

Spending on Education and Wealth

Summary of a project by Hazel Nicholls for Mathematics of Data Management, Sir Robert Borden High School, April 30, 2003

I wanted to find a relationship between a country's spending on education and its economic wealth. I found the *United Nations Briefing Papers for Students* and read the *Education Briefing Paper*¹. Common sense suggested to me that by spending more on education, a country would be making an investment in its future workers and thus, its wealth and productivity would increase. The *Education Briefing Paper* confirmed the reasonableness of my hypothesis by stating "Education is the key to the new global economy, from primary school on up to life-long learning. It is central to development, social progress and human freedom."² and:

Education is an effective weapon to fight poverty. It saves lives and gives people the chance to improve their lives. It gives people a voice. And it increases a nation's productivity and competitiveness, and is instrumental for social and political progress.³

I would need to decide how long it takes the spending to affect wealth, so I would need data for both education spending per student and gross domestic product (GDP) per person that would span a period of years and be available for many countries.

Due to the lack of international data available, I decided to take another look at my topic. It seemed that the same sort of relationship with spending and wealth would be true at home in Canada. Since education is a provincial responsibility, I would need data for provincial spending per student and provincial GDP per person that would span many years. I would also need the Consumer Price Index (CPI) in order to adjust for inflation.

I went to EStat and was able to locate data over a range of years. I was able to manipulate this data to fit my requirements, providing me with the spending per school age child (SPSAC) adjusted to 1986 dollars for the years 1954-1995, and the provincial GDP per person adjusted to 1986 dollars for the years 1961-1991.

For each province I graphed both GDP per person and SPSAC on the same axis. I made the scale of each axis the same for all provinces to offer a fair comparison. To make the trends easier to see and analyse, I created a three year moving average and a line of best fit for both the GDP and SPSAC.

After graphing both SPSAC and GDP over time, it seemed that GDP had the impact on SPSAC rather than the opposite. Generally if GDP is decreasing, a province either leaves SPSAC the same, increases it at a very slow rate, or decreases it.

¹ "Education," *Briefing Papers for Students*, n.d., UNESCO, April 28 2003
<<http://www.un.org/cyberschoolbus/briefing/education/index.htm>>.

² "Education".

³ "Education".

When graphing each province's SPSAC and GDP, I also noticed a wide disparity between the provinces in both SPSAC and GDP. It seemed that the "poorer" provinces were spending a larger portion of their GDP on education. I then realized that since "poorer" provinces receive equalization payments to ensure that "... regardless of their ability to raise revenue, [they are able] to provide roughly comparable levels of services at roughly comparable levels of taxation..."⁴ This statement on a federal government website made it sound like since there are equalization payments, a student in PEI, for example, should expect a "roughly comparable" amount of money to be spent on his or her elementary and secondary education as a student in Ontario. To see if the amounts were "roughly comparable" I graphed each province's SPSAC over time on one graph. In order to get a better idea of how the spread of spending changed over time, I drew a box and whisker plot.

Generally, the size of both the box and the length of the whiskers increases over time. This indicates that the spread not only on the extremes but in the middle half of the data is increasing, and seems to support a conclusion that in recent years the provinces do not spend "roughly comparable" amounts on education.

I also wanted to compare the spread of the SPSAC of each province on one graph, so using Fathom I drew another box and whisker plot with the provinces on the x-axis. From this plot I could see that the median was quite comparable in Alberta, British Columbia, Manitoba, Ontario, and Quebec. Astonishingly, the ends of the whiskers of the Atlantic Provinces were below the lower bounds of these provinces' third quartiles. This confirmed my finding that the levels of funding are not "roughly comparable" across provinces. I would expect the actual cost of delivering education in each province, and at different time periods, to vary slightly; however, the dramatic differences seen here suggest that education spending and the relative ability to deliver a quality education vary substantially from province to province. In fact, a province in the bottom half of GDP has never been in the third quartile (top 25%) of SPSAC during the years 1961-1991. I also used the normal distribution to show that high SPSAC is not randomly distributed throughout the provinces.

I was able to find that generally, if a province's SPSAC is high, that province usually has a high GDP. However, there are several points where SPSAC is sometimes higher in one province with a lower GDP than others. I speculate that the politics of the day, when it comes to choices in government spending, probably play as big, if not a bigger role, as does GDP.

I would like to see governments increase the SPSAC, especially in those provinces where GDP is low. At a national level, more should be done to reduce the spending gap between the "haves" and the "have-nots". Hopefully in the future, a baby born in Newfoundland will have the same chance of having as large an investment made in his or her education as a baby born in Ontario would expect; that high spending on education will become independent of a low GDP. Perhaps it is only then that we will begin to see GDP rise as a result of spending.

⁴ "equalization," Glossary of Frequently Used Terms, 28 Jan. 2003, Department of Finance Canada, 20 April 2003 <http://www.fin.gc.ca/gloss/gloss-e_e.html#equal>.