

EENEE Ad-hoc Question

Investing for Improving the Teaching Profession

May 2019

*By Prof. Dr. Martina Viarengo
Department of Economics
The Graduate Institute, Geneva*

The aim of this report is to provide a brief review of the existing economic literature related to investment in teachers. Resources allocated to teachers represent the largest single budgetary element in schools at all levels of education (Hanushek and Rivkin, 2006; OECD, 2018). Existing international research on the determinants of student achievement consistently shows a positive association between certain dimensions of teacher quality and students' learning outcomes (e.g., Hanushek and Woessmann, 2017; Dolton et al. 2011). Recent cross-country research also highlights that differences among countries with respect to cognitive skills of teachers – measured in terms of proficiency in numeracy and literacy – can explain a large share of the international variation in student performance (Hanushek et al. 2014, 2018). These findings highlight the fundamental role that teachers play in the efficiency of the education systems. Investing in attracting and retaining effective teachers, as well as raising their professional competencies, are therefore significant policy concerns (OECD, 2005). Education systems vary considerably across countries in terms of institutional settings, governance, and allocation of resources (Woessmann, 2016). In this regard, within countries - conditional on country-specific characteristics and national policies - there is significant heterogeneity of school policies and teaching practices (Freeman and Viarengo, 2014), which ultimately have an impact on the quality of teaching and student educational achievement.

1] Methodology

The core studies presented in this review are drawn from international peer-reviewed journals in the areas of the economics of education, labour economics and general interest

economics, as well as from the main working paper series in economics. The coverage is mainly limited to advanced economies. For the more recent initiatives, for which rigorous empirical evidence on their impact is not yet available, information has been extracted from education reports of international organizations and country-specific institutional sources.

2] Investments in the Teaching Profession

Empirical evidence on the impact of teachers on students' educational achievement has generally shown large variations in teacher value-added in learning gains. However, teacher observable characteristics such as level of education, academic credentials and experience have not been found to be consistently related to students' performance, suggesting that these may not be satisfactory measures of teacher quality (e.g., Hanushek and Rivkin, 2012). A limited number of studies have examined the impact of teachers' professional training on students' learning outcomes. Evidence over their effectiveness is mixed. Moreover, the significant variation in the content, design and intensity of training programs evaluated –together with differences in the stage in the teachers' professional life-cycle when they are implemented - does not allow drawing general policy implications.

Most cross-country analyses remain descriptive. Berrera-Pedemonte (2016) finds that high-quality teacher professional development, defined according to the extent of collective participation, collaboration, active learning and extended duration, is positively associated with the self-reported classroom teaching practices adopted by teachers across 35 countries. Country-specific studies generally rely on more rigorous strategies to identify causal effects and address possible biases that are more difficult to overcome in cross-country estimation. Relevant studies include Bressoux et al. (2009) who rely on a quasi-experimental design and find that training matters at the early stages of teachers' career. Their findings suggest that training of novice teachers in France had on average a significant positive impact on primary school students' test scores in mathematics. In another study, Bouguen (2016) examines the effects of an intensive teacher pedagogical training in kindergarten in France that aimed at training teachers to adjust their teaching according to students' needs. The author finds positive effects on students' short-term reading performance¹, with larger effects for the more disadvantaged students. Machin et al. (2018) evaluate an intervention that targeted the pedagogy of existing teachers in the framework of a national change in policy and practice in England that refocused the teaching of reading around "synthetic phonics". Their analysis provides evidence over the effect of the change in pedagogy and teacher training and also shows that the reform was relatively low cost and effective. That is, the Authors find that the intervention improved students' performance at age 5, positive impacts persisted until age 7 and then faded out by the end of primary school. Positive impacts persisted until the end of primary school for children from a disadvantaged background and for children non-native speakers of English, suggesting that the policy was effective in reducing inequality in school

¹ The non-experimental setting does not allow to fully address concerns of possible selection bias.

performance. The Authors also estimate that the positive effects on the disadvantaged groups were high enough to justify the costs of the policy.

A relatively larger number of studies have focused on the United States, either by evaluating training programs in individual states or by comparing the effectiveness across a sample of states (e.g., Goldschmidt and Phelps, 2010; von Hippel et al., 2018). Among these studies, Harris and Sass (2011) by relying on a comprehensive administrative dataset from Florida find that only teachers' informal on-the-job training has a significant impact on students' performance in elementary and middle school whereas preservice undergraduate education and professional development after entering the teaching do not appear to be related to teacher productivity. On the other hand, Taylor and Tyler (2012) show how interventions can improve teacher skills by focusing on mid-career math teachers in the Cincinnati Public Schools, and find significant improvements in teacher performance post-evaluations, especially for those teachers with weaker initial evaluations. The authors' findings suggest that teachers' professional competencies can potentially be raised by providing them with information on how to improve their performance.

There is significant variation across Member States in terms of recent innovations in teacher training. Overall, in several countries there has been an expansion of professional development through peer learning, especially in secondary education, and an increase in training programs designed to provide teachers with support to integrate information technology in teaching mathematics (e.g., OECD, 2019²). There is no empirical evidence available yet over the impact of these changes.

In this regard, the rapidly expanding digital economy, together with growing robotisation and other technological changes, will revolutionize learning. This creates both opportunities and challenges for education systems as they adjust traditional teaching methods to meet the new needs.

The fast technological change in education may also bring the potential for a reduction in inequality in terms of access to some forms of educational resources (e.g., online courses) but at the same time creates a need for teachers to provide complementary teaching services (Acemoglu et al., 2014). Falck et al. (2018) make an important contribution to the existing literature as they show that the little or no effects of computer use on student achievement generally found in the existing studies can be explained by the fact that computers are used for different activities in the classroom. In their analysis, the authors show that when computers are used for activities that do not have an effective alternative traditional teaching method available they have a positive impact, whereas when they are used to substitute potentially more effective traditional teaching methods they lower learning outcomes at both 4th and 8th grade levels in OECD countries.

² These are measured in terms of share of students taught by teachers who took part in the different training programs.

In another recent study, Comi et al. (2017) by relying on student-teacher matched data for Italy find that information and communication technology has a positive effect but such an effect is limited to the development of analytical skills and communication practices, also suggesting that in this context the overall effect of computer use critically depends on teaching practices.

A number of country-specific initiatives have been introduced in Member States to foster the integration of students of migrant background. There is significant variation across countries in the nature and design of the professional development programs introduced to support teachers in acquiring skills and competencies needed to support migrant students, some examples are described in Eurydice (2019). These initiatives are in several cases recent and a rigorous assessment over their impact is not available at this stage.

Exchange schemes that offer teachers opportunities for mobility and experience vary widely. In some countries, they are regulated by authorities of different ranks. In other countries, they are defined through school-level practices (Eurydice, 2018). Empirical evidence on the causal impact of these programs on teaching quality and students' educational achievement is not available yet.

3] Expenditure in Education and the Teaching Profession

Several studies, both cross-country analyses and country-specific studies, have found a positive association between student learning outcomes and the quality of the teaching force. However, rigorous evidence on the causal links is still limited (Hanushek and Woessmann, 2017). Characteristics of the labour-market are important determinants of teacher quality (Hanushek and Rivkin, 2006) as they affect teacher recruiting and retaining policies, and ultimately affect the supply of potential teachers. For example, Dolton and Marcenaro- Gutierrez (2011) examine whether the quality of teachers is likely to be higher if they are paid higher up the income distribution in their own country and what is the impact of teachers' relative pay on student achievement as measured in a comparable and consistent way in the framework of the international studies (i.e., PISA and TIMSS). They find a significant and positive effect of teachers' wages on secondary school students' performance by assessing the impact on test scores in mathematics, reading and science while examining a sample of 39 countries which includes both developing countries and advanced economies.

Other related studies have examined how exogenous changes in the teacher labour market affect the pay structure and teacher compensation. Hensvik (2012) studies the effects of an increase in school competition in local labour markets in Sweden and finds this to be related to an increase in teacher salaries and greater wage dispersion between high skilled and low skilled teachers, with higher wage returns for teachers entering the profession.

Other studies have examined the effects of performance pay programs and incentive schemes that link teacher pay to their students' academic performance. Evidence on their impact is mixed, and varies across

programs and countries.³ In general, the lack of positive results seems to be related to implementation and measurement issues. The majority of the existing evidence is based on the United States (e.g., Goodman et al., 2013; Imberman et al., 2015; Lavy, 2003; Atkinson et al., 2009).

Different initiatives have been introduced by different Member States to raise the profile and social status of the teaching profession. These initiatives vary across countries in their nature and design, ranging from the design of career trajectories, to career advancement tools, and incentives (e.g., some country-specific examples are described in Schleicher (2011)).

Research on the causal effects of resources in schooling on students' outcomes in developed countries has found either no effect or a limited role in cross-sectional analyses. Some positive effects have been found in country-specific studies, especially for students who come from economically disadvantaged backgrounds (e.g., Hanushek, 2003, 2006; Krueger, 2003; Holmlund et al., 2010; Gibbons et al., 2018). Recent studies have found that specific school resources, such as higher teacher quality [is this a resource?], the adequacy and quality of instructional material, and instruction time can have a positive impact on learning outcomes (e.g., Woessmann, 2003). The effect of resources allocated to improve teachers' working conditions has also been examined. For example, Falch (2011) found in a Norwegian experiment that raising wages reduced turnover. On the other hand, Leuven et al. (2007) found no positive results after a subsidy was given in the Netherlands to improve teachers' working conditions in schools with many disadvantaged students. In another context, Bednar and Gicheva (2019) show to what extent in the United States providing workplace support is associated with a reduction in minority teachers' turnover, especially in schools where minorities are under-represented.

Furthermore, existing research has shown the positive association between student learning outcomes and institutional settings such as school competition, the presence of school accountability and school autonomy in personnel and process decisions – the latter seems to be positively related to student achievement as long as it is combined with curriculum-based external exit exams at the end of secondary school⁴ (e.g., Woessmann 2003; Fuchs and Woessmann, 2007; Woessmann et al., 2009).

4] Concluding Remarks

The important role that teachers play in affecting student achievement and the quality of learning outcomes is widely acknowledged across Member States. Existing research suggests that the composition of the teacher workforce is affected by the structure of the education system and the labour market. The

³ This report focuses on advanced economies, a list of selected publications in the context of developing countries is provided in the Appendix.

⁴ These external exit exams exist in countries such as England, France, Italy, Japan, the Netherlands and South Korea. For a comprehensive and insightful description of the characteristics regarded as fundamental aspects of the curriculum-based external exit exam systems see Woessmann (2018).

current evidence on the effectiveness of training varies across countries and programs and does not allow the drawing of generalized conclusions. While a number of initiatives have been recently introduced across Member States to improve the quality of teaching and train teachers to adjust their skills to current challenges such as the expanding digital economy and the other rapid technological changes, which will shape the future of work and learning, there is still limited comparable and rigorous evidence over their impact in the European context.

References

- Acemoglu, D., D. Laibson, and J. A. List, (2014), "Equalizing Superstars: The Internet and the Democratization of Education", *American Economic Review*, 104 (5): 523-527.
- Atkinson, A., Burgess, S., Croxson, B., Gregg, P., Propper, C., Slater, H., and Wilson, D. (2009), "Evaluating the impact of performance-related pay for teachers in England", *Labor Economics*, 16(3): 251-261.
- Barrera-Pedemonte F. (2016), "High-Quality Teacher Professional Development and Classroom Teaching Practices: Evidence from Talis 2013", *OECD Education Working Papers*, No. 141.
- Bednar S. and D. Gicheva (2019), "Workplace Support and Diversity in the Market for Public School Teachers," *Education Finance and Policy*, 14(2), Forthcoming.
- Bouguen A. (2016), "Adjusting content to individual student needs: Further evidence from an in-service teacher training program", *Economics of Education Review*, 50: 90-112.
- Bressoux P., F. Kramarz and C. Prost (2009), "Teachers' Training, Class Size and Students' Outcomes: Learning from Administrative Forecasting Mistakes," *Economic Journal*, 119(536): 540-561.
- Comi, S. L., G. Argentin, Gui, M., Origo, F., and Pagani, L. (2017) "Is it the way they use it? Teachers, ICT and student achievement", *Economics of Education Review*, 56:24- 39.
- Dolton, P., and O. D. Marcenaro-Gutierrez (2011), "If you pay peanuts do you get monkeys? A cross-country analysis of teacher pay and pupil performance", *Economic Policy*, 26(65): 5-55.
- Eurydice (2018) "Teaching Careers in Europe: Access, Progression and Support", Brussels: Eurydice Publication.
- Eurydice (2019), "Integrating Students from Migrant Backgrounds Education into Schools in Europe – National Policies and Measures", Brussels: Eurydice Publication.
- Falch T. (2011), "Teacher Mobility Responses to Wage Changes: Evidence from a Quasi-natural Experiment", *American Economic Review*, 101(3): 460-65.
- Falck, O., C. Mang, and L. Woessmann, (2018), "Virtually no effect? Different uses of classroom computers and their effect on student achievement", *Oxford Bulletin of Economics and Statistics*, 80(1):1-38.
- Freeman R. B., and M. Viarengo (2014), "School and family effects on educational outcomes across countries", *Economic Policy*, 29(79): 395-446.

Fuchs T. and L. Woessmann (2007) "What Accounts for International Differences in Student Performance? A Re-examination Using PISA Data," *Empirical Economics*, 32(2– 3): 433–64.

Gibbons S., S. McNally and M. Viarengo (2018), "Does Additional Spending Help Urban Schools? An Evaluation Using Boundary Discontinuities," *Journal of the European Economic Association*, 16-5(1): 1618–1668.

Goodman S. F. and Lesley J. Turner (2013), "The Design of Teacher Incentive Pay and Educational Outcomes: Evidence from the New York City Bonus Program," *Journal of Labor Economics*, 31(2): 409-420.

Goldschmidt P., and G. Phelps (2010), "Does teacher professional development affect content and pedagogical knowledge: How much and for how long?," *Economics of Education Review*, 29(3): 432-439.

Hanushek, E. A. (2003), "The Failure of Input-Based Schooling Policies", *Economic Journal*, 113: F64-F98.

Hanushek, E. A. (2006), "School Resources", In Eric A. Hanushek and Finis Welch (eds.), *Handbook of the Economics of Education*, Volume 2, Elsevier.

Hanushek E. A., M. Piopiunik, and S. Wiederhold (2014, 2018), "The value of smarter teachers: International evidence on teacher cognitive skills and student performance", NBER Working Paper No. 20727, Revised in 2018.

Hanushek, E. A., and S. G. Rivkin (2006), "Teacher quality", *Handbook of the Economics of Education*, 2:1051-1078.

Hanushek E. A., and S. G. Rivkin (2012), "The distribution of teacher quality and implications for policy," *Annual Review of Economics*, 4:131-157.

Hanushek E. A., and L. Woessmann (2017), "School resources and student achievement: A review of cross-country economic research". In *Cognitive abilities and educational outcomes* (pp. 149-171), Springer International Publishing.

Harris D. N. and T. R. Sass (2011), "Teacher training, teacher quality and student achievement", *Journal of Public Economics*, 95(7–8): 798-812.

Hensvik, L. (2012), "Competition, Wages and Teacher Sorting: Lessons Learned from a Voucher Reform", *Economic Journal*, 122: 799-824.

Holmlund H., S. McNally and M. Viarengo (2010), "Does Money Matter for Schools?" *Economics of Education Review*, 29: 1154-1164.

Imberman S. A. and M. F. Lovenheim (2015), "Incentive Strength and Teacher Productivity: Evidence from a Group-Based Teacher Incentive Pay System", *Review of Economics and Statistics*, 97(2): 364-386.

- Krueger, A. (2003), “Economic Considerations and Class Size”, *Economic Journal*, 113: F34-F63.
- Lavy, V. (2002), “Evaluating the Effect of Teachers’ Group Performance Incentives on Pupil Achievement,” *Journal of Political Economy*, 110(6): 1286-1317.
- Leuven, E., M. Lindahl, H. Oosterbeek and D. Webbink, (2007) “The Effect of Extra Funding for Disadvantaged Pupils on Achievement”, *Review of Economics and Statistics*, 89(4): 721-36.
- Machin S., S. McNally and M. Viarengo (2018), “Changing How Literacy is Taught: Evidence on Synthetic Phonics,” *American Economic Journal: Economic Policy*, 10(2): 217-241.
- OECD (2005), “Teachers Matter: Attracting, Developing and Retaining Effective Teachers”, Paris: OECD Publication.
- OECD (2018), “Education at a Glance” Paris: OECD Publication.
- OECD (2019), “Measuring Innovation in Education. What has changed in the classroom?” Paris: OECD Publication.
- Schleicher A. (2011), “Building a High-Quality Teaching Profession: Lessons from around the World, International Summit on the Teaching Profession”, Paris: OECD Publication.
- Taylor, E. S., and J. H. Tyler (2012), “The Effect of Evaluation on Teacher Performance,” *American Economic Review*, 102 (7): 3628–51.
- Von Hippel P. T., and L. Bellows (2018), “How much does teacher quality vary across teacher preparation programs? Reanalyses from six states”, *Economics of Education Review*, 64: 298-312.
- Woessmann, L. (2003), “Schooling Resources, Educational Institutions, and Student Performance: The International Evidence,” *Oxford Bulletin of Economics and Statistics*, 65(2): 117–70.
- Woessmann L. (2016), “The importance of school systems: Evidence from international differences in student achievement”, *Journal of Economic Perspectives*, 30(3): 3-32.
- Woessmann L. (2018), “Central Exit Exams improve Student Outcomes”, *IZA World of Labor*, 419: 1-10.
- Woessmann L., E. Luedemann, G. Schuetz, and M. R. West (2009), “School Accountability, Autonomy, and Choice around the World”, Cheltenham, UK: Edward Elgar.

APPENDIX – Selected List of Studies focusing on Teachers in Developing Countries

- Cilliers J., B. Fleisch, C. Prinsloo and S. Taylor (2019), “How to improve teaching practice?”

Experimental comparison of centralized training and in-classroom coaching”, forthcoming in the *Journal of Human Resources*.

Contreras D. and T. Rau (2012), “Tournament Incentives for Teachers: Evidence from a Scaled-Up Intervention in Chile”, *Economic Development and Cultural Change*, 61(1): 219-46.

Duflo E., P. Dupas, and M. Kremer (2015), “School Governance, Teacher Incentives, and Pupil-Teacher Ratios: Experimental Evidence from Kenyan Primary Schools”, *Journal of Public Economics*, 123: 92–110.

Duflo E., R. Hanna, and S. P. Ryan (2012), “Incentives Work: Getting Teachers to Come to School”, *American Economic Review*, 102(4): 1241–78.

Glewwe P., N. Ilias, and M. Kremer (2010) “Teacher Incentives”, *American Economic Journal: Applied Economics*: 205-27.

Muralidharan K. and V. Sundararaman (2011), “Teacher Performance Pay: Experimental Evidence from India”, *Journal of Political Economy*, 119(1): 39-77.

Popova, A., D. K. Evans and V. Arancibia (2016) “Training Teachers on the Job: What Works and How to Measure It”, *World Bank Policy Research Working Paper No. 7834*.

Urquiola M. (2006), “Identifying class size effects in developing countries: Evidence from rural Bolivia”, *Review of Economics and Statistics*, 88 (1): 171-77.

Urquiola M. and E. Verhoogen (2009), “Class-Size Caps, Sorting, and the Regression Discontinuity Design”, *American Economic Review*, 99(1): 179-215.