

**BAR-ILAN UNIVERSITY**

**The Relationships amongst Teachers Quality, Teachers Satisfaction,  
Investment in Education and PISA Performances:  
An International Comparative View**

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## Abstract

The economic theory emphasizes the importance of human capital development for a country's economic growth. Therefore, many countries strive to improve their student achievements and human capital quality in order to boost the economic growth rate, among other things (Hanushek & Woessmann, 2020). The professional literature distinguishes various types of factors that affect student achievements. For example, teacher's development, education finance policy, and the background characteristics of the student, his family and community (Thapa et al., 2020).

The purpose of the study is to examine the relationships between teacher quality (level of literacy and numeracy competencies), teacher satisfaction (from profession and job environment), and the of public investment in education (government expenditure per student in the secondary in percentage of the GDP per capita ), and students' performance in PISA (Programme for International Student Assessment) 2018.

The research combines comparative data of 15 developed OECD countries (Organization for Economic Co-operation) members whose GDP per capita is in the range of 31,000-68,000 \$ ppp. from four international data files: PIAAC, PISA, TALIS, and the World Bank **at the student, school, and country levels**. The database contains 100,589 records of PISA 2018 student performance in mathematics and reading. As measured by an adult skills survey in numeracy and literacy, teacher quality was extracted from PIAAC 2012 and teacher satisfaction from TALIS 2018<sup>1</sup>.

In addition, the variables public expenditure per student percentage of GDP per capita from World Bank 2018<sup>2</sup>, and school characteristics such as the percentage of female students in school, school size, school ownership, accountability and pedagogical autonomy (PA), the teachers students ratio, advanced equipment, and physical infrastructures, as well as student

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<sup>1</sup> Countries that did not participate in TALIS 2018, were sampled from the previous questionnaire.

<sup>2</sup> Countries with missing values for public expenditure per student percentage of GDP per capita 2018, were sampled from most recent year.

background characteristics such as gender, socioeconomic status, immigration background, and early childhood education were extracted from PISA 2018.

**Method:** this study takes a unique approach to examining relationships between explanatory variables (teachers' quality, teachers' job satisfaction, and public investment in education) and dependent variables (PISA 2018 student performance in mathematics and reading). Whereas previous studies examined these relationships in a single-level linear analysis, this study examines these relationships using two models of analyses. First, a three-level model using SPSS software, due to the nature of the education system data grouped into clusters and three levels- student, school and country. This regression based on analyses that counts the multilevel structure data (Raudenbush & Bryk, 1986), and indicates the dependence on the predictors at the same level by decomposing the variance within and between different levels (Raudenbush & Bryk, 2002). Second, by **Ordinary Least Squares (OLS) model** using IDB analyzer ([IEA International Database Analyzer](#)) software, which allows for more accurate PISA data analysis due to PISA's sampling design and method of reporting student performances.

The variables at the country level include teacher competencies in numeracy and literacy, teacher satisfaction from profession and job environment, and public expenditure per student as a percentage of GDP per capita. The variables at the school level include school size, ownership, accountability, PA, the ratio of teachers to students, advanced equipment, and physical infrastructure. The variables at the student level include gender, socioeconomic status, immigration background, early childhood education, students' PISA 2018 scores in reading and math. At the student and school level, the supervised variables include gender, socioeconomic status, immigration background, early childhood education, school size, school ownership, the teachers students ratio, advanced equipment, school infrastructure, accountability, and school PA.

The findings indicate a statistically significant positive relationship between teacher competencies in literacy (writing articles), teacher satisfaction with profession and job environment, public expenditure per student in secondary school, and student mathematics and reading performances in PISA 2018 in 15 developed OECD countries. In other words, student achievements are higher in countries where government investment per student is higher.

In addition, it was found that the higher the teachers competencies and satisfaction, the higher the level of student performance. The relationship between teacher competencies in numeracy (algebra) and student performances was found positive but not statistically significant.

This study has two main contributions. First, while most studies focus on analyzing the relationships between teacher quality and student performances, the relationships between students' background characteristics and performances on two levels, this study focuses on three levels (country, school, and student). In addition, while previous studies examine relationships between students' background characteristics, teacher quality, and achievements, this study includes country-level connections between investment and achievements from a global perspective.

More specifically, there are studies that examine the relationships between students' background characteristics (e.g., ESCS) and their achievements using two-level analysis. e.g., see ( Mensah & Baidoo-Anu , 2022). Similarly, other studies examine the relationships between teacher quality, school characteristics and students' achievements as well, e.g. see (Even & BenDavid-Hadar, 2021; Meroni et al., 2015; Jerrim et al., 2020). Further studies examine the relationships between increment of resources and improvement in achievements, for a brief review on this topic see (Hu et al., 2018; Thapa et al., 2020). This study examine the relationships between student background, teachers' quality, school characteristics and the

public expenditure per student as a percentage of GDP per capita, and students' performance in PISA 2018.