ECONOMIC RETURN ON EDUCATION IN THE OECD

Kazi Minhazur Rahman  
Graduate Student  
Master of Information Program  
University of Maryland  
minhaz@gmail.com  
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DATA SET

The data set used was taken from Education at a Glance 2012: OECD Indicators. This report offers a range of indicators illustrating the current state of education in OECD countries. OECD and visualizing.org has teamed up and opened the Visualize the Return on Education challenge. For this challenge, a subset of the data from the report has been provided. The dataset can be found at the raw data page of the report. The following measures and dimensions for 28 OECD countries as well as averages can be found in the dataset:

Measures (numeric)
- Total costs
  - Direct cost
  - Foregone earnings
  - Foregone taxes on earnings
- Total benefits
  - Gross earnings benefits
  - Income tax effect
  - Social contribution effect
  - Transfers effect
  - Unemployment effect
  - Grants effect
- Net present value
- Internal rate of return

Dimensions (categorical)
- Education type: 2 (Post-secondary non-tertiary and tertiary)
- Gender: 2 (Men and Women)
- Sector: 2 (Public and private)

Based on these dimensions, a total of 8 (2*2*2) tables were available from the data source.

The objective is to visualize the economic costs and returns on education for OECD countries while encouraging comparison across the countries, and revealing the individual statistics that go into these indicators.

- It should be noted that all the measures have been discounted using 3% discount rate and country data have been adjusted using Purchasing Power Parity (PPP).
- Upper secondary education is compulsory in Belgium and Netherlands. On the other hand, for Japan, data at lower and upper secondary level of education are not broken down. Therefore, for these three countries, non-tertiary data is not available.
- Methodology and assumptions and the data description can be found at the main site.
- Most importantly, visualizations and findings that have already been covered in the OECD report have been deliberately avoided here. (e.g. Chart A9.1 – Chart A9.5 in the report provide significant insights)
Men, in general, have more to gain from tertiary education compared to women in most OECD countries. From Error! Reference source not found., it can be seen that women who complete tertiary education have a lesser net present value compared to men in each of the countries except Turkey, Norway and Spain. The main reason for this is they get less gross earnings in the first place. In countries like Sweden, Denmark, Italy, Hungary, Israel and USA, gross earnings benefit for women completing tertiary education is higher since their governments provide incentives to low wage earning women (transfer effect). On the bright side, in 17 countries out of 28, women have a greater unemployment effect compared to men which means women are more likely to get employment by getting tertiary education.
Though higher income tax tend to lessen social contribution by tertiary educated people, there is a socially charitable group of countries.

By creating two new measures - Income tax effect as % of gross earning vs social contribution as % of gross earning, and plotting them in Figure 2, it can be seen that people tend to spend less of their additional earning in social welfare if they are being taxed highly. The trend lines show that men are more elastic to this interchange compared to women in different countries. This visualization also explains Portugal’s highest net present value – due to the low income tax % and low social contribution %. However, for other countries, it is not exactly possible to establish any linear relationship between net present value, and income tax % or social contribution %. Furthermore, there is a group of countries – Poland, Slovenia, Germany, Hungary and Belgium; who seem to spend a significantly greater portion on social contribution compared to other countries, regardless of their income tax effect %. It might be worthwhile to further investigate why these countries act so and what policies affect this.

Figure 2: Income tax effect as % of gross earning vs social contribution as % of gross earning for tertiary education in private
Higher the education cost, higher you pay later in life.

In this chart, by plotting total direct cost (both public and private) against private income tax effect, it can be seen that private income tax effect increases with increase in direct cost of education: significantly for men, moderately for women. This relationship is valid for both non-tertiary post-secondary education and tertiary education. One way to explain it is higher cost of education mostly is a result of demand in education. Demand in education results in higher earnings. Higher earnings lead to higher tax payments. On the other hand, the public direct cost is significantly more than its private counterpart. (2 times more for OECD tertiary, 10 times more for OECD non tertiary). Thus, government actually recovers the higher spend in education by getting more tax income.

**Figure 3 : Total direct cost vs private income tax effect for Men and Women**

In this chart, by plotting total direct cost (both public and private) against private income tax effect, it can be seen that private income tax effect increases with increase in direct cost of education: significantly for men, moderately for women. This relationship is valid for both non-tertiary post-secondary education and tertiary education. One way to explain it is higher cost of education mostly is a result of demand in education. Demand in education results in higher earnings. Higher earnings lead to higher tax payments. On the other hand, the public direct cost is significantly more than its private counterpart. (2 times more for OECD tertiary, 10 times more for OECD non tertiary). Thus, government actually recovers the higher spend in education by getting more tax income.
# TOOLS USED

Excel was used to collate and transform the data. Spotfire and Tableau was used for the visualizations. Adobe Illustrator was used to enhance the clarity and quality of the outputs provide by Spotfire and Tableau.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Spotfire</th>
<th>Tableau</th>
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| **Positive Aspects** | • Has additional chart types including treemap, parallel coordinate and 3D scatterplot.  
• Dynamic query filters are available on the main interface.  
• Details on demand display on main interface is helpful in identifying data points.  
• Marker size change (scatter plot) happens on "slider move", not on "mouse up".  
• Single interface box serves for measure /dimension selection and filtering.  
• It is possible to draw lines based on equations (scatterplot). | • Very intuitive interface that has a Web 2.0 feel to it – easy drag and drop of filters.  
• Can extract data from source and save it to local file or work on live data.  
• Using pages is a useful feature where each page acts like a step in an animation (like Gapminder).  
• Separate worksheets can have separate sets of filtered data.  
• Color sets can be saved and applied to different charts.  
• Custom annotations can be created on individual item level |
| **Problems Encountered** | • Formats of one element cannot be directly applied to another  
• There is no way to zoom in or out of a chart.  
• Some customization options are hidden deep within. e.g. sorting bars based on a certain column value. (bar chart)  
• Data filters are applied to all pages simultaneously. It was not possible to have different visualizations on different pages with different filter sets.  
• Filters cannot be removed by dragging out. | • Formats of one element cannot be directly applied to another  
• Double clicking in chart results in "zoom in". However, the program does not provide any easy way to zoom out or control the zoom level.  
• Dynamic query filters are hidden inside settings.  
• Marker size change (scatter plot) happens on "mouse up", not on "slider move" meaning it is not updated instantly.  
• It is not possible to draw lines based on equations. (scatterplot).  
• Labels do not have annotation line (scatterplot) |
| **Suggestions for improvement** | • Include format painter (like Excel).  
• Use a 48bit color system to enable transparency control and include a better color management interface.  
• Have percentile based dynamic query slider in addition to regular one. | • Provide facility to have multiple charts on the same page.  
• Include an option to save color sets and apply them later to visualizations.  
• Enable an easy option to apply different filter sets to different pages.  
• Provide ability to have different chart types within same chart. |
ADDITIONAL: PRE AND POST ILLUSTRATOR COMPARISON
Sum of Income tax effect% of Gross Earning vs. sum of Social Contribution% of Gross Earning. Color shows details about Sex. Size shows sum of Private Net present value. The marks are labeled by Country. Details are shown for Country. The data is filtered on Sector and Row Type. The Sector filter keeps Private. The Row Type filter keeps Country. The view is filtered on Country, which keeps no members.