

Measuring the Sacrifice of Open Borders

Garett Jones
George Mason University
November 2019
Preliminary: Corrections Welcomed

Abstract: How would Open Borders—a policy of unlimited immigration—change the wages of current residents of the United States? To answer this question, I begin by running the same quantitative experiment that Caplan runs on page 131 of his graphic novel *Open Borders: The Science and Ethics of Immigration*. This experiment presumes that the only two drivers of national income per capita are national average IQ and an unexplained productivity residual. I use the same constant returns to scale framework as Caplan, in which the migration of every human being to the United States would increase global output per capita by about 80%. I then estimate that in the benchmark model, where IQ’s social return is much larger than its private return, the per-capita income of current U.S. residents would permanently fall by about 40%. This is not an arithmetic fallacy: this is the average causal effect of Open Borders on the incomes of ex-ante Americans. This income decline occurs because cognitive skills matter mostly through externalities: because your nation’s IQ matters so much more than your own, as I claim in 2015’s *Hive Mind*. Therefore, a decline in a nation’s set of average cognitive skills will tend to reduce the productivity of the nation’s ex-ante citizens.

Jones: Department of Economics, George Mason University. *Contact:* jonesgarett@gmail.com, or twitter.com/GarettJones.

How much would an American policy of Open Borders change the world? Consider the simple log-linear model that underlies Caplan's estimate on page 131 of *Open Borders: The Science and Ethics of Immigration*. Caplan estimates that if everyone on Earth moved to the United States, world GDP per person would rise by 81%. The model he draws upon is essentially the same model used in a pair of Jones and Schneider papers (*Journal of Economic Growth*, 2006; *Economic Inquiry*, 2010). The model is useful for thinking about externalities within any constant returns to scale, steady-state Solow or Ramsey model. It's a good workhorse model, even though it is surely not a complete model of the wealth of nations. I'll use this model to address the same question Caplan poses on page 131: what happens if Open Borders are enacted, and everyone in the world moves to the U.S.? I ignore short-term disruptions and just consider *a best case scenario within that specific framework*. An extreme case, but a focal one, and one useful for quantifying the best possible outcomes from Open Borders.

IQ, like other human capital measures, appears to have an exponential effect on income; that exponential relationship can also be treated as log-linear. Let's define a few variables:

y_{us} is log income per person in the U.S. before Open Borders (i.e., ex-ante annual U.S. income per person). Logs work a lot like percentages;

y_{world} is log income per person for the planet before Open Borders;

IQ_{us} and IQ_{world} are just average test scores (national average IQ here, but results would turn out essentially the same using any standardized test scores);

β_{IQ} is the national long-run boost to income per person (in percent, or log points) of one extra point of national average IQ. This number is assumed the same everywhere in the world. My 2006/2010 estimate of β_{IQ} is 6.1%, and Caplan uses that number;

and finally, α_{us} and α_{world} are the unexplained, permanent productivity

“shocks” for the U.S. and for the world as a whole, respectively. They’re also logs, so again they’re a lot like percentages.

The log-linear model of income per person in the U.S. will look like this:

$$y_{us} = \alpha_{us} + IQ_{us}\beta_{IQ}$$

And the world as a whole (which includes the U.S., about 5% of the world’s population) will look like this:

$$y_{world} = \alpha_{world} + IQ_{world}\beta_{IQ}$$

Using Caplan’s numbers (pages 131 and 231, which imply ex-ante annual U.S. income per person of \$58,000, along with a U.S. average IQ of 98), the U.S. equation becomes:

$$\ln(58,000) = \alpha_{us} + (98)0.061$$

And with his chosen estimate of an average world IQ of 87 and average global income per capita of \$16,000, the world equation becomes:

$$\ln(16,000) = \alpha_{world} + (87)0.061$$

Taking the difference between the US and the world output per capita equations:

$$1.28 = \alpha_{us} - \alpha_{world} + (11)0.061$$

This means that the unexplained, unmodeled, effectively exogenous productivity boost from being in the United States in particular rather than just being on planet Earth in general is:

$$\Delta\alpha_{us} \equiv \alpha_{us} - \alpha_{world} = 1.28 - 0.67 = 0.61$$

So in his model there is an unexplained permanent shock to U.S. productivity worth 61 log points: that's $e^{0.61} - 1$ or 84% more output per person, for every person located in the United States, quite apart from any IQ externality (the number is a touch higher than Caplan's 81% due to some rounding along the way on my part). That means that moving everyone to the U.S. would raise average global income to \$29,000 per person, nearly doubling its old level. Impressive by any measure.

Attention should be paid to the root causes of that 84%, since it plays such an important role in Open Borders activism—is it permanent or temporary? If a mix, which fraction is permanent? Is it mostly geography? Is it the effects of other human traits, individual or emergent, that aren't captured by national average IQ? But for this essay we'll treat the 61 log points the way Caplan does: Permanently attached to U.S. territory.

Quantifying the Sacrifice of Open Borders

How will Open Borders affect the incomes of ex-ante U.S. citizens in this one-country world? This isn't an arithmetic fallacy question—I'm not asking what happens to average height in a classroom if a relatively tall person walks in. I'm asking what will happen to the actual paychecks of ex-ante Americans before versus after Open Borders in this particular model of the world economy. As Caplan emphasizes, and as the subtitle of my book *Hive Mind* implies, IQ mostly matters through externalities, through spillovers: your nation's IQ matters more than your own. So how will ex-ante U.S. citizens fare when about 7 billion immigrants arrive, most of whom, as the World Bank's Harmonized Test Scores demonstrate, currently have lower cognitive skills than the average ex-ante American? [cf. Patrinos and Angrist, World Bank, 2018.]

The answer to the question turns out to be simple, and I'll round just a little to make it even simpler. Since the average American has moderately higher test scores

than the average resident of the planet—98 IQ points versus 87—and since 1 IQ point predicts about 1% higher wages in my favorite estimate (Zax and Rees, *Review of Economics and Statistics* 2002), then all we need to do is take our above estimate of average income in Open Borders America—\$29,000 per person—and then add a bit more than 11% to it. That’s roughly what happens in the rest of this section.

Let’s write down a precise model of *individual* income per person in a hypothetical country x . We don’t just want average national income per capita: we now want a model that captures both the (smallish) individual returns to IQ and the (biggish) social returns. That smallish private return is denoted γ_{IQ} , and as noted I think a good estimate of the value of γ_{IQ} is 1%. Some think it’s bigger than that, some smaller, but I’m happy to stick with a median if not a consensus estimate. If you’ve got an IQ that’s one point higher than the national average IQ_x , then holding other things equal you’ll earn 1% more than your country’s average. Capture any other personal, non-IQ shocks to person i ’s productivity with a simple mean-zero shock e_i . A person i with individual test score of IQ_i living in country x will then earn a (log) income of $y_{i,x}$ as follows:

$$y_{i,x} = \alpha_x + IQ_x \beta_{IQ} + (IQ_i - IQ_x) \gamma_{IQ} + e_i$$

Thus a “totally average” person i living in country x will have nation x ’s average IQ and will have $e_i = 0$. So the above equation reduces to our standard national per-capita income equation, and confirms we’re on the right path:

$$y_{i,x} = \alpha_x + IQ_x \beta_{IQ}$$

Let’s use the individual income equation to measure the income of the average ex-ante American living in Open Borders America. Let’s see how Open Borders changed their lives. Denote this “after” version of America with the acronym *OBA*. Average IQ in *OBA* is assumed to be the world average of 87, but the average IQ of ex-ante Americans living in *OBA* is still 98 (again we’re keeping the IQ figures exogenous, as Caplan does). The personal productivity shock e_i , averaged over all ex-ante

Americans, will be zero. So the average (log) income of ex-ante Americans, $y_{us,OBA}$, will be

$$y_{us,OBA} = \alpha_{us} + IQ_{world}\beta_{IQ} + (IQ_{us} - IQ_{world})\gamma_{IQ}$$

Since we want to measure the sacrifice that ex-ante Americans will make for the cause of Open Borders, we need to estimate the *difference* between ex-ante American incomes before versus after Open Borders. Recall the ex-ante American income equation:

$$y_{us} = \alpha_{us} + IQ_{US}\beta_{IQ}$$

To quantify the effect of Open Borders on ex-ante Americans, we'll take the difference between the two. And notice: this calculation *assumes* that the U.S.'s unique and critically important productivity shock α_{US} lasts forever:

$$y_{us,OBA} - y_{us} = (IQ_{World} - IQ_{us})\beta_{IQ} + (IQ_{us} - IQ_{world})\gamma_{IQ}.$$

Everything on the right hand side is a value we pretend to know:

$$y_{us,OBA} - y_{us} = (-11)0.061 + (11)0.01 = -11(0.051)$$

And that's the result we've been looking for: -0.561 log points. That's the average decline in income predicted for ex-ante Americans when you take account of both IQ's large national return and standard estimates of IQ's much smaller individual return. How big is that, in percentages? It's a 43% drop, since $e^{-0.561} = 0.57$, 43% below the starting value. Using Caplan's base year estimate of U.S. income per capita of \$58,000 per person, that would suggest the mean per-capita income of ex-ante Americans would fall from \$58,000 to \$33,000. It's about 14% higher than the Open

Borders America average of \$29,000, but quite a decline from the world before Open Borders. Is a 43% drop in income a large sacrifice for the cause of Open Borders? I'll leave that for each reader to answer personally.

Optimal Policy in this Model

While it might sound intuitive that in a world of Open Borders, the most efficient policy is the one that moves everyone to the most productive country (or at least to the most productive country covering a vast area), that is not the optimal policy in this simple two-factor, IQ + residual model of national income per capita. Here I set aside the question of the optimal allocation of immigrants across *multiple* countries; the non-linearities of the exponential return to cognitive skill are big enough for that to matter, but I leave that topic for another day. Instead, consider the optimal single-destination immigration policy: the optimal policy is to move everyone on the planet to the nation with the highest productivity residual. Consider: if global average IQ is 87, then for any single country x , moving everyone in the world to that country would yield a per-capita income of

$$y_x = \alpha_x + 87\beta_{IQ}$$

And since β_{IQ} , the national payoff to cognitive skills, is exogenous, the *only* factor that matters when choosing the optimal destination country is α_x , the productivity residual for that country. Fortunately, in Figure 1 of Jones and Schneider (2010), one can eyeball the values of α_x for dozens of nations. If we ignore, for obvious reasons, countries heavily weighted toward natural resources, then the nation with the largest productivity residual on this two-factor model appears to be South Africa. While further investigation is appropriate, it appears that the most promising nation for Open Borders activists to focus on as a destination for unrestricted global migration may be South Africa.

Of course, different models will yield different optimal immigration destinations. But the underlying principle is general: optimal immigration policy should focus

on the nations with the largest productivity residuals, residuals that net out the effects of traits that migrants tend, to a substantial degree, to import to their new nations. Whether one considers the relevant imported skills to be cultural, cognitive, personality-driven, or some combination of the three, the effect of those imported skills must be removed from the analysis when choosing the optimal immigration destination. The optimal location, as Caplan suggests on page 126 of *Open Borders*, should focus on permanent, unalterable traits that boost productivity, traits that might include explainable factors like geography. In any case, permanent productivity shocks attached to a precise location, whether explained or unexplained, are indispensable to the case for Open Borders.

Discussion

Let's return to the central claim of this essay, that in a benchmark model, moving everyone in the world to the United States would reduce the incomes of ex-ante Americans by about 40%. Naturally, there are endless ways to change this result. Indeed, Chapters 8 and 9 of *Hive Mind* offer another approach to considering the effects of immigration. Those chapters build on the Dual Labor Market theory studied by (among others) Dickens and Lang (AER, 1984) and on the O-Ring Theory of new Nobel laureate Michael Kremer (QJE, 1993). In such settings, high- and low-skilled workers wind up in quite different sectors of the economy, earning vastly different wages. Worth thinking through another time.

The approach of this short essay is instead close to the Mincer (1974) education wage regression approach common in labor economics: it assumes there's a log-linear return to some measure of worker skill, an assumption that fits quite a lot of facts. And here I further assume that those returns to skill are truly returns to productivity, that cognitive skills help workers produce more output. Further, this essay, like much of my own research, sticks close to the theory that differences in productivity across countries are mostly externalities, bigger than any one person and shared by essentially everyone within a country.

The source of those externalities matters. When comparing the 90th percentile to the 10th, average income per capita differs across countries by a factor of about 24. By contrast, within the ostensibly high-inequality United States that same 90/10 ratio is about 6. Most income inequality is across, not within countries. And most of that cross-country inequality is due to differences in productivity, in particular to differences in total factor productivity, the magic that moves the world, the magic that creates investment in physical and organizational capital. Understanding the root causes of total factor productivity differences continues to be a great intellectual challenge for economists. I hope that this century makes major progress in creating what Nobel laureate Ed Prescott called for in his important 1997 paper. That paper's title: "Needed: A Theory of Total Factor Productivity." Externalities, I believe, will be an important part of that theory.

References

Caplan, B. and Weinersmith, Z., 2019. Open Borders: The Science and Ethics of Immigration. First Second.

Dickens, W. and Lang, K., 1984. A test of dual labor market theory.

Jones, G., 2015. Hive mind: how your nation's IQ matters so much more than your own. Stanford University Press.

Jones, G. and Schneider, W.J., 2006. Intelligence, human capital, and economic growth: A Bayesian averaging of classical estimates (BACE) approach. *Journal of economic growth*, 11(1), pp.71-93.

Jones, G. and Schneider, W.J., 2010. IQ in the production function: Evidence from immigrant earnings. *Economic Inquiry*, 48(3), pp.743-755.

Kremer, M., 1993. The O-ring theory of economic development. *The Quarterly Journal of Economics*, 108(3), pp.551-575.

Mincer, J.A., 1974. Schooling, Experience, and Earnings. NBER Books.

Patrinos and Angrist, 2018. <http://documents.worldbank.org/curated/en/390321538076747773/Global-Dataset-on-Education-Quality-A-Review-and-Update-2000-2019>

Prescott, E.C., 1998. Lawrence R. Klein lecture 1997: Needed: A theory of total factor productivity. *International economic review*, pp.525-551.

Zax, J.S. and Rees, D.I., 2002. IQ, academic performance, environment, and earnings. *Review of Economics and Statistics*, 84(4), pp.600-616.