

Interpolating PISA Data with World Bank Development Indicators

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Abstract

Introduction/Motivation

Education has been established in the literature as a driver of economic growth. However, most of the studies that explore the effect of education on economic growth focus on the quantity of education with little consideration for the quality of education, usually due to poor available data. Year of schooling, enrolment rates, class sizes, and degree level indicators do not reflect the quality of education but signify improved education investment, and fail to capture the quality of education. While a good proxy for the quality of education is debatable, the PISA (Programme for International Student Assessment) data is considered to be a more reliable standard index for education quality. PISA is an international score for education outcomes that comprises reading, math, and science. This proxy poses some limitations as it is measured every three years, with long series of annual PISA data still unavailable.

Data/Methodology

In this paper, we used the annual data on the proxies for education quality from World Development Indicators (WDI) database to interpolate the PISA data (i.e., data on education outcomes) retrieved from Organisation for Economic Co-operation and Development (OECD) database. The PISA data covers the period between 2000 and 2015 and is only available every three years. We gather data for all the 3 core indicators of the education outcome of PISA (reading, math, and science). We gathered data for 37 OECD countries that have a complete PISA dataset and grouped them into 4 groups using the Human Capital development index (HCIDI).

To complete the PISA data from tri-annual to annual series, we followed the following steps:

- First, we build factors to capture all the available annual series from WDI for education quality proxies. In the first instance, a linear interpolation was used to fill the missing observation in WDI proxies of education qualities. We further compressed all the WDI proxies of education quality into the main three key factors pupil-teacher ratio, education compensation, and education expenditure. The weighted average of all these factors was used to create a related series.
- Second, we then used factors created in the first step to perform the interpolation of PISA data using the Chow Lin Methodology. Finally, we use the related annual series in the Chow-Lin method to complete the tri-annual observations into annual observations from 2000 to 2015.

Conclusion

To add to the existing evidence, the study interpolates the missing observation in the PISA data for the period between 2000 to 2015. Chow-Lin Method was used to obtain an interpolated annual series for 37 OECD countries' PISA education outcomes data. using 22 variables available on the proxies of education quality from the World Development Indicators (WDI, 2020).

Having obtained an interpolated complete series for PISA outcomes using the Chow Lin method, we then used these new series to present the trend analysis for education outcomes in all 37 OECD countries. The main contribution of this paper is to extend the PISA data (on education outcomes) to an annual series using factor models and the Chow Lin technique. The original observations for these countries were 533 observations and we have extended them to 1364 observations -- the reading scores were extended from 208 observations to 541 observations; maths scores were extended from 179 observations to 461 observations and science scores were extended from 146 observations to 362 observations. This critical extension of this data set provides a complete annual data set on quality of education for researchers who wants to explore the issues in the field of education, economic growth, income inequality, and human capital development to mention just a few. The data set is available from the authors.

Key Words: Education; Quality of Education; PISA, factor analysis, Interpolation, Chow Lin, OECD

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