

Education as an Engine of Growth and Sustainable Development in Puerto Rico

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Over the past fifteen years Puerto Rico has suffered one of its deepest economic and social crises. From growth in income per-capita that was close to an average of 4 percent per year in the period of 1975 to 2004, the island suffered a complete turn around and its income per-capita *declined* an average of 1.6 percent per year from 2005 to 2020. Suffering from the aftershocks of hurricanes, earthquakes, the COVID-19 pandemic, and a deep fiscal crisis, the Island is at a crossroads, needing an economic strategy that can reverse its economic collapse.

Education and Economic Development

From a long-run perspective, the plight currently faced by Puerto Rico is common to other countries. Economists refer to it as the middle-income trap, referring to the substantial slowdown in economic growth that occurs for many developing countries once they reach a certain middle-income level, such as 40 percent of the U.S. income per-capita. This is the case of countries like Mexico, Brazil, Russia, and Peru, among others. In the case of Puerto Rico, the

Island reached 43 percent of the U.S. income per-capita in 2005, but the ratio has fallen since then, and it was equal to 37 percent in 2020.

The reasons for the middle-income trap have been researched over the years. But one factor that has been found to be key in explaining it is education. Indeed, the accumulation of human capital has long been postulated as a major force behind economic growth. Both as a factor of production and as an input into innovation and technological change, human capital is widely recognized as a major causal force in the process of economic growth (see, for instance, Romer, 1990, Mankiw, Romer and Weil, 1992, Lucas, 1993, Goldin and Katz, 2008, and Manuelli and Seshadri, 2014).

Education was essential to Puerto Rico's economic expansion during its golden period of growth. Enrollment in primary and secondary schools rose from 441,758 to 811,380 between 1950 and 1980, and higher education enrollment grew from 63,073 in 1970-71 to 199,842 in 2002-03. As a result, between 1960 and 2000, the average schooling of the Island's labor force fifteen years of age and older rose by 6.0 years, far exceeding the worldwide average expansion of 3.2 years and exceeding the gains in all countries other than the Republic of Korea. By 2015-2019, as much as 76.5 percent of Puerto Rico's population 25 years of age or older had received a high school diploma or higher, a figure that is equivalent to that for the Republic of Korea, New Zealand, and Singapore, among others. These educational investments in the Island were highly successful in propelling the country into high growth. Indeed, an accounting of economic growth suggests that the rise of schooling accounted for close to half of the increase in output per worker in Puerto Rico between 1975 and 2000 (Bosworth and Collins, 2006).

But the more recent work of economists such as Erik A. Hanushek at Stanford University and Joseph E. Stiglitz at Columbia, recognizes that it is not just the quantity of human capital that matters in terms of economic growth. The quality of education, and the corresponding knowledge and skills it generates, are also essential. On this regard, Puerto Rico's educational system faces a great challenge. There appears to be a crisis of learning in the Island's public schools. This is not just an issue that Puerto Rico alone is facing. It is a problem in many other developing countries. The 2018 World Development Report, titled "Learning to Realize Education's Promise" was dedicated to the difficulties many developing countries face in increasing the quality of public education.

The Crisis in Learning

The learning challenges facing Puerto Rico's public school system are reflected in local, national (USA), and international measures of student achievement. Consider the results of Puerto Rico's public schools academic achievement tests (called Medición Educativa para la Transformación Académica de Puerto Rico or META-PR). In the 2018-19 META-PR battery of tests in mathematics, the results indicated that only 31 percent of fourth-graders, 7 percent of seventh-graders and 12 percent of eleventh-graders were proficient in math. The outcomes in other fields (Spanish, English, etc.) also show significant deficiencies.

The picture is worse when measured by the US national tests of student assessment, the National Assessment of Educational Progress (NAEP). The 2019 NAEP results for Puerto Rico show that only 1 percent of tested students in the eighth grade were proficient in math, and 91 percent tested below the basic level, compared to the overall US results, which showed that 34 percent of students were proficient in math and only 31 percent below the basic level. Similar

results were obtained for fourth graders as well as for previous years the tests were administered (2015 and 2011).

Finally, one can compare the learning levels in mathematics of 15-year-old students in Puerto Rico with those in other countries, as measured by the OECD's Programme of International Student Assessment (PISA). Puerto Rico participated in PISA in 2012 and 2015. On average, students in the Island have had some of the lowest average scores (for Reading, Math and Science) among the 66 jurisdictions in the assessment. For instance, the average score in mathematics for the students tested in the Island in 2012 was 382, compared to 613 for Shanghai in China, 573 for Singapore, 481 for the US mainland, and a 397 average for Latin America and the Caribbean. Students in the Island surpassed only one country in the world: Peru. The results in 2015 were not much different, with the average score in math declining to 378.

A Split System: Public versus Private Education

The PISA assessments just discussed include the average results for students enrolled in both public and private schools. When separated, the assessments do find substantial differences in the average performance of students in these two segments of the school system. For instance, in the 2012 mathematics assessment, the average score among public students sampled in Puerto Rico was 370 while for students in private schools it was 474. These differences in student achievement are found as well by the College Board's university admissions test (PAA).

The learning gap between private and public schools needs to be seen within the context of one of the major challenges facing education in Puerto Rico: the bifurcation of the education system into two parts: one part, the public school system, that caters to low-income populations and a second part, the private school system, where students tend to come from middle-class and

high-income families. Indeed, a large fraction of public-school students in the Island are low-income students (as much as 80 percent of students in the system are part of the school lunch program, for which only poor families are eligible) while private schools –whose annual tuition can run into the thousands of dollars (the San Ignacio school’s annual tuition cost is over \$11,000) tend to come from middle-class and higher-class families. This split system reflects the great inequality existing in Puerto Rican society, but it also tends to magnify and perpetuate it. With a poverty rate of 43.5 percent in 2020, this constitutes a mammoth issue for the Island.

Compounding the situation in recent years is the overall environment of declining school enrollments. Overall enrollment in K-12 schools reached a peak in 2000-01, with over 600,000 students, but this has dropped precipitously, to just over 400,000 in 2020-21. The decrease occurred in both the public and private school systems, but it was more accelerated in the public sector: The private sector increased its share relative to public schools, rising from 21 percent of the total in 2000 to 27 percent in 2020.

Demographics is the main reason for the collapsing school enrollments. Population has declined dramatically in the Island, both because of lower fertility rates as well as massive emigration to the continental US. Between April 2000 and April 2010, the Island’s population decreased by approximately 83,000, but from April 2010 to April 2020, the population of Puerto Rico dropped by close to half a million, as people fled the natural disasters affecting the Island and the sustained economic crisis.

The Crisis in Higher Education

In a world of high-speed internet, automation, and artificial intelligence, it is the population with higher education as well as the research & development activities of scientists

and technical workers that sustain a country's competitive advantage in production and global trade. In fact, recent research on countries that have surpassed the earlier-mentioned middle-income trap shows that those investing more heavily in tertiary education and in research & development are the most likely to shift their production structures to the high-technology exports that sustain the economic growth of most high-income nations (see, for example, Eichengreen et. al., 2014, and Lee, 2018). Increased tertiary education enrollment and graduation are also a key for upward social mobility and, therefore, potential mechanisms for reduced poverty and lower inequality.

The status of higher education institutions in Puerto Rico, however, is worrisome. First, reversing earlier trends, overall higher education enrollment in Puerto Rico declined from a high of 250,192 in 2010-2011 to 186,474 in 2019-2020. Both private and public sector enrollments have decreased, with the public higher education system dropping from a peak of 74,506 students in 2002-2003 to 55,774 in 2019-2020. Just as with primary and secondary education, population decline is one of the main reasons for the collapsing higher education enrollment. But enrollment in higher education has declined also because of a drop in gross enrollment rates. The number of students enrolled in higher education institutions as a proportion of the population in the higher education age group declined by 5.2 percentage points between 2010 and 2020.

In addition to reduced enrollments, institutions of higher education face significant difficulties in graduating their students. At the University of Puerto Rico in Rio Piedras only 60 percent of entering students graduate within six years. At the Interamerican University (Metro unit), the corresponding graduation rate is 36 percent and at the Catholic University in Ponce, the graduation rate is 46 percent.

A major factor affecting both enrollment and retention rates in higher education institutions is the rising tuition costs. At the University of Puerto Rico in Rio Piedras, the preeminent public institution, the average tuition cost per credit rose from \$30 in 2013-14 to \$115 in 2018-19. The tuition has also increased in private universities, but not at the same rate. The climbing tuition costs impose a major challenge to the goal of increasing the number of college graduates. Most of the students (in both public and private universities) rely on scholarships, such as the Pell Grants granted by the US Federal Government. These grants, however, increasingly fail to cover the rising tuition and other costs facing low-income students.

The public university system encounters a particularly serious financial situation due to the government's fiscal crisis and the associated cuts in the funding provided by the central government. Between 2015-16 and 2021-22, the public higher education system has faced a 42 percent reduction of the funds it receives from the central government. Although the future is uncertain, the expected recovery of the economy and an anticipated increase in the federal funds available to the government (connected to previously undisbursed disaster relief funds as well as newly passed federal infrastructure and other legislation), are bound to allow the government to reinvest in the public university system. But the question remains as to whether and how this will occur.

Policy Choices

Given a potential inflexion point facing the Puerto Rican economy, what policies would reverse the problems facing its educational system? A resurgence of education will require a re-financing of both the K-12 and the higher education systems. But this means investing in policies and areas of priority, proven by educational research to be essential in the process of economic

development. Previous experiences from a wide array of countries shows that just throwing more money at educational institutions does not often work. What could be some of these priorities?

Past educational reform efforts in the K-12 school system in Puerto Rico, involving increased school accountability, teacher evaluation, school governance, and changes in curriculum and instruction, among others, have been amply discussed. Some of these reforms ought to be continued, although the lack of any sustained improvement in student outcomes suggests they may need a serious revamping. Other areas of concern should be emphasized or strengthened, such as the transition from secondary schools to work, reforms of the special education program, improving the pipeline from secondary to post-secondary education among low-income students, increased decentralization, and greater teacher pay. There has also been enormous debate regarding privatization of public schools through school choice, charter schools and other education reform proposals. However, the following discussion focuses on a different set of policies oriented to moving the Island's educational system towards a technologically dynamic society that can succeed in a rapidly changing global economy.

One of the top priorities must be investment in infrastructure for schools and universities, particularly as it involves information technologies and telecommunications. As an example: during the COVID-19 pandemic lack of access to high-speed internet connections by large segments of the population (particularly low-income families) and in schools and universities made learning a major challenge. It has resulted in a big step back for education in the Island. But moving forward, as educational pedagogy and learning shift towards greater use of new technologies, Puerto Rico risks being left further behind if it does not invest in the appropriate infrastructure.

Increasing support for and promoting STEM (Science, Technology, Engineering and Math) education in schools and universities should remain high in the Island's agenda. Puerto Rico should take advantage of the fact that its students are highly motivated in achieving science-related occupations. A little-known fact is that, according to the 2015 PISA results, when asked whether they expected to work in a science-related occupation by age 30, a whopping 40.6 percent of the Puerto Rican 15-year-old students in the PISA sample said yes, the highest by far in all the countries in the PISA study. And this result did not vary that much by socioeconomic status. For students whose parents (one or both) did not have secondary school education, close to 30 percent declared they expected to have a science-related occupation by age 30. For parents who had completed some secondary education, the percentage rose to 33.7 percent and among parents with tertiary education, the percentage was 45.4.

The interest in STEM among students in Puerto Rico is reflected in the high proportion of graduates in these fields among its higher education institutions. Close to 50 percent of all degrees conferred in 2018-19 were in STEM fields, such as biology and medical sciences, engineering, information technology and computers, physical sciences and chemistry, and health-related professions and sciences.

But the absence of local employment opportunities for many of the tens of thousands of STEM graduates means they emigrate to the mainland US, often heavily recruited by American employers, from hospitals to NASA. And this points to a deficit in the local demand for STEM graduates as a major constraint in the development of this sector.

For the employment of highly trained, college-educated workers to increase, the demand for those workers must also rise. The decline of direct investment on the island, caused in part by

the Island's economic collapse and by major policy changes, such as the end of the 936 Section of the US tax code (which had provided substantial tax incentives for American firms—especially pharmaceuticals-- to locate in Puerto Rico), would need to be reversed for employment in manufacturing and high-tech services to expand in the short-run.

Puerto Rico remains a major manufacturer of pharmaceuticals and medical devices, with 12 of the top 20 global firms currently having facilities in Puerto Rico, from Amgen to Pfizer. Agglomeration economies suggest that attracting both greater manufacturing in the existing pharmaceutical sector as well as related firms in the biotechnology field should be a priority. But, although promising, this sector is highly capital-intensive and has not provided as many links to the local economy as it was hoped. Puerto Rico also needs to develop a plan for capital accumulation that relies more on increased local investment and savings, a policy area that has been ignored by the consumer-based economy prevailing in the Island.

To stimulate innovation, Puerto Rico needs also to expand its research & development (R&D) expenditures. Santiago-Bartolomei (2021) finds that Puerto Rico's R&D output is 0.54 percent of GNP, way below that of the US, South Korea, Japan, and other high-innovation countries. With higher education institutions (particularly the University of Puerto Rico) having a history of excellence in STEM fields, increased funding for R&D in these fields may provide a boost for innovation and technological change. One well-known, successful example of this approach at a global level is the Science Foundation Ireland (SFI), which is a financial fund supporting human capital accumulation, developing private-public partnerships, and attracting venture capital in the fields of science and engineering in that high-growth country. Puerto Rico's Science, Technology and Research Trust is a similar institution, and it may spearhead the start of other, additional initiatives that could reproduce Ireland's success in these areas.

Connected to these policies are initiatives to foster regional science and technology hubs that link universities and the private sector (see Wolff, 2021). The synergies between local economic development and regional university-based clusters of new firms can be a breeding ground for innovation, whether in Rio Piedras (surrounding the University of Puerto Rico campus in Rio Piedras), Mayaguez (at the University of Puerto Rico campus in that city), San German (at the InterAmerican University main campus), and Ponce (at the Catholic University's main campus).

But as Reyes (2021) emphasizes: any of the above –and other—policy interventions can only emerge and be successful if public sector governance in Puerto Rico improves. The public debt crisis the Island has been facing (arising from a long history of public finance mismanagement), the presence of constraining bureaucracies and corruption, and the politization of educational and other institutions means that little may be accomplished until the many aspects of good governance, from transparency and accountability to bureaucratic efficiency and de-politization are implemented.

References

- Bosworth, Barry P. and Susan M. Collins, “Economic Growth” in S.M. Collins, B.P. Bosworth and M.A. Soto-Class, editors, *The Economy of Puerto Rico: Restoring Growth*, Brookings Institution/CNE, 2006.
- Eichengreen, Barry, Donghyun Park and Kwanho Shin, “Growth Slowdowns Redux,” *Japan and the World Economy*, November 2014, 65-84.
- Goldin, Claudia and Larry Katz, *The Race between Education and Technology*, Harvard University Press, 2008.
- Hanushek, Erik A. and Ludger Woessmann, “Education and Economic Growth,” in *Oxford Research Encyclopedia of Economics and Finance*, Oxford: Oxford University Press, 2021.
- Lee, Jong-Wha, “Convergence Success and the Middle-Income Trap,” Working Paper, European Bank for Reconstruction and Development, 2018.
- Ladd, Helen and Francisco L. Rivera-Batiz, “Education and Economic Development,” in S.M. Collins, B.P. Bosworth and M.A. Soto-Class, editors, *The Economy of Puerto Rico: Restoring Growth*, Brookings Institution/CNE, 2006.
- Lucas, Robert E., "Making a Miracle," *Econometrica*, Vol. 61, March 1993, 251-272.
- Mankiw, N. Gregory, David Romer and David Weil, “A Contribution to the Empirics of Economic Growth,” *Quarterly Journal of Economics*, 1992.
- Manuelli, Rodolfo and Ananth Seshadri, “Human Capital and the Wealth of Nations,” *American Economic Review*, 2014.
- Reyes, Belinda I., “Investing in Ourselves: Post-Secondary Education for a Sustainable and Equitable Recovery,” *Policy Brief*, Center for a New Economy, November 2021.

Romer, Paul M. "Endogenous Technological Change," *Journal of Political Economy*, Vol. 98, 1990, S71-S102.

Santiago-Bartolomei, "UPR's Role in Economic Development in Puerto Rico: Research & Development, Center for a New Economy, August 2021.

Stiglitz, Joseph and Bruce Greenwald, *Creating a Learning Society*, Columbia University Press, New York, 2014.

Wolff, Jennifer, "Universidad Pública, Inversión y Desarrollo," Center for a New Economy, August 2021.