



Knowledge and Growth: What Paul Romer's Economics Nobel Prize Says About Africa's Infrastructure Obsession

By David Ndi



The Nobel Prize season is one of the things I look forward to, not least because there is a prize in economics. But the more important reason is that it is always a welcome reminder that humanity's most important work is not done by the powerful, the moneyed and the celebrities that hog the daily limelight, but by the people of ideas and ideals. And in these dog days of an apocalyptic time, it could not come often enough.

This year's economics Nobel Prize was shared by William Nordhaus and Paul Romer for contributions to natural resource economics and economic growth respectively. The commonality between their work is rather technical and I shall not go into it, but it has to do with developing methods of analyzing the interaction of the economy with complex phenomena — in Nordhaus case, climate, and in Romer's, knowledge. The latter is the subject of this column.

Romer pioneered what is now known as new or endogenous growth theory. Hitherto, economists treated knowledge and technical progress as "exogenous", that is, something that occurred outside the economic system. This was quite awkward since it was quite obvious that research and innovation were fundamental elements of the economic system.

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Another seminal contribution was made by Robert Lucas, the 1989 Nobel Laureate. There is an interesting backstory to his prize. Seven years before, his ex-wife had inserted a clause in their divorce settlement that entitled her to half the prize money if he won it. The prize came 21 days before the provision lapsed. Romer's prize has an interesting backstory too: he is the second chief economist of the World Bank to leave the institution acrimoniously only to be awarded the Nobel Prize shortly thereafter— the other one is Joseph Stiglitz.

Paul Romer's model emphasizes the role of knowledge in long run economic growth; Lucas model emphasizes human capital. The two are intimately related but are not the same thing, although many people, including economists, often conflate them. Let me illustrate.

I came across a trending story—about a young Philippino inventor who had just successfully tested his passenger drone in the provincial city of Batangas, Watching the video, his geek-in-a garage drone is as good as those that have been showcased by tech companies with lots of venture capital money. In fact, it looked more fun to fly than the ones I have seen before. And the guy is not even an engineer. And he built it in a garage. An Australian company was sufficiently impressed to propose a commercial partnership. It was then brought to my attention, pleasantly so, that a young Kenyan, Morris Mbetsa, has built and tested one—he tweeted me video footage.

“How to build a passenger drone” i.e. the science and engineering is knowledge—that's Romer.. The ability of a geek in a garage in Batangas and Ong'ata Rongai to use that knowledge to build a drone in a garage in Banda is human capital— that's Lucas. One can think of Romer's model as explaining how the world becomes more prosperous; Lucas' as explaining why we see developing countries catching up with rich countries. When the Wright brothers made their maiden flight in 1903, it was hard to imagine a native in the colonies somewhere in Africa or Asia making a viable attempt to manufacture an aircraft. A couple of decades ago it took an entire national industrial project to make “Nyayo Pioneer”, the ill-fated contraption that stalled on the track in Kasarani stadium on the occasion of its launch. All the same, from the look of things your future personal transportation could well be made in Kariobangi.

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If knowledge and human capital are the engines of economic growth, what is the role of the foreign investment and infrastructure edifices that our governments are obsessed with?

The title of one of Lucas's less well known papers on the subject, published in the 1990 edition of the American Economic Review, poses the following question: *Why doesn't capital flow from rich to poor countries?* The article links investment, human capital and growth in a simple and intuitive manner. Suppose there are only two countries, a rich and a poor one - let's call them America and Bangladesh. Average monthly factory wages in the two countries are \$1800 and \$60 respectively - that is, wage in America is 30 times more than in Bangladesh. At first, they do not trade. Each country makes its own clothes. Suppose they decide to trade?

Let us say it takes a worker one hour to stitch together a pair of jeans. In America, the labour cost for this is \$11.25. In Bangladesh, it would cost \$0.325. Even if productivity in Bangladesh was only a third of America, it would still cost a dollar to stitch the pair of jeans in Bangladesh. Let us say Made in America sold for \$50. The retailers could sell Made in Bangladesh jeans at \$45 dollars and still make \$5 more. Off-shoring garment factories to Bangladesh would be very profitable. This would continue until Bangladeshi wages rise to the point where cost of production is the same in both countries. As it happens, the wage figures cited are quite close to what the actual wage costs in America and Bangladesh are. And indeed Bangladesh is now second to China in garment exports, earning US\$ 28 billion last year, and employing over four million people.

The garment making industry makes a good example because it is a very basic skill that we can reasonably expect people with little or no education to learn quickly and do as well as better educated ones. Using similar analogy with US and India, but with more sophisticated data and mathematics, Lucas demonstrated that at the time he was writing, the return on capital in India would have been 58 times more than in the US. This then begs the question: with profitable opportunities of this magnitude why are poor countries not inundated with investment?

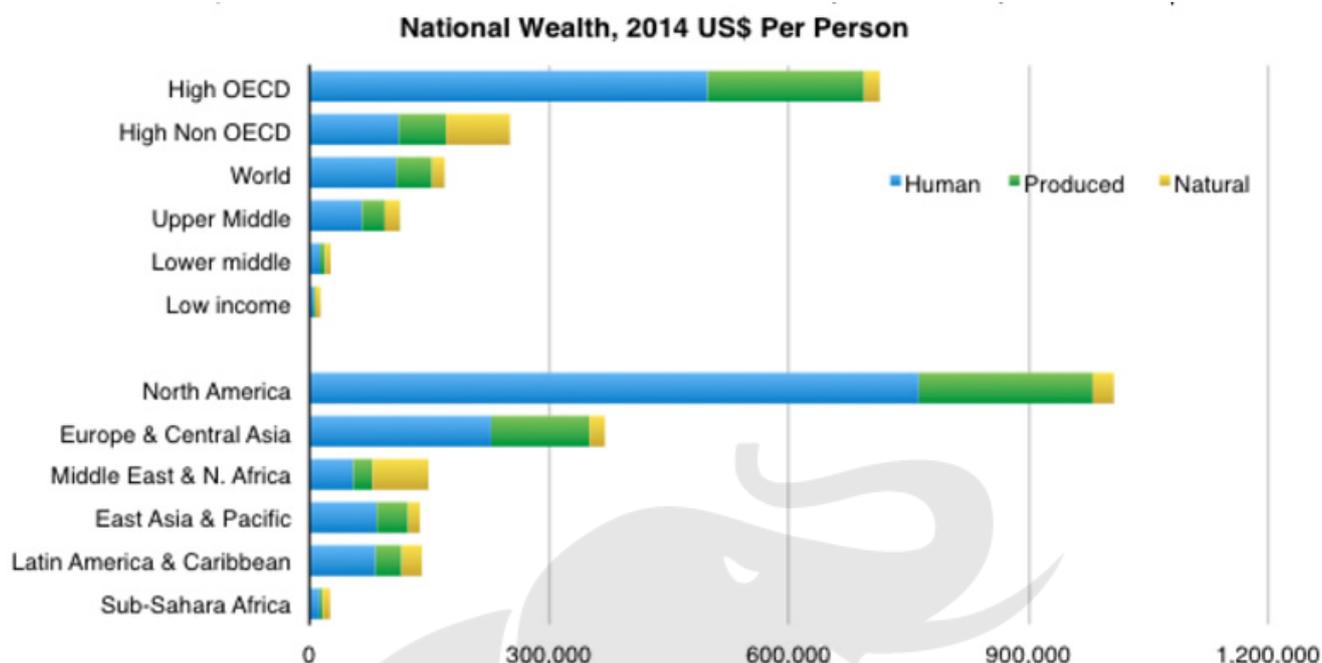
But once you move from low tech manufacturing like stitching garments, offshoring becomes a little more challenging. It takes armies of engineers and techies to manufacture commercial jetliners and all manner of scientists to do pharmaceutical research. Using very basic measures of education attainment, Lucas' model demonstrates that once differences in human resource base are taken into account the potential returns to capital in India reduce to just 4% above the US.

In a previous column, I used similar data to show how initial differences in human capital may give answers to the questions that can't seem to stop Africans from scratching heads: how it is that countries we are told we were "at par" with at or shortly after independence took off, and we did not. In 1970, the Kenyan workforce had an average of two years of education per person, and was the highest in the region. South Korea's had six, Singapore five and Malaysia four years per person. In fact, South Korea's education attainment was higher than several European countries including Portugal (3), France (4.8), Spain (5.6) and Italy (5.6) years per person. South Asia by contrast was in the same league with Africa—India (1.6), Pakistan (1.6) and Bangladesh (1.4). Sri Lanka is an outlier with 6.4.

Education attainment data provide only a rough approximation of human capital, even though the data have proved to be quite robust in economic research. The World Bank has recently published its latest national wealth accounts, in a report titled *The Changing Wealth of Nations*. National wealth accounting is a new statistical initiative that responds to the shortcomings of gross domestic product (GDP) as a measure of economic performance. As many readers will know, GDP and its derivatives are measures of production and expenditure, which in business accounts correspond roughly to annual turnover. As currently constructed, national economic accounting does not produce the equivalent of balance sheets, that is, the assets and liabilities of a business. To illustrate, the Jubilee administration has borrowed KSh 3.5 trillion but there is no account where we have recorded the value of assets acquired with these loans. One of the assets financed, the SGR railway, has cut through the Nairobi National Park. We ought to be able to revalue the park to reflect the loss of both economic and ecological value caused by the railway, but there is no way of doing that in the GDP system. This is what national wealth accounting seeks to remedy.

This latest version, which provides wealth accounts for the year 2014 has what the Bank says is the "first sound estimates of human capital". With wealth accounts we are able to compare the relative importance of different assets in a nation's wealth directly. What do they tell us? First, that human capital accounts for two-thirds of the world's wealth. Second, the wealthier the country the higher the proportion of human capital in its wealth portfolio. It ranges from 40 percent in low income

countries, to 70 percent in the high-income OECD countries (*See chart below*). In the wealthiest region, North America, human capital accounts for 77 percent of total wealth, compared to half of national wealth in Sub-Sahara and South Asia. The Middle East/North Africa is an outlier with only a third of its wealth in human capital on account of the region's unusually high oil wealth.



National investment rates in most developing countries are between 15 to 25 percent of GDP while expenditures on education and health (both public and private) are between 5 and 10 percent of GDP. Roughly, this suggests that a dollar invested in people generates five times as much wealth as a dollar investment in other assets. This should not surprise—think of a million shillings invested in an engineering degree against the same amount invested in a rental apartment.

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Eight years ago, the African Development Bank (AfDB) published a report in which it estimated that Africa has an infrastructure financing requirement of US\$ 93 billion a year to the year 2020. The figure was subsequently adjusted upwards to \$120 billion a year— a cumulative figure of 1.2 trillion dollars. Consequently, less than two decades after the HIPC (Highly Indebted Poor Countries) debt forgiveness initiative many African countries are now hurtling towards a second debt crisis.

It is stated in the AfDB report that the purpose of building on this scale is to crowd in the investment to create jobs. Texas Instruments was the first Western company to invest in Bangalore. I came across a photograph of the first equipment Texas Instruments delivered to its first facility, in a bullock cart. Texas Instruments was attracted by Indian workers, not its roads. In fact, there is no account of India's tech boom that does not mention the Indian Institutes of Technology (IITs). It is now said that IIT graduates are now India's leading export to the US.

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In all the documents and discussions I have encountered, there is no acknowledgement that Africa does not have the skills—the engineers, architects and builders—to scale up building on anything close to this scale of investment, and to maintain it subsequently. Let us do the math. An engineering degree on the continent is at most \$25000. The \$120 billion annual “infrastructure deficit” budget works out to six million engineers. That is a whole passenger drone industry right there. And of course, once we are zipping in drones, we will not be needing so many roads.

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There is no evidence in economics that infrastructure investment contributes to economic growth.

This conclusion by the Asian Development Bank is typical:

“The main conclusion is that a number of countries in developing Asia have significantly improved their basic infrastructure endowments in the recent past, and this appears to correlate significantly with good growth performances. However, the evidence seems to indicate that this is mostly the result of factor accumulation (a direct effect), while the impact on productivity is inconclusive.” - *Stéphane Straub and Akiko Terada-Hagiwara (2010)*

“Infrastructure and Growth in Developing Asia” ADB Economics Working Paper Series No. 231.

Mwalimu Nyerere: Development which is not development of the people may be of interest to historians in the year 3000. It is irrelevant to the kind of future which is created. Thus, for example, the pyramids of Egypt and the Roman roads of Europe, were material developments which still excite our amazement. But because they were only buildings and the people of those times were not developed, the empires, the cultures, of which they were a part have long ago collapsed. The Egyptian culture of those days—with all the knowledge and wisdom which it possessed—was quickly overthrown by foreign invaders because it was a culture of a few; the masses were slaves who simply suffered because of the demands of this material development, and did not benefit from it.

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