases in output caused by such endogeous capital should be attributed to TFP, not to capital.

Our experimental estimate is much simpler to calculate. Dohmen et al. (2010) gave subjects two portions of typical IQ test (a symbol-matching test and a vocabulary test) during an economic experiment on impatience and risk-aversion run in Germany; the experiment used cash as well as attitude surveys to elicit measures of patience, and the impatience experiment involved a choice between money now (via a check sent in the mail, thus guaranteeing some front-end delay) versus money in 12 months (via a postdated check). They report overwhelming evidence that higher IQ predicts greater patience, even after controlling for income, personality measures, and other demographics. In their direct estimation of $\partial\rho/\partial IQ$, they report a value of -2.5% per standard deviation, equivalent to -17 basis points per IQ point. Here, the mean discount rate in the study was between 27.5% and 30% per year.

In their appendix, they go one step further: They assume a CRRA utility function in order to separate out risk aversion from impatience, and they estimate the effect of IQ on the rate of time preference.[3] In these estimates, based on strong functional form assumptions, higher IQ is a statistically significant predictor of greater patience in 3 of 6 estimates, with no incorrectly signed significant results. Their coefficients across various specifications, reported in $\frac{\partial\rho}{\partial IQ}$ form and in standard deviation IQ units, are: -1.5, -1.4, -1.2, -0.6, +0.2, +0.4. If I have uniform prior beliefs about the true value of $\frac{\partial\rho}{\partial IQ}$, then a simple average yields us a posterior estimate: -0.68% per standard deviation of IQ, or -4.5 basis points per IQ point, remarkably close to the Warner and Pleeter estimate.

An additional experimental study using real-money choices provides an estimate of $\partial\rho/\partial IQ$ where the time unit for ρ is months rather than years: Burks et al. (2009). Converted to

[3] Because IQ is positively correlated with risk tolerance in experimental settings (Frederick, 2002; Dohmen et al., 2010; al-Ubaydli, Jones, and Weel, 2011), and because risk tolerance is associated with higher *de facto* patience in a CRRA-based Ramsey growth model, one could include the IQ-CRRA channel in the work that follows. I hope future research explores this channel.

monthly $\partial\rho/\partial$IQ in IQ points, their estimate is -21 basis points per IQ point, or ~260 basis points per IQ point per year. The monthly estimates are significant at conventional levels.[4] The implicit mean monthly discount rate in is ~60%.

It should be noted that the monthly estimate implies annual ρ values substantially higher than the studies based on year-long choices. While the month-based estimate is larger than the year-based estimates in levels, they are of the same order of magnitude in semi-elasticities: $(\partial\rho/\partial IQ)/\rho$ per IQ point is on the order of $\frac{-1}{300}$ across these various methods.

In the interest of methodological conservatism, consider the smallest annual estimate as our estimate of $\frac{\partial\rho}{\partial IQ}$: -4.5 basis points per IQ point from the Dohmen CRRA-based estimate. Alternatively, consider the smallest semi-elasticity estimate of $(\partial\rho/\partial IQ)/\rho = -0.002$, which comes from the same CRRA estimate. Using the 4% annual real discount rate that is often the benchmark for general equilibrium calibration exercises, a 15 point, one standard deviation increase in IQ from the mean should predict a discount rate falling to 2.6% in a level specification and to 3.9% in the semi-elasticity specification. Using the highest annual estimates (the Dohmen study without imposing CRRA utility), the estimates are 1.4% in levels and 3.6% in semi-elasticities. Recall that peer effects on frugality may increase these effects.

The key feature of these estimates is that they imply a non-negligible relationship between IQ and measured time preference. As we shall see below, the precise values may be of secondary importance: In a Ramsey-style steady state the precise values are most relevant in the

[4] Oechssler et al. (2009) used a web-based experiment where the options were an immediate bank transfer of the player's winnings from the experiment versus a 10% larger bank transfer in one month. They found that high-scorers on Frederick's (2005) Cognitive Reflection Test were more likely to wait one month for a 10% larger payment ($p<0.09$): high-scorers, who made up 73% of the sample, chose immediate payment 8.1% of the time versus 12.9% of the time for the low-scoring group.

closed-economy world or along the transition to a frictionless steady-state; in a frictionless open-economy steady state, a knife-edge result holds.

Additional evidence linking higher IQ to frugality comes from recent research using the National Longitudinal Survey of Youth (Cole and Shastry, 2009). The authors investigate only sibling pairs and use sibling pair fixed effects, thus reducing the role of differences in culture, nutrition, and parental socioeconomic status. Controlling for education, income, the sibling fixed effect, and many other factors, a one standard-deviation rise in IQ (as measured by the Armed Forces Qualifying Test) predicted a 3.6% rise in one's probability of having positive net worth. The authors also find that "one standard deviation [of IQ] increases the propensity to save by 5%" (p. 26). Higher IQ also predicts a greater likelihood of having a retirement plan or a non-retirement investment account; again, the sibling fixed effect and other controls are included. The authors summarize: "[C]ognitive ability is associated with all assets and methods of investing measured in the data" (p. 26).

3. IQ and Time Preference in an Open Economy.

Now we turn to the open-economy Ramsey model, such as that covered in the third chapter Barro and Sala-i-Martin (2004). I largely focus on steady states—an assumption that is false in any particular case, but may be approximately true on average around the world, because the average nation has grown at close to the frontier country's growth rate in recent decades (*inter alia*, Fischer, 2003). Throughout, I suppress time (t) and nation (i) subscripts whenever possible. I first consider the frictionless steady state—where capital flows unencumbered to its highest return and where a nation can borrow a limitless amount at the risk-free rate.

Production is Cobb-Douglas, $Y=K^{\alpha}(AL)^{1-\alpha}$, and per-period utility is $u(c) = c^{1-\theta}/(1-\theta)$. Individuals in each country *i* discount future utility with the discount factor $1/(1+\rho_i)$. Following Barro and Sala-i-Martin, I rank countries in order of time preference, with ρ_1 the most patient country. While other economic parameters may vary from country to country—population growth (*n*), initial technology level ($A_{0,i}$) and technological progress (*g*)—these differences are irrelevant to the frictionless steady-state prediction.

In a world of free capital flows, capital is allocated to the nation where its marginal product is highest, so marginal products (net of depreciation) would be close to equalized across countries before the world reached steady-state, a prediction that approximately fits cross-country day (Caselli and Feyrer, 2007). The link between national savings and national investment completely breaks down. In such a world, how will differences in national rates of time preference influence long-term net holdings of tradable assets? Barro and Sala-i-Martin (2004) have answered this question. When all countries are ordered by their rates of time preference ρ_i, with Country 1 the most patient, they prove the following:

> "Asymptotically, Country 1 owns all the wealth…[all] claims on capital and the present value of the wage income in all countries…All other countries own a negligible amount (per unit of effective labor) in the long run" (164-165).

Thus, all countries except the most patient have negative net worth and negative holdings of net foreign assets: the most patient country holds title to all capital flows from the less patient. Consumption per unit of effective labor approaches zero (kept from zero consumption only by the Inada condition) because income flows are devoted to debt repayment. Indeed, in steady state all but the most patient country have savings rates near 100%—but these savings are mere debt repayments to the most patient country. In this steady state, the most patient country (or more realistically, *countries*) would continue to consume a non-negligible amount and would have the *lowest* savings rate(s) in the world.

As long as it is difficult for patient countries to sign credible loan contracts with less patient countries, this extreme outcome is unlikely. In practice, only some fraction of each country's capital stock (human, physical, organizational) can be collateralized. What happens in such a world? Barro and Sala-i-Martin address this possibility, where they define two types of capital, arbitrarily labeled "physical" and "human" capital, the former of which is perfectly collateralizable on the global market, the latter of which must be funded intra-country. In this world of credit frictions, the marginal product of collateralizable capital is equalized across countries in steady state, but the marginal product of noncollateralizable capital is pinned down by the closed-economy Ramsey model, taking the globally-sourced collaterizable capital as exogenous, a form of *de facto* technology. The less-patient countries again voluntarily lend to the most patient:

> "In the model with a credit constraint, the prediction is instead that all but the most patient country will eventually reach a situation in which the residents are effectively constrained in the international credit market" (173).

In the credit constrained economy, consumption is still positive in impatient countries in steady state, so savings is not 100% of GDP in these countries. Indeed, if the elasticity of collaterizable capital, α, is identical in each country's production function, then savings dedicated to repaying the most patient country will be the fraction α of GDP in steady state, identical across all countries except the most patient: All income flowing from the collateralized capital will flow outside the country.

The savings rate for noncollateralizable capital (N) will differ across countries, and will behave as in a closed economy Ramsey model. If β is the elasticity of noncollateralizable capital (e.g., with a production function of $Y=K^{\alpha}N^{\beta}L^{1-\alpha-\beta}$), then in steady state, this savings rate *s* devoted toward creating noncollateralizable capital will tend toward the conventional closed-economy value (Barro and Sala-i-Martin, 2004, 107):

$$s^* = \beta(n + g + \delta)/(\rho_i + \theta g + \delta)$$

Thus if the world is near steady state on average, then all nations except the most patient will have savings rates equal to $\alpha + s^*$, a value that rises as time preference falls; and if national time preference is negatively related to national average intelligence, then savings rates and national average intelligence should be positively related. At the same time, the most patient country (or countries) will hold all of the world's collateralizable wealth.

If nations are far from steady states, then impatient countries may still be enjoying their period of high consumption and low savings before they mortgage their futures to the most patient country (or countries). This would hold even in a world without credit frictions. Thus, there are two Ramsey-driven reasons why lower average national intelligence would predict lower savings rates: noncollateralizable capital in the steady state or a consumption boom before it.

4. Measures of National Average IQ

Having discussed empirical evidence linking IQ to patience and theory linking patience to national savings, I return to empirical evidence: evidence that average IQ currently differs across countries. The psychologist Richard Lynn and the political scientist Tatu Vanhanen (henceforth LV) assembled two collections of IQ scores by scouring the academic and practitioner literatures for reported IQ in a total of 113 countries (2002, 2006).[5] The authors used these scores to generate estimates of national average IQ (henceforth LV IQ). The LV IQ

[5] This section draws heavily from Jones (2011).

estimates have been used repeatedly in the psychology and economics literatures and have recently been used in the medical literature (Eppig et al., 2010).

Because the LV IQ database assembles data from across many decades, their national average IQ estimates include an adjustment for the Flynn Effect, the still poorly understood long-term increase in average IQs documented across many countries (a vast literature beginning with Flynn, 1987). There is some evidence the Flynn Effect has peaked or even reversed in the richest countries (Flynn, 2007; Sundet et al., 2004; Teasdale and Owen, 2005).

In assembling their database, Lynn and Vanhanen included some IQ standardization samples created by private-sector psychological testing companies and some national tests of math ability, but most of the studies they used were "opportunity samples," published studies of an ostensibly typical classroom or school in a particular country. As Jones and Schneider (2010) show, the high-quality samples and opportunity samples are highly correlated, and have a mean absolute deviation of 3.2 IQ points. For comparison, the 20th and 80th percentiles of national average IQ span 27 IQ points, and the 10th and 90th percentiles span 32.

LV IQ estimates correlate 0.7 with log GDP per capita (Jones and Schneider 2006; Dickerson 2006). Because the LV sample includes many types of IQ tests and because LV describe the IQ tests that make up each nation's IQ estimate, Jones and Schneider (2010) were able to show that this correlation holds if one uses only IQ estimates from nonverbal IQ tests such as the Ravens. The correlation between Ravens IQ and log GDP per capita is between 0.9 and 0.7, depending on the form of the test; the Ravens was the only individual test used often enough to calculate test-specific correlations. And regardless of the type of IQ test used, rank order across countries is little-affected.

The global mean LV IQ (unweighted by population) is 90, 2/3 of a UK standard deviation below the UK mean of 100. The standard deviation across countries is 11.9 IQ points. In recent work, Rindermann and coauthor (2007a,b; 2011) and Lynn and Meisenberg (2010a) have created new average national IQ estimates using different (sometimes preferable) methods but for fewer countries. Rindermann (2011) and Rindermann and Thompson (2011) found that LV IQ has a correlation of 0.86 or higher with other national tests of cognitive skill such as the TIMMS, the PRL, and the PISA. Their survey is recommended as a comprehensive discussion of the representativeness and reliability of these various cross-country tests. Because these newer estimates correlate strongly with the larger LV 2006 sample, I use the latter. LV interpolate IQ scores for countries without relevant studies; in LV 2006, they demonstrated that their 2002 interpolations were reliable when compared with later estimates as more complete data became available. Below, I typically report results using the full LV IQ dataset, which includes the interpolated IQ estimates; when estimates are run without interpolated observations, there is no substantial change in results.

One question is whether these cross-country IQ measures are reliable as indicators of human capital, whether they measure differences in the same valuable battery of mental skills across countries as they do within countries. On a variety of measures, one can say that the answer is yes. Leaving aside the purely psychometric measures of cross-cultural IQ validity (a longstanding research area in psychology, see citations in Jensen, 1998, c. 11), economists have found that within low average IQ countries, IQ scores have approximately the same relationship with wages as they do in rich countries. In both rich and poor countries, 1 IQ point is associated with between 0.5% and 1.25% higher wages. One study in rural Pakistan using the Ravens IQ test (Alderman et al., 1996) found that 1 IQ point was associated with 0.9% higher wages, very close to the Zax and Rees (2002) estimate of males in Wisconsin; and other examples can be multiplied (Behrman et al., 2004).

Some social scientists have criticized the LV datasets (Volken 2003, Wicherts et al. 2010a and citations therein); early criticisms included claims of one- to two-point errors in recording or interpreting the underlying data. In only one case was a misinterpretation substantial.[6] Random errors in the one- to two-point range are regrettable but almost surely irrelevant for empirical work; and to the extent that they introduce errors in variables, they will understate the true relationship in univariate regressions (Durbin, 1954).

Turning to regional differences in national average IQ, the psychometric literature broadly agrees that average IQs among East Asians are higher than those of Europeans (Jones, 2011; Loehlin, 2000; Mackintosh, 2011). In literature reviews, psychologists Loehlin and Mackintosh take seriously the possibility that the higher average IQ of East Asians is partly genetic in origin; Loehlin tentatively accepts the hypothesis. In rank order terms, that portion of the cross-country IQ debate is largely settled, and psychologists debate whether genes, culture, education, or some combination are the driving force behind these differences.

Academic criticism of the LV IQ measure has arisen in a series of papers by Wicherts et al. (2010a,b,c) focusing solely on LV's sub-Saharan African IQ estimates. These critics note that LV exclude many studies of African IQ from their sample, and include some studies where the researchers reported health problems or enormous irregularities in test administration (for instance, some children taking a test in rural Africa were inexperienced in the use of pencils). Lynn and Meisenberg (2010b) responded to this critique in part by noting that tests preferred by Wicherts et al. sometimes included college-student samples or otherwise elite populations,

[6] This was the estimate for Equatorial Guinea; Lynn has dropped this observation from his most recent update and it is dropped from our sample as well.

samples likely to be unrepresentative in undeveloped countries. Indeed, LV always omitted college-only samples when estimating IQ for rich countries, so their treatment was symmetric across rich and poor countries. This exchange is highly recommended for insight into how databases are constructed; and Young (2010) is recommended as a parallel reminder of the weaknesses of African GDP data.

If the critics of LV are correct, how large is the understatement of LV IQ in sub-Saharan Africa? In Wicherts et al., (2010a) the authors searched for individual studies that used only large, nationally representative samples, samples that met all of their quality requirements. In their K-12 samples, the median IQ across a variety of sub-Saharan African countries was 76.5—approximately half an intra-UK standard deviation away from LV's own estimate of average sub-Saharan African IQ: 70. By either measure, sub-Saharan African nations currently have the lowest average IQs of any region of the world. As Wicherts et al. themselves conclude, "[t]here can be little doubt that Africans average lower IQs than do Westerners" (Wicherts et al., 2010b, p. 17). The authors (2010b, p. 17) propose some methods of increasing average sub-Saharan African IQ: "These include improvements in nutrition and health (care), increases [in] educational attainment, improvements in educational practices, urbanization, large-scale dissemination of visual–spatial toys, etc. Although it cannot be precluded that genetic effects play a role in the low IQ performance of Africans, we view environmental circumstances as potentially more relevant to the present-day difference in mean." Jones (2011) surveys evidence from many countries for environmental influences on IQ—particularly from micronutrients (Behrman et al., 2004) and lead abatement, but also possibly from educational improvements. The poorest countries, with the greatest number of insults to brain health, likely have substantial possibilities for cognitive convergence.

The academic critics and Lynn agree on the point that is of most interest to economists: IQs currently differ across countries, and the rank order of the difference has broad agreement. Because the precise span of national average IQ differences is subject to some disagreement, I always report Spearman rank correlations and employ two regression methods that are relatively robust to outliers: least absolute deviations and a robust regression technique that downweights high-leverage observations.

5. National Average IQ and National Frugality

A. IQ and national savings rates

Typical measures of national savings rates may be distorted (Hsieh and Klenow 2007) by the higher relative price of investment in poor countries. Further, conventional measures do not measure savings out of disposable income. The object of interest here is the gross national savings rate, a measure that both focuses on saving out of disposable income and savings measured in local currency units unadjusted for differences in the price of capital across countries. Accordingly, I use the one high-quality source for gross national savings, that of the IMF's World Economic Outlook (Figure 1). IMF defines the measure thus: "Gross national saving is gross disposable [i.e., after-tax] income less final consumption expenditure after taking account of an adjustment for pension funds" all measured in local currency (IMF, 2011). They then divide this by GDP measured in "current local currency" (IMF, 2011).

These estimates only available from 2003 to 2008; given the short sample, the reported savings rates are the median across these years; mean and median have correlations greater than 0.98. The Spearman rank correlation of median savings rate with LV IQ is 0.32, statistically significant at the $p<0.0001$ level. To address the possibility of outliers and measurement errors, all results are reported with least absolute deviation and Stata's robust regression method (discussed in Verdari and Croux, 2009) along with OLS: In a least absolute deviation univariate regression, 1 IQ point predicts a 0.3% higher private savings rate.

As Table 1 indicates, this statistically significant result holds when controlling for national institutional quality in 2006 (the same year as the LV IQ data) jointly using three widely-used institutional quality measures: The Fraser Institute's Economic Freedom of the World, The Heritage Foundation's Economic Freedom index, and Transparency International's Corruption Perception Index. IQ coefficients are little-changed from the univariate regression estimate. Table 2 illustrates that these results also hold if the savings rate is redefined as savings as a percentage of after-tax GDP, possibly a better measure of a typical citizen's ability to save.

In results not reported in Tables 1 and 2, the savings rate was regressed on each institutional index one at a time along with LV IQ using all three estimation methods: no institutional measure was ever both statistically significant at the 10% level and correctly signed when LV IQ was included as a control. These institutional quality measures—which capture a variety of indicators of property rights, financial stability, and other plausibly productivity-enhancing policies—do not appear to predict national savings rates as effectively as LV IQ.

In a closed economy Ramsey model, expected population growth should also influence savings rates, so in additional unreported specifications I included as a control variable United Nation forecasts of national population growth through 2100 (UN, 2003, 2004) in both levels and logs; the coefficient on population growth was never statistically significant in any multivariate specification or estimation method ($p>0.2$) and the coefficient was almost always negative, the opposite of the closed economy Ramsey prediction. The absence of statistical significance for future population growth may reflect relatively free global capital flows, or may reflect less intergenerational altruism than assumed in the infinite horizon Ramsey model.

The above savings rates omit saving in the form of human capital and dissaving in the form of natural resource depletion and environmental degradation, yet as Hamilton and Clemens (1999) demonstrate both of these contributions to net savings should be influenced by a nation's rate of time preference. Hamilton and Clemens estimated "genuine savings rates" that included these omitted forms of saving for the 1970's, 80's, and early 90's for many countries. For brevity, I omit full results, but in regressions identical to those reported in Tables 1 and 2, higher LV IQ predicted higher "genuine savings rates" controlling for institutional quality and population growth. The coefficients on IQ were similar in magnitude and statistical significance to those reported in the previous tables.

Thus, both conventional and broad measures of saving are higher in nations with high cognitive skill. This is consistent with both the existence of noncollateralizable capital in steady state as well as with a frictionless world where impatient nations, far from steady state, are currently enjoying their consumption boom.

B. IQ and Net Foreign Assets

As a proxy for globally-held wealth I use the net foreign asset measures assembled by Lane and Milesi-Ferretti (2007). In an open-economy world that either retained some financial frictions or that was transitioning toward a frictionless steady-state, one would predict that the ratio of net foreign assets to GDP (N/Y) should be positively related to national average IQ: The knife-edge result from steady-state theory might not appear in the data, although one might predict a tendency to move in that direction as financial flows became freer since the end of Bretton Woods.

Lane and Milesi-Ferretti provide annual estimates of net foreign assets and nominal GDP from 1970 to 2007 for 101 countries at the beginning of the period and 178 in the final year. Because this is a net measure, banking havens are of little concern, and indeed, none are outliers. Oil-rich countries and phosphorous-rich Kiribati are modest positive outliers, but have no noticeable influence on regression outcomes.[7] Liberia is a massive negative outlier in recent years. Rather than dummy out unusual observations, I run panels with OLS, least absolute deviation, and Stata's robust regression method. As noted earlier, the latter downweights high-leverage observations. All three methods yield similar results.

In panel estimates using data from 2000-2007, higher national IQ is a reliable predictor of higher net foreign asset holdings. This result holds when the three aforementioned measures of institutional quality are also included (Fraser Institute's Economic Freedom of the World, Heritage Foundation Economic Freedom Index, and Transparency International's Corruption Perceptions Index). These institutional quality measures are measured in 2006, the same year as the LV IQ measure. Results are reported in Table 3.

The coefficients for LV IQ are quantitatively significant. When N/Y is averaged across time to smooth out massive year-to-year volatility, the cross-country standard deviation of N/Y is 1.10 (0.68 if four outliers are omitted). The standard deviation of LV IQ is 11.9. Taking the two robust regression estimates as bounds (i.e., excluding and including institutional controls), a one standard deviation increase in LV IQ in this sample (11 IQ points) predicts a rise in N/Y of

[7] Oil-intensive countries have unique portfolio reasons and unique national "life-cycle" reasons for holding more net foreign assets than other countries. In the former case, it is especially appealing for them to hold assets with returns uncorrelated with oil prices, even at the cost of lower short-run consumption. In the second case, if oil-intensive countries expect to substantially deplete their resource wealth in the future, it is rational to save for a low-productivity future.

between 0.10 and 0.25. This is comparable to the relationship between N/Y and the most robust of the three institutional measures, the Transparency International index: a one-standard deviation increase in that index (=2.2 units) predicts a rise in N/Y of 0.14. Cognitive skill is thus a useful predictor of a nation's net foreign asset holdings.

Is LV IQ a better predictor of N/Y in recent decades than in the past? The answer appears to be yes: When estimated across the full 1970-2007 period, an IQ*Year interaction term is significantly positive. This result holds across estimation methods and when institutional controls are included. The relationship between human capital and global asset accumulation has grown stronger over the decades.

C. IQ and U.S. Treasury Holdings

As a supplementary measure of national savings, consider national holdings of United States Treasuries. These are only a gross asset holding, making them an incomplete measure of net wealth.   However, as a relatively safe asset, holdings of U.S. Treasuries will tend to reflect a time preference motive little-mixed with risk tolerance.

Data on overseas holdings of U.S. Treasuries by country is available at the Treasury's website. These data combine Treasuries held by governments as well as by the private sector. I use nominal GDP measures the Penn World Tables (Heston, Summers, and Aten, 2009), measured at current (non-PPP) prices to estimate the actual nominal buying power of each country; the dependent variable is thus the Treasury/GDP ratio, T/Y.

The measure in Figure 3 is June 2007 holdings of long-term Treasury bonds divided by nominal GDP. Treasury does not separately report bonds held by governments versus private individuals; these values combine both private and public holdings. OPEC countries, Bermuda, Luxembourg, and some Caribbean countries that hold large amounts of assets for investors in other countries are omitted. Indeed, Treasury keeps separate data categories for "Caribbean tax havens" for just that reason.[8] However even if every country with data is included, the Spearman rank correlation between IQ and T/Y is 0.48, significant at the 0.01% level (n=129).

Omitting OPEC countries and tax havens, the conventional correlation (using only non-interpolated IQ data—though results are robust to inclusion of all LV IQ data) is 0.39, significant at the 0.01% level (n=82). In this case, a 15 point rise in IQ is associated with a 2.2% rise in T/Y (s.e. =0.6%). If log GDP per person is included as an additional regressor, the IQ coefficient increases to 7.1% (s.e.=2.1%), and log GDP has a negative sign and a coefficient of 4%, statistically significant at the 5% level (n=40, R^2=27%). Thus richer countries hold fewer Treasuries controlling for IQ, even though there is a positive (though statistically insignificant) bivariate correlation of 0.25 between T/Y and log GDP per person.

Using Treasury data from 1994, 2000, and 2006 to check for persistence, I find that when controlling for both national average IQ and that year's GDP per capita, IQ is always significant at the 5% level while GDP per capita is never significant at greater than the 25% level. Coefficient sizes remain comparable to those in the previous paragraph. 1994 is the earliest year for which Treasury reports holdings for a substantial number of countries.

Are these results driven by the possibly too-low estimates of sub-Saharan African IQ? Winsorizing the IQ data by raising all IQ estimates below 80 up to 80 (slightly above the median results of Wicherts et al. (2010a) mentioned above, but still below other regional averages), all of the statements of the previous paragraph still hold. National average IQ, an estimate created by psychologists, is a better predictor of long-term Treasury holdings than GDP per capita.

[8] The OPEC exclusion is largely imposed by Treasury itself: Treasury does not report U.S. financial investments of major oil exporters by country; investment data are reported in the aggregate as "Middle East Oil Exporters" and "African Oil Exporters."

These figures and regressions present a new stylized fact for growth and finance researchers: The strong relationship between national average IQ and holdings of globally traded assets. If the world moves toward freer capital flows, and if East Asian countries continue to have the world's highest average IQs, then the results presented here, interpreted structurally, predict that the net foreign asset/GDP ratio, the Treasury/GDP ratio, and other comparable measures of global asset holdings will grow ever-wider across countries, with East Asian countries holding an ever-larger proportion of the world's financial assets.

5. Conclusion

A recent Congressional Budget Office study of China's high savings rate reports that "[b]y including the East Asia dummy in some of our models, we find that factors proxied by that dummy variable also contribute to China's higher saving rate…However, it is beyond the scope of this paper to disentangle the many complex factors that are likely to be proxied by that dummy." (Hung and Qian, 2010, p. 6). The results presented here suggest that the East Asia dummy, so powerful in cross-country savings rate regressions, is in part a proxy for higher cognitive skills routinely found in East Asia and its offshoots. The nations of the world with the highest average IQ scores are, with the exception of a few resource-rich countries, the most frugal nations in the world. The link between intelligence and frugality found in microeconomic data is replicated at the cross-country level.

A sizeable literature in psychology (reviewed in Hunt, 2010; Loehlin, 2000; Mackintosh 2011) has shown that average IQ scores differ substantially across countries. In a parallel microeconomic literature, higher IQ scores are shown to be strong predictors of lower individual rates of time preference and higher savings. This paper is the first to quantitatively link these two literatures together via the open-economy Ramsey model.

The empirical results presented here suggest that policies that successfully lift cognitive skills within a country—perhaps through nutrition, education, and immigration policies--will have sizable payoffs for long-run asset accumulation.

References

al-Ubaydli, Omar, Garett Jones, and Jaap Weel (2011). "Patience and coordination in the repeated stag hunt," working paper, George Mason University.

Alderman, H., J. R. Behrman, D. R. Ross, and R. Sabot (1996). "The Returns to Endogenous Human Capital in Pakistan's Rural Wage Labour Market." *Oxford Bulletin of Economics and Statistics* 58(1):29–55.

Barro, Robert, and Xavier Sala-i-Martin, (2004). *Economic Growth*. MIT Press.

Becker, Gary and Casey Mulligan (1997). "Endogenous determination of time preference," *Quarterly Journal of Economics*, 729-758.

Behrman, J., H. Alderman, and J. Hoddinott (2004). "Copenhagen Consensus—Challenges and Opportunities: Hunger and Malnutrition." *CopenhagenConsensus.com.*

Benjamin, Daniel J., Sebastian A. Brown, Jesse M. Shapiro (2006), "Who is Behavioral? Cognitive Ability and Anomalous Preferences," Working paper, University of Chicago.

Burks, Stephen V., Jeffrey P. Carpenter, Lorenz Goette, and Aldo Rustichini (2009). "Cognitive skills affect economic preferences, strategic behavior, and job attachment," Proceedings of the National Academy of Sciences, V.6, No. 109, p. 7745-7750.

Carroll, Christopher D. and David N. Weil (1994). "Saving and growth: a reinterpretation," Carnegie-Rochester Conference Series on Public Policy 40 (1994) 133-192.

Caselli, Francesco, and James D. Feyrer (2007). "The Marginal Product of Capital," Quarterly Journal of Economics, vol. 122(2), pages 535-568.

Chabris, Christopher F., David Laibson, Jonathon Schuldt (2007). "Intertemporal Choice," in Durlaf, Steven and Lawrence Blume, eds., *The New Palgrave Dictionary of Economics* (2nd ed.). London: Palgrave Macmillan.

Cole, Shawn A. and Gauri Kartini Shastry (2009). "Smart Money: The Effect of Education, Cognitive Ability, and Financial Literacy on Financial Market Participation," Working Paper, Harvard Business School.

de Wit, H., J. D. Flory, et al. (2007). "IQ and nonplanning impulsivity are independently associated with delay discounting in middle-aged adults." Personality and Individual Differences 42(1): 111-121.

Dickerson, Richard E. (2006). "Exponential correlation of IQ and the wealth of nations," *Intelligence*, 34(3), May–June, 291-295.

Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, (2010). "Are Risk Aversion and Impatience Related to Cognitive Ability?" *American Economic Review*, 100(3), June, 1238-1260.

Durbin, J. (1954). "Errors in Variables," *Review of the International Statistical Institute*, (22, 1/3), 23-32.

Eppig, C, C.L. Fincher and R. Thornhill (2010). "Parasite prevalence and the worldwide distribution of cognitive ability," *Proceedings of the Royal Society B*, 277(1701), 3801-3808.

Feldstein, Martin, and Charles Horioka (1980). "Domestic Saving and International Capital Flows," *Economic Journal*, v. 90, no. 358, 314-329.

Fischer, Stanley 2003. "Globalization and Its Challenges." *American Economic Review*, 93(2): 1–30.

Flynn, J.R. (2007). *What is Intelligence? Beyond the Flynn Effect.* Cambridge, UK: Cambridge University Press.

Flynn, J.R. (1987). "Massive gains in 14 nations: What IQ tests really measure." *Psychological Bulletin*, 95, 29-51.

Frederick, Shane (2005), "Cognitive Reflection and Decision Making," *Journal of Economic Perspectives*, 19(4): 25-42.

Frederick, Shane, George Loewenstein, and Ted O'Donoghue (2002). "Time Discounting and Time Preference: A Critical Review," *Journal of Economic Literature*, 40, pp. 351-401.

Frey, M.C., Detterman, D.K. (2004). "Scholastic assessment or g? The relationship between the Scholastic Assessment Test and general cognitive ability." *Psychological Science* 15, 373–378.

Gordon, Robert A. (1997). "Everyday life as an intelligence test: Effects of intelligence and intelligence context," *Intelligence*, Volume 24, Issue 1, January-February 1997, Pages 203-320.

Grinblatt, Mark, Matti Keloharju, and Seppo Ikäheimo (2008). "Social Influence and Consumption: Evidence from the Automobile Purchases of Neighbors," *Review of Economics and Statistics*, 90:4, 735-753.

Hamilton, Kirk and Michael Clemens (1999). "Genuine Savings Rates in Developing Countries," *World Bank Economic Review*, 13(2), 333-56.

Hanushek, Eric, and Ludger Woessmann (2010). "The Economics of International Differences in Educational Achievement," NBER Working Paper 15949.

Heston, Alan, Robert Summers and Bettina Aten (2009). *Penn World Table Version 6.3*, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, August.

Hsieh, Chang-Tai, and Peter J. Klenow (2007). "Relative Prices and Relative Prosperity." *American Economic Review*, 97(3): 562–85.

Hung, Juann H. and Rong Qian (2010). "Why is China's Savings Rate So High? A comparative study of cross-country panel data," Working paper 2010-07, Congressional Budget Office.
Hunt, Earl B. (2010). *Human Intelligence.* Cambridge University Press.

International Monetary Fund (2011). *World Economic Outlook Database*, September. http://www.imf.org/external/pubs/ft/weo/2011/02/weodata/download.aspx.

Jensen, A. R. (1998). The g-factor: The science of mental ability. Westport, CT: Praeger.

Jones, Garett (2011). "IQ and National Productivity," *New Palgrave Dictionary of Economics*. New York: Palgrave Macmillan.

Jones, Garett and W. Joel Schneider (2006). "Intelligence, Human Capital, and Economic Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach," *Journal of Economic Growth*, Vol. 11, No. 1, March.

Jones, Garett and W. Joel Schneider (2010). "IQ in the Production Function: Evidence from Immigrant Earnings," *Economic Inquiry*, 48:743-755.

Hsieh, Chang-Tai and Peter J. Klenow (2007). "Relative Prices and Relative Prosperity," *American Economic Review*, 97(3), 562-585.

Kuhn, Peter, Peter Kooreman, Adriaan Soetevent, and Arie Kapteyn (2011). "The Effects of Lottery Prizes on Winners and Their Neighbors: Evidence from the Dutch Postcode Lottery," *American Economic Review*, 101 (August): 2226–2247.

Lane, Philip R., Gian Maria Milesi-Ferretti (2007). "The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970–2004," Journal of International Economics, 73(2), 223-250.

Loehlin, J.C. (2000). "Groups Differences in Intelligence," in R.J. Sternberg, ed., *Handbook of Intelligence*, Cambridge University Press.

Lutz, Wolfgang, Warren Sanderson, Sergei Scherbov (2001). "The end of world population growth," *Nature*, 412:543-545, August.

Lynn, R. and G. Meisenberg (2010a). "National IQs calculated and validated for 108 nations," *Intelligence*, 38(4), 353-360.

Lynn, Richard, and Gerhard Meisenberg, (2010b). “The average IQ of sub-Saharan Africans: Comments on Wicherts, Dolan, and van der Maas,” Intelligence, Volume 38, Issue 1, January-February 2010, Pages 21-29, ISSN 0160-2896, DOI: 10.1016/j.intell.2009.09.009.

Lynn, Richard, and Tatu Vanhanen (2002). *IQ and the Wealth of Nations*, Praeger Publishers.

Lynn, Richard, and Tatu Vanhanen (2006). *IQ and Global Inequality,* Washington Summit Publishers.

Mackintosh, Nicholas (2011). *IQ and Human Intelligence*. Oxford University Press.

McCloskey, Deirdre N. and Stephen T. Ziliak (1996). “The Standard Error of Regressions,” *Journal of Economic Literature,* 34(March), 97-114.

Mischel, Walter; Ebbe B. Ebbesen, Antonette Raskoff Zeiss (1972). "Cognitive and attentional mechanisms in delay of gratification." *Journal of Personality and Social Psychology* 21 (2): 204–218.

Oechssler, Jörg, Andreas Roider, Patrick W. Schmitz, (2009). “Cognitive abilities and behavioral biases.” *Journal of Economic Behavior and Organization,* 72(1), pps. 147-152.

Potrafke, N. (2012). “Intelligence and corruption.” *Economics Letters*, 114(1), 109-112.

Rae, John M. (1834). *New Principles of Political Economy*. Republished as *The Sociological Theory of Capital,* New York: Macmillan and Company, 1905.

Ram, Rati (2007). “IQ and economic growth: Further augmentation of Mankiw-Romer-Weil model,” *Economics Letters,* V. 94, Issue 1, January, Pages 7-11.

Rindermann, Heiner (2011). “Intellectual classes, technological progress and economic development: The rise of cognitive capitalism,” *Personality and Individual Differences*, in press, corrected proof.

Rindermann, Heiner (2008). “Relevance of education and intelligence at the national level for the economic welfare of people,” *Intelligence*, V. 36, Issue 2, March-April 2008, Pages 127-142.

Rindermann, H. (2007a). “The big G-factor of national cognitive ability,” European Journal of Personality 21, 767–787.

Rindermann, Heiner (2007b). “The g-factor of international cognitive ability comparisons: the homogeneity of results in PISA, TIMSS, PIRLS and IQ-tests across nations,” *European Journal of Personality,* August, p 667-706.

Rindermann, Heiner and James Thompson (2011). “Cognitive Capitalism: The Effect of Cognitive Ability on Wealth, as Mediated Through Scientific Achievement and Economic Freedom.” *Psychological Science*, 22(June), 754-763.

Romer, David (2000). *Advanced Macroeconomics*, second ed., McGraw-Hill Irwin.

Shamosh, Noah A., and Jeremy R. Gray, (2008). "Delay discounting and intelligence: A meta-analysis," Intelligence, Volume 36, Issue 4, July-August 2008, Pages 289-305,

Shoda, Yuichi; Mischel, Walter; Peake, Philip K. (1990). "Predicting Adolescent Cognitive and Self-Regulatory Competencies from Preschool Delay of Gratification: Identifying Diagnostic Conditions". *Developmental Psychology* 26 (6), 978–986

Sundet, J.M., D.G. Barlaug, and T.M. Torjussen (2004). "The End of the Flynn Effect? A study of secular trends in mean intelligence test scores of Norwegian conscripts during half a century." *Intelligence* 32, 349-362.

Teasdale, T.W., and D.R. Owen (2005). "A long-term rise and recent decline in intelligence test performance: The Flynn Effect in reverse," *Personality and Individual Differences* 39, 837-843.

United Nations (2004). "World Population to 2300," Department of Economics and Social Affairs, Population Division, ST/ESA/SER.A/236.

United Nations (2003). "Below-replacement fertility expected in 75 per cent of developing countries by year 2050 according to UN population report," press release, POP/850, 26 February.

Verdari, Vincenzo and Christophe Croux (2009). "Robust Regression in Stata," *Stata Journal* 9(3), 439-453.

Volken, Thomas (2003). "IQ and the Wealth of Nations. A Critique of Richard Lynn and Tatu Vanhanen's Recent Book," *Eur Sociol Rev*, 19(4), 411-412.

Warner, John T. and Saul Pleeter (2001), "The Personal Discount Rate: Evidence from Military Downsizing Programs," *American Economic Review*, Vol. 91, No. 1 (Mar., 2001), pp. 33-53.

Weede, E., & Kampf, S. (2002). "The impact of intelligence and institutional improvements on economic growth," *Kyklos*, 55, 361–380.

Whetzel, Deborah L., Michael A. McDaniel (2006). "Prediction of national wealth," *Intelligence*, 34(5), September–October, 449-458.

Wicherts, Jelte M., Conor V. Dolan, Jerry S. Carlson, Han L.J. van der Maas (2010a). "Another failure to replicate Lynn's estimate of the average IQ of sub-Saharan Africans," *Personality and Individual Differences*, 20:155-157.

Wicherts, Jelte M., Conor V. Dolan, and Han L.J. van der Maas (2010b). "A systematic literature review of the average IQ of sub-Saharan Africans," *Intelligence*, Volume 38, Issue 1, January-February, Pages 1-20.

Wicherts, Jelte M., Conor V. Dolan, Jerry S. Carlson, Han L.J. van der Maas (2010c). "Raven's test performance of sub-Saharan Africans: Average performance, psychometric properties, and the Flynn Effect," *Learning and Individual Differences* 20(3, June), 135-151.

Young, A. (2010). "The African Growth Miracle," unpublished manuscript, London School of Economics.

Zax, Jeffrey S. and Daniel I. Rees. (2002). "IQ, Academic Performance, Environment, and Earnings," Review of Economics and Statistics, 84, 4, 600-616.

Table 1: National IQ and gross national savings rates, 2003-2008.

Dependent Variable: Median national savings rate between 2003-2008						
LV IQ	0.249*** (0.070)	0.273*** (0.059)	0.326*** (0.061)	0.246* (0.097)	0.293** (0.085)	0.288** (0.092)
Fraser EFW				1.880 (2.121)	3.216 (1.87)	2.657 (2.018)
Heritage EFI				-0.298 (0.231)	-0.489 (0.204)	-0.427 (0.220)
Trans Intl CPI				0.226 (0.727)	0.431 (0.651)	0.596 (0.663)
R^2	8%	n/a	8%	8%	n/a	8%
N	159	159	159	128	128	128
Method	OLS	Robust Reg.	LAD	OLS	Robust Reg.	LAD

Notes: *,**,*** denote 5%, 1%, and 0.1% statistical significance, respectively. Results little-changed when dependent variables is mean private savings rate as reported by IMF World Economic Outlook. Robust regression employs Stata defaults. Least absolute deviation reports pseudo-R^2. When institutional measures are included with LV IQ one at a time, no institutional measure is both correctly signed and significant at the 10% level. Constants not reported.

Table 2: National IQ and gross national savings per unit of after-tax GDP, 2003-2008.

Dependent Variable: Median national savings per unit of after-tax income 2003-2008						
LV IQ	0.540*** (0.124)	0.552*** (0.084)	0.596*** (0.117)	0.366* (0.172)	0.468*** (0.110)	0.346** (0.131)
Fraser EFW				3.159 (3.786)	3.256 (2.413)	3.285 (2.902)
Heritage EFI				-0.636 (0.414)	-0.961*** (0.264)	-0.954** (0.312)
Trans Intl CPI				2.444 (1.299)	3.212*** (0.828)	3.851*** (0.473)
R^2	11%	n/a	12%	13%	n/a	16%
N	161	161	161	129	129	129
Method	OLS	Robust Reg.	LAD	OLS	Robust Reg.	LAD

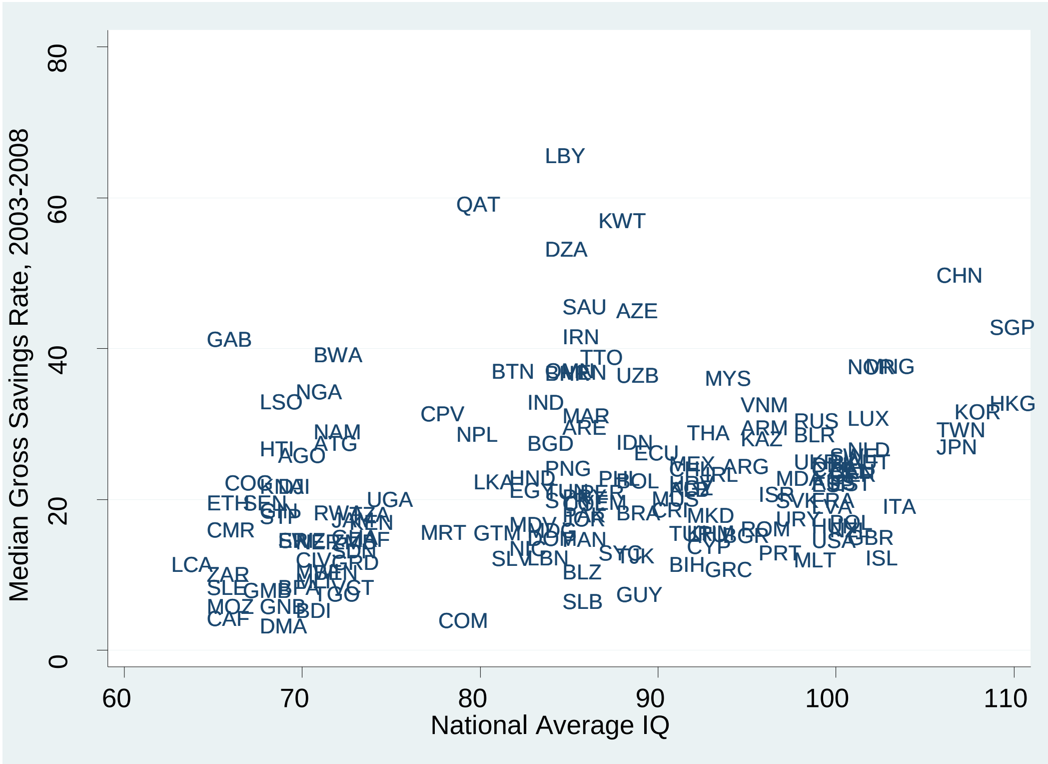
Notes: *,**,*** denote 5%, 1%, and 0.1% statistical significance, respectively. Results little-changed when dependent variables is mean savings rate. Robust regression employs Stata defaults. Least absolute deviation reports pseudo-R^2. When institutional measures are included with LV IQ one at a time, no institutional measure is both correctly signed and significant at the 10% level. Constants not reported.

Table 3: National IQ and Net Foreign Assets

Dependent Variable: Net Foreign Assets/GDP	2000-2007	2000-2007	2000-2007	2000-2007	2000-2007	1970-2007	1970-2007	1970-2007		
LV IQ	0.0367*** (0.0026)	0.0206*** (0.0013)	0.0090*** (0.0023)	0.0085*** (0.0017)	0.0093*** (0.0016)	0.0143*** (0.0005)	-0.9083*** (0.0855)	-0.6282*** (0.0831)		
EFW 2006			0.0864 (0.0492)	0.0160 (0.0356)	0.0115 (0.0342)			-0.0008 (0.0131)		
TI 2006			0.0743*** (0.0167)	0.0625*** (0.0121)	0.0556*** (0.0116)			0.0399*** (0.0047)		
Heritage 2006			0.0016 (0.0055)	-0.0060 (0.0040)	-0.0044 (0.0038)			-0.0054*** (0.0015)		
Year							-0.0448*** (0.0039)	-0.0309*** (0.00004)		
IQ*Year							0.0005*** (0.00004)	0.0003*** (0.00004)		
R^2	13%	n/a	22%	n/a	9%	n/a	n/a	n/a		
N	1379	1379	1048	1048	1048	5541	5541	4355		
Method	OLS	Robust Reg.	OLS	Robust Reg.	LAD	Robust Reg.	Robust Reg.	Robust Reg.		

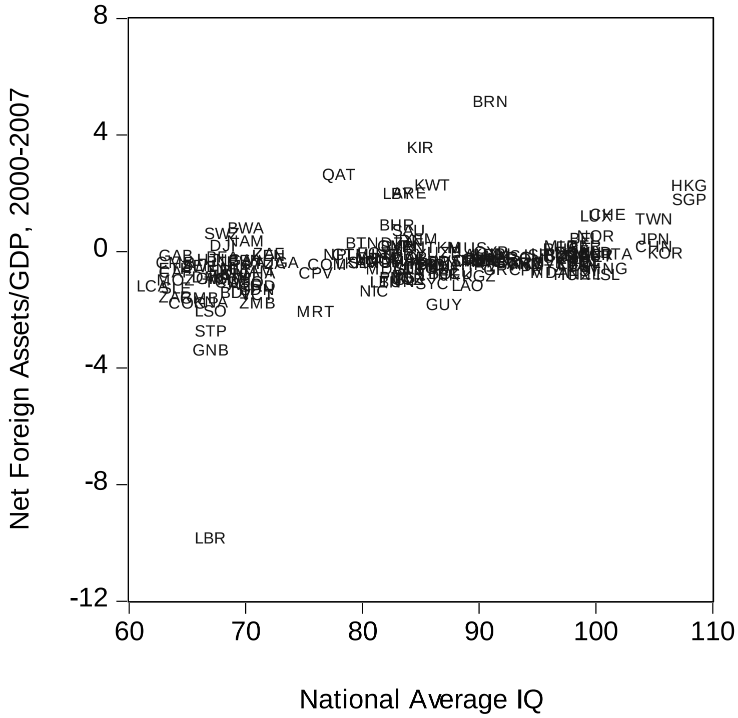
Notes: *,**,*** denote 5%, 1%, and 0.1% statistical significance, respectively. Year dummies (always included) not reported. Robust regression employs Stata defaults. Least absolute deviation reports pseudo-R^2. Reported robust regression results have similar statistical and economic significance when estimated via OLS or LAD. Constants not reported.

Figure 1
National IQ and Gross National Savings Rate, 2003-2008



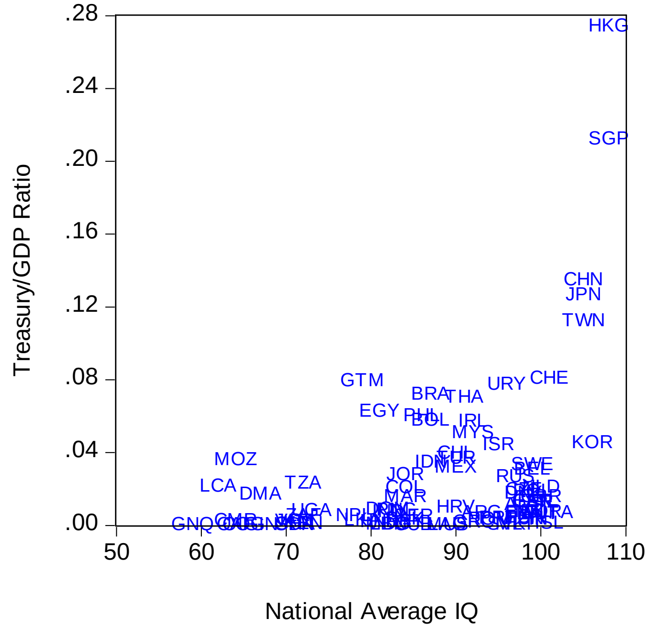
Notes: Spearman rank correlation = 0.32, p<0.0001. Spearman correlation=0.33 if mean private savings rate used. Only Chad, with median and mean private savings < -40%, is omitted. In a least absolute deviation regression, 1 IQ point predicts a 0.3% higher national savings rate. Source: IMF World Economic Outlook and Lynn and Vanhanen (2006).

Figure 2
National Average IQ vs. Net foreign assets to GDP ratio, 2000-2007



Note: Spearman rank correlation = 0.43, p<0.0001. Rank correlation = 0.50 if interpolated IQ estimates omitted. In a univariate least absolute deviation regression, one IQ point predicts a 2.0% increase in net foreign assets to GDP.

Figure 3
National Average IQ and Treasury Holdings



Note: Bermuda, Luxembourg, OPEC countries and Caribbean tax havens omitted (e.g., for Bermuda, T/Y=5). ρ=0.39 (p<0.01%).