Do university rankings matter for growth?

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Proposal

Education quality is hard to measure. Until most recently, researchers such as Hanushek and Kim (1995), Barro (1999), Hanushek and Kimko (2000), Hanushek and Woessmann (2007), Hanushek and Woessmann (2010) used standardized test scores to proxy for education quality.

I think that these measures of cognitive skills are at best, measures of primary and secondary education quality only. I would like to investigate the relationship between tertiary education quality and GDP per capita. I will use international university rankings to proxy for tertiary education quality.

I assume that big countries such as the United States and China, given other things equal, tend to produce more universities that can compete in the international university rankings. Therefore, I will use "the number of universities that a country has in the rankings list divided by millions of population" as the independent variable, in which I will define it as "Tertiary Education Quality Index" in this case. The dependent variable will be GDP per capita.

I have run the regression for GDP per capita against number of universities in top 100 per millions of population, number of universities in top 200 per millions of population, number of universities in top 300 per millions of population, number of universities in top 400 per millions of population, number of universities in top 500 per millions of population respectively (all in the year 2013). For the purpose of this research, I will define Tertiary Education Quality Index as the number of universities a country has in the top 100, 200, 300, 400 or 500 per millions of population.

The top 100 list includes United States, United Kingdom, Switzerland, Australia, Germany, France, Canada, Japan, Netherlands, Sweden, Israel, Denmark, Belgium, Norway, Finland and Russia. They are all high-income economies (World Bank definition) with GDP per capita of $12,616 and above.

The top 500 list includes United States, United Kingdom, Switzerland, Australia, Germany, France, Canada, Japan, Netherlands, Sweden, Israel, Denmark, Belgium, Norway, Finland, Russia, China, Hong Kong, Taiwan, Italy, South Korea, Austria, Saudi Arabia, Singapore, Brazil, Argentina, Mexico, Spain, New Zealand, Ireland, South Africa, Czech, Portugal, Greece, Poland, Hungary, India, Serbia, Chile, Croatia, Egypt, Iran, Malaysia, Slovenia, and Turkey. The list contains both developed and developing countries.

The regression results show that Tertiary Education Quality Index has a positive and statistically significant impact on GDP per capita. Interestingly, the relationship became more statistically significant as I expand the list of universities (rankings 100, 200, 300, 400, 500). Logging both the independent and dependent variables make the results more statistically significant too. Therefore, we might conclude that as far as promoting economic growth is concerned, it is more important to have a good number of "decent" universities (top 500) rather than only a few "elite universities" (eg in the top 100).

At this preliminary state, I used the Shanghai Ranking (published since 2003) to run the regression outlined above. I will run the same regression again for other years (from 2003 to 2012) and other rankings (such as Times, QS etc) to see if this relationship holds as well.

Also, I want to investigate whether there is a bias in the rankings towards English-speaking universities. I will add the English (1) or No English (0) as the dummy variable into the regression model to see what happens. This is to control for the fact that some non-English speaking countries (such as Germany, Japan) which boast superb universities but their universities might be underrated in the international university rankings.

Also, some high-income economies (World Bank definition) do not have any "good universities" even in the top 500 list. I would like to investigate the reasons why these economies enjoy high GDP per capita despite not having any so-called "good universities". The list of high-income economies with no "good universities" include Antigua and Barbuda, Andorra, Aruba, Bahrain, Barbados, Bermuda, Brunei, Cayman Islands, Channel Islands, Curacao, Cyprus, Estonia, Equatorial Guinea, Faeroe Islands, French Polynesia, Greenland, Guam, Iceland, Isle of Man, Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Macau, Malta, Monaco, New Caledonia, Northern Mariana Islands, Oman, Qatar, Puerto Rico, San Marino, San Marino, Sint Maarten, St. Kitts and Nevis, , Slovak Republic, St. Kitts and Nevis, Trinidad and Tobago, Turks and Caicos Islands, United Arab Emirates, Uruguay, Virgin Islands (US).

Interestingly, China, with only GDP per capita of around 6000 USD in 2012, has managed to produce 28 universities in the top 500 list. Could it be due to the large population size and thus the country could devote all of its resources to produce a good number of "good universities"? Tertiary education quality index is still quite low due to its 1.3 billion populations, thus explaining its low GDP per capita. This special case requires special investigation.

And not surprisingly, many poor developing countries such as African countries (except South Africa) do not have any universities that appear in the top 500 list. I would like to run the same regression to see if this relationship holds as well among the developing countries (eg the Africa region), provided that I can find reliable university rankings for these countries as well.

I would like to see if institution quality interacts with tertiary education quality to affect economic growth. Proxies for institution quality might include openness to trade, corruption index, and respect for property rights.

Last but not least, I would like to investigate how universities drive the country's economic growth. Since I used international university rankings as the proxy for tertiary education quality, I would then have to delve into their methodologies. I might want to question whether these rankings reflect teaching quality. For example, if some rankings place greater emphasis on research output and top-journals publications, then I might want to suggest that universities drive economic growth through research and innovation rather than doing a good job of educating the students. For example, if some rankings place greater emphasis on academic reputation and peer review, I might then want to question whether these rankings have bias towards more well-connected universities in the first place.

(999 words)

Literature Review

At a micro level, human capital theory suggests that education is an investment that increases the productivity of workers, hence increasing the lifetime earnings of workers (Becker, 1964). Mincer (1974) included the measure of on-the-job training and experience in his Mincer Equation. Many studies have confirmed the positive impact of education on individual's earnings, such as Card (1999), Amermuller, Kuckulenz and Zwick (2006), Cohn and Addison (1998), Schultz (1960), Becker (1967), Mincer (1958), Arrow (1973) and Spence (1974).

Temple (2001) and Harmon, Oosterbeek and Walker (2003) concluded that there is strong evidence that private returns to education are unambiguously high. Temple (2001) estimated that the private rate of return to a year's extra schooling is typically between 5 per cent and 15 per cent.

Xiao (1999) found that pre-work formal education had a positive impact only on the initial salary at hiring, and that firm-based on-the-job training increased salaries through productivity increases, based on a 1996 salary survey of 1,023 employees in Shenzhen, China. Mason et al. (2012) found that vocational skills had a positive impact on average labor productivity growth in 6 of the 7 countries considered. Therefore, education can be more than just formal schooling that is the main focus in this review.

There is a school of thought which suggests education does not increase productivity but to indicate the potential of productivity. Spence (1973) developed his famous Job Market Signaling Model to suggest that people attend university to signal to the employers that they are more capable than the rest, even if universities do not increase their productivity. Arrow (1973) developed a mathematical model to show that higher education helps to identify the more capable individuals and filter out less capable individuals. Thurow (1975) suggested that firms can train well-educated workers at a lower cost. Indeed, Harmon, Oosterbeek and Walker (2000) pointed out that the coefficient on education variable may not fully reflect the impact of education on productivity if it is correlated with unobserved characteristics such as ability that are also correlated with wages, and therefore, the education coefficient is more likely to reflect both the impact of education on productivity and the impact of the unobserved variable that is correlated with education.

On the other hand, Arrow (1973) made it clear that he personally do not believe higher education serves as only a screening device because apparently, professional schools and degrees in science subjects teach useful skills that are highly sought after in the market, although it is much less clear for liberal arts courses. Sianesi and Van Reenen (2000) also concluded based on the review of several studies that "education really is productivity-enhancing rather than just a device that individuals use to signal their level of ability to the employer."

I think that the most plausible answer would be that both productivity and signaling effects are at work, it is only a matter of which effects play a more dominant role in determining the individual returns to education.

Stevens and Weale (2003) claimed that since education delivers economic benefits to individuals, it should be expected that countries with more education grow better too, and we might want to look at returns to education at a macro level too.

Education can be measured in terms of its quantity and quality.

Education quantity is measured by enrolment rates (Mankiw, Romer and Weil 1992, Barro 1991, Levine and Renelt 1992), the average years of schooling (Hanushek and Woessmann 2007, Krueger and Lindhal 2001), adult literary rate (Durlauf and Johnson 1995, Romer 1990), education spending (Baladacci et al.).

Many researchers have found a positive relation between education quantity and economic growth, such as Hanushek (1995), Gemmel (1996), Krueger and Lindahl (2001), Temple (2001). Barro (1991) found that "poor countries tend to catch up with rich countries if the poor countries have high human capital per person (in relation to their level of per capita GDP)". Benhabib and Spiegel (1994), Bils and Klenow (2000) and Prichett (2001) find a weak relation between education quantity and economic growth.

However, Hanushek and Woessmann (2007) pointed out that one problem with this measure of education implicitly assumes one year of education in anywhere (eg Papua New Guinea and Japan) is of the same quality.

Sianesi and Van Reenen (2000) found that the effects of primary and secondary schooling appear both larger in magnitude and statistically more significant for less developed countries. Also, primary and secondary skills are more related to growth in the poorest and in intermediate developing countries respectively, whereas tertiary skills are important for growth in OECD countries. Stevens and Weale (2003) also found that returns to education diminish with levels of development.

Increasing education quantity is not easy. Annababette Wils (2002) found that it took 55-100 years for 67% of the countries to go from 10 to 90 percent adult literacy, while remaining 23% countries progressed even slower. Also, Harry Anthony and George Psacharopoulos (2011) quoted that "For a typical country it takes 35-80 years to make a transition from 10 percent net primary enrollment to 90 percent (Wils 2003; Wils and O'Connor 2003a). Education transition follows an S-shaped curve due to the much education one can attain in terms of years of schooling (Meyer et al. 1992).

Sianesi and Van Reenen (2000) had a few important findings that are worth highlighting. First, neo-classical tradition argues that a one-off permanent increase in the human capital stock will cause a one-off increase in the economy's growth rate, until productivity per worker hour has reached its new (and permanently higher) steady state level. New Growth theories argue that the same one-off increase in human capital will cause a permanent increase in the growth rate. Dowrick (2002) also recognized that there are debates over whether changes in educational attainment ultimately affect the long-run growth rate of the economy, or only the long-run level of output. Second, there are reverse causality problems with education, which means income growth might lead to an increased demand for education, and they believe that most likely there is "a bi-directional causality between human capital accumulation and economic growth". Third, there are indirect benefits of human capital on growth, by fostering the accumulation of productive inputs such as physical investment, technology or health. Fourth, they concluded that overall, the available evidence suggests that education has a positive impact on growth.

Suggested measures of education quality include costs per student, number of library volumes per student, student-faculty ratios, faculty-administration ratios, and student-support staff ratios (Conrad and Pratt, 1985). Dahlin (2002) pointed out that there are difficulties measuring the quality

of education and that “a low student-faculty ratio, for instance, says nothing about faculty’s ability to teach.” Hanushek (1996) found that spending per pupil is not a good proxy for school quality.

Hanushek and Kim (1995), Barro (1999), Hanushek and Kimko (2000), Hanushek and Woessmann (2007), Hanushek and Woessmann (2010) used standardized test scores to proxy for education quality. They found a strong positive relation between education quality and economic growth.

Hanushek and Woessmann (2007) found that the education quantity is statistically significantly related to economic growth when the model neglects education quality, but once the quality of education is included in the model, the relationship between education quantity and economic growth becomes insignificant. They measured the education quality by using a simple average of the mathematics and science scores over all international test scores.

Cooray (2009) also measured education quality by, survival rates, repetitions rates, student/teacher ratios, schooling life expectancy and trained teachers in primary education, and she found that education quantity, when measured by enrolment ratios at the primary, secondary and tertiary levels, have a positive and significant impact on economic growth. She also found that the interaction effect between government spending and education quality is significant for economic growth. However, she found no relation between government spending and economic growth.

However, measures of international standardized tests of cognitive skills could only at best, reflect education quality at the primary and secondary level. University rankings might be a good proxy for tertiary education quality. Until recently, Peter U. Okorie (Oct 2013) wrote a paper that shows African countries with better university performance generally performed better in the rankings of economic indicators such as Human Development Index (HDI). But apparently, Peter U. Okorie (Oct 2013) failed to look at the number of universities in Africa’s top 100 on a per capita basis. Craig A. Depken, II and Egle Mazonaite, investigated the factors that contribute to the number of universities ranked in the QS Top 500 World Universities in 2008, and they found that larger population, greater economic (and perhaps academic) freedom, being industrialized, ethnic fractionalization all contribute to having more universities ranked in the top 500 list. EUA has published a report in 2011, “Global University Rankings and Their Impact”, that analyzes the methodologies behind the main international university rankings, such as the Shanghai Ranking, QS Ranking, Times Ranking etc.

Dowrick (2002) found that education and R & D promotes economic growth substantially. Howitt (2013) suggested that university research can boost economic growth. Wolff and Gittleman (1993) found that “university enrolment rates are positively associated with labor productivity growth.”

There is an abundant literature which shows that institution plays a complementary role for education to boost economic growth.

Murphy, Kevin M, Andrei S, Robert W. Vishny (1991) showed that talents will go to nonproductive rent-seeking activities if the country is conducive for corruption.

Harry Anthony Patrions, George Psacharopoulos (2001) found that Sri Lanka has a highly educated labor force relative to its neighbors but it has a very poor economic performance due to bad political environment that has dampened the educated labor from realizing its potential.

Prichett (2001) find that the impact of education varies widely across countries. He provided three possible explanations. First, in some countries, the institutional quality is so horrible that the education actually lowered economic growth, such as producing more educated pirates. Second, the demand for educated labor remained the same, and so the marginal return to education declines as the supply of educated labor increases. Third, education quality in some countries is so poor that additional years of schooling is useless and produces no human capital. Therefore, we might say that increasing both education quantity and quality is important.

Murphy, Kevin M, Andrei S, Robert W. Vishny (1991) also run regressions to show that countries with more students studying engineering grow faster; whereas countries with more students studying law grow slower. Even though their paper is mainly about rent-seeking, and that they used college enrollment in law to proxy for talent allocated to rent seeking, and college enrollment in engineering to proxy for talent allocated to entrepreneurship, but it might also suggest that education in more technical subjects such as engineering have a more positive effect on growth. This view is supported by Tin-Chun Lin (2004) who found that higher education, especially engineering and natural sciences, had a positive and significant effect on Taiwan's economic development.

Bloom, Canning and Chan (2006) concluded that higher education plays an important role to promote economic growth, but they also commented that "without sensible macroeconomic management, for example, new graduates will be much less likely to find productive work.", and therefore, good governance and openness to trade are important for growth too.

To sum up, there is overall agreement that more and better education is good for economic growth. It is worth noting that the value of education is far beyond the economic value it brings. It is certainly against morality to deny education to any individual on the grounds of little marginal private and social returns. Weiss (1995) said "Education does not have to be justified solely on the basis of its effect on labour productivity. This was certainly not the argument given by Plato or de Tocqueville and need not be ours. Students are not taught civics, or art, or music solely in order to improve their labour productivity, but rather to enrich their lives and make them better citizens."

(1995 words)

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