

Measuring the Contribution of Primary-School Teachers to Education Outcomes in The Netherlands

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1 Introduction

Human capital is a crucial input into a country's production function and in determining long-term income growth and prosperity. Macroeconomists have traditionally used years of education as a measure to explain differences in cross-country growth performance (Barro and Lee 1993, 2001; Cohen and Soto 2007). They observe that an educated workforce goes along with higher levels of labour productivity and technology development. Education also influences social outcomes, such as the probability to be unemployed (e.g., Oreopoulos 2006) and the life expectancy of individuals (e.g., Van Kippersluis et al. 2011).

Advances have been made in the measurement and data availability of the inputs which build the stock of human capital. Pioneering initiatives, such as the International Adult Literacy Survey (IALS) and the Programme for the International Assessment of Adult Competencies (PIAAC), have led to the conclusion that there are differences across countries in terms of a range of skills, which are not captured by looking at years of education. These new measures have shown to be helpful in explaining cross-country differences in labour-market outcomes and economic performance (e.g., Leuven et al.

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2004; Hanushek et al. 2015). One of the main lessons from these studies is that the link between human-capital indicators and economic performance and the link between individual abilities and outcomes (such as employment opportunities and wages) is far from automatic (e.g., Acemoglu and Autor 2011 for a review).

Advances in discovering the most important inputs of the human-capital production function have led to the conclusion that teacher quality is crucial for building a country's human-capital stock (Hanushek 1971; Hanushek and Rivkin 2006; Staiger and Rockoff 2010). Most studies focus on primary-school teachers. They build the curriculum, challenge children to achieve their goals, help to build social networks and recognize learning difficulties. In addition, they are able to influence a child's educational career by their impact on transitions from primary to secondary education. The latter is especially important for systems with early tracking such as in Germany and the Netherlands, in which the teacher's assessment of each child's ability is given a substantial weight.

Teacher quality differs across countries and within-country differences in teacher quality are remarkably large (e.g., Nye et al. 2004). A successful strategy to address the impact of teachers on a child's outcomes has been to estimate differences in the growth of a child's achievement across different teachers. Nye et al. (2004) find a difference in standardized test scores over one third of a standard deviation (0.35) in reading and almost half a standard deviation (0.48) in mathematics between teachers who raise the skills of a child only slightly (teachers in the lowest quartile of the skill distribution) compared to teachers who raise skills substantially (teachers in the highest quartile). Numerous other studies corroborate these findings (e.g., Hanushek 2011 for an overview; and Chetty et al. 2014a, b for recent empirical evidence on the United States).

Most of the empirical evidence in this field comes from studies about the United States. This *special issue* presents empirical evidence from the Netherlands. It is challenging to assess the causal impact of teachers on skills acquisition and a child's performance in school. The main reasons for this are that differences in value added are not easily measured across teachers and that teachers are typically not randomly assigned to schools and/or classes. For example, teachers in the Netherlands prefer working in schools with a lower proportion of disadvantaged pupils and smaller classes (e.g., Bonhomme et al. 2016). Nevertheless, when using the estimated impact of good teachers (from the international literature) to predict their impact on Dutch children the size of the effect is remarkable: it equals the difference in standardized test scores at the end of primary education between prospective Vmbo-t and Havo-students. The former students will attend vocational secondary education, which level can be compared to high school in the United States; the latter students will typically finish higher vocational education, which level can be compared to college education.¹

¹ For the Netherlands Gerritsen et al. (2016) find that for primary-school teachers years of work experience is an important driver of differences in value added. However, the mechanisms behind these differences are still not fully understood. As such, it seems particularly challenging to identify successful policy initiatives that improve the skills of existing and future teachers.

This *special issue* considers the value added of primary-school teachers in the Netherlands. There are four contributions. Three of them add empirical estimates to the literature by providing relevant information on the actual skill levels of existing teachers. First, [Golsteyn et al. \(2016\)](#) present an international comparison of teacher skills based on data from the Adult Literacy and Lifeskills Survey (ALL) and the PIAAC programme. Second, [Feron et al. \(2016\)](#) observe that teachers are more able than standardized tests to predict a child's future performance in secondary education. Third, [Van der Steeg and Gerritsen \(2016\)](#) analyse which (non-cognitive) skills are likely to be responsible for the between-teacher-differences in measured value added. The fourth paper by [Van Elk and Kok \(2016\)](#) assesses the impact and role of teachers in a quality-improvement programme in Amsterdam that was aiming at producing increases in student achievement.

2 Background

Measuring teachers' contributions to children's achievement is central to designing policies targeted at improving teacher quality. One of the main roles of teachers is to transmit knowledge to children. To do so, teachers need a set of skills. Many different measurement systems of skills exist and economists often distinguish between cognitive and non-cognitive skills (e.g., [Borghans et al. 2008](#)). A teacher's cognitive skills are often defined by the level of grammar and algebra. Non-cognitive skills are defined as, for example, the ability to concentrate, communicate and persevere, and having empathy for others. However, a sharp contrast between cognitive and non-cognitive skills or traits creates the potential for much confusion because few aspects of human behaviour are devoid of cognition. Many aspects of non-cognitive skills and traits are influenced or build by cognitive processes.

Economists have done considerable research into the level and importance of cognitive skills to assess teacher quality and relate this to children's outcomes. An often emerging question is whether teachers who score relatively low on cognitive tests add less value to a child's skills level compared to teachers who score high on such exercises. The empirical literature does not seem to find clear evidence that differences in teachers' cognitive skill levels create substantially different child outcomes. For example, [Buddin and Zamorro \(2009\)](#) and [Harris and Sass \(2011\)](#) show that teachers with higher measured skill levels (SAT scores) in reading, writing and mathematics do not perform better in terms of children's test scores relative to teachers with lower skill levels. Whether or not primary-school teachers have a master's degree also does not seem to significantly matter for child outcomes. [Rivkin et al. \(2005\)](#) find that primary-school teachers with a master's degree do not seem to transmit more skills to children compared to teachers without a master's degree.

In the Netherlands, policymakers have recently spent considerable effort in increasing the minimum level of education required for aspiring teachers. This is not necessarily contradictory to the previously mentioned findings because the empirical studies mainly analyse skill levels above a certain threshold, rather than a minimum skill level. However, not much is known about the effectiveness of increasing minimum levels. Under the new requirement in the Netherlands, all first-year students who

enter the teacher academy have to take both a language test and a mathematics test. Those with deficiencies in other subjects are also tested. Only students who pass all these tests are allowed to proceed to later stages of the teacher academy. This measure was motivated by worries about the level of cognitive skills of Dutch teachers. These doubts specifically concerned students who entered the academy from a vocational secondary school. High drop-out rates at the teacher academy among this group and the wish to devote more class time to other skills, made policymakers decide to require higher entry levels. The effectiveness of these measures is currently being examined. First impressions suggest a substantially lower inflow of students.

Dutch policymakers also tried to increase cognitive skills beyond setting minimum cognitive requirement levels. In 2008, a voucher scheme was introduced through which teachers were financially supported to pursue a bachelor's or master's degree. [Van der Steeg and van Elk \(2015\)](#) exploit a regression-discontinuity approach to study the effects of this voucher scheme on enrolment and completion of education programmes. The authors conclude that there is a large deadweight loss associated with this voucher scheme because many participants would have joined a training programme anyway.

The economic literature that analyses the importance of teacher's non-cognitive skills for children's outcomes suggests that certain skills, especially pupil-teacher-interaction skills, matter for achievement. [Allen et al. \(2011\)](#) observe that improved teacher-pupil interactions predict improved test scores regardless of the content area of instruction. These findings are based on a randomized controlled trial of a teacher coaching programme. The programme focussed on improving teacher-student interactions in classrooms in Virginia with the ultimate aim of enhancing motivation and achievement. The programme targeted the motivational and instructional qualities of teachers' ongoing, daily interactions with children. Similarly, the findings of [Taylor and Tyler \(2012\)](#) suggest that intensive teacher evaluations significantly improve children's math scores. [Papay et al. \(2016\)](#) study programmes in which high-performing and low-performing teachers working at the same school are paired and asked to collaborate on improving the low-performer's skills, with a focus on those non-cognitive skills in which the teacher showed a deficiency. The estimated coefficients suggest that children of low-performing teachers treated by the intervention scored significantly higher compared to children in control classrooms.

In the Netherlands, the Inspectorate of Education performs annual tests of teacher quality. It turns out that in 2015 83% of all primary-school teachers has all required didactic skills, 62% is able to differentiate between pupils, and 57% has both skills ([Onderwijsinspectie 2015](#)). Among the 43% who lack at least one of these skills, inexperienced and young primary-school teachers are overrepresented.

The literature confirms the importance of work experience for teacher quality. Young teachers in mathematics perform significantly worse than more experienced teachers. [Harris and Sass \(2011\)](#) find effects of up to 5 years of experience. Generally, experience effects appear to decrease after 5 years, although [Gerritsen et al. \(2016\)](#) report more prolonged effects for Dutch primary-school teachers. They find that younger teachers at the start of their careers have equal skill levels and learning curves compared to their older colleagues when they started their careers. It seems therefore unlikely that the estimated effect is driven by differences in cohorts, caused

for instance by changes in the labour market or differences in the curriculum of the teacher academy.

3 Contributions to this Issue

Most of the existing economic literature on teacher quality is based on studies conducted in the United States. As the institutional and cultural context of education is arguably very important for the production function of skills, it is necessary to bring relevant Dutch evidence to the table. This *issue* of *De Economist* presents three papers that add knowledge about the value added of primary-school teachers in the Netherlands and one paper on a policy initiative aimed at improving the value added.

Bart Golsteyn, Stan Vermeulen and Inge de Wolf focus on the level of cognitive skills of both primary and secondary-school teachers. The authors present international evidence, using the PIAAC and ALL-databases of the OECD, on the relative cognitive skills distribution of teachers. The Netherlands is one of the countries in which adults of different professions have participated in this survey. This allows the authors to compare literacy and numeracy skills of teachers in different countries to other citizens in those countries. The paper shows that teachers have better literacy and numeracy skills than other equally educated respondents in almost all of the 15 countries, including the Netherlands. In most countries, teachers outperform others in the bottom percentiles, while in some countries they perform better than others throughout the whole skills distribution. [Golsteyn et al. \(2016\)](#) highlight that policy-makers should take the shape of the skills distribution into account when designing interventions which are supposed to raise teachers' skills. It turns out that Dutch teachers who perform worst in these skills are still a lot better than the worst performing other equally educated respondents in the OECD surveys. The difference between teachers and others is less profound at the top of the distribution. This suggests that policy measures aiming at increasing the minimum level of skills among teachers are in all likelihood expected to be not very effective.

Teacher skills do not only serve as direct inputs for the production process of their students' skills. With direct inputs, we refer to their skills in transferring knowledge. Beyond transferring knowledge, teachers play a role in influencing decisions that are crucial to the school career of children. In an international context, acceptance decisions are for example often based on teachers assessments. In the Netherlands, promotion decisions, allocation to teachers and classrooms heavily depend on teachers' information. Perhaps the most notorious decision of all in the Dutch context is the primary-school teacher's advice, which is given to each primary-school child in the final grade of primary school. In this advice the teacher articulates what he or she expects to be the child's optimal career in secondary school.

The second paper in this *special issue* is about the prediction made by primary-school teachers. The paper by Eva Feron, Trudie Schils and Bas ter Weel addresses the question to what extent the subjective teacher's assessment of children's ability predicts children's outcomes in the transition from primary to secondary school. The outcome measures are initial track allocation, track switching in the first 3 years of secondary education and subsequent test scores. The empirical analysis makes use of

an enriched administrative dataset from the Dutch province of Limburg. The estimated coefficients suggest that the subjective teacher's assessment is a better predictor of all three outcome measures compared to the results of cognitive tests taken at the end of primary school. The analysis suggests that primary-school teachers seem to possess the skill of observing, assessing and interpreting the performance and behaviour of children in such a way that this accurately forecasts future performance and behaviour. This is important information for an educational system with early tracking.

Recent policy changes have made the teacher's advice leading in the choice of the initial track in secondary schools. There were several reasons for doing so, amongst others that there is a strong belief in the professional expertise of teachers. Even more recently however, the Dutch Education Inspectorate published an influential report in which it highlighted the differences in educational careers between children of equal cognitive capacities but with different parental characteristics. After this, concerns have been raised that the teacher's advice could be biased towards children with higher educated parents or from more advantaged families relative to children from lower educated parents and more disadvantaged families. [Feron et al. \(2016\)](#) do find that children whose mother is either unemployed or disabled receive relatively lower teacher assessments. This does not necessarily mean that teachers are biased; it is for example possible that the home environment is less favourable and that hence the lower prediction of these children's future success is accurate. From a societal point of view an accurate prediction does not necessarily mean that this outcome is preferable. Estimating the societal costs and benefits is a useful direction for future work.

In the third contribution to this *issue*, Marc van der Steeg and Sander Gerritsen focus on the importance of non-cognitive skills for the effectiveness of primary-school teachers. The researchers measure skills by making use of a teacher evaluations system (TES). TES assesses teachers on eighteen competences, twelve of which are didactical, four pedagogical, and two organizational. Examples are "clearly sets high expectations", "differentiates between pupils", "provides extra time to weaker pupils", "encourages pupils to reflect on differing solution strategies" and "provides feedback". The estimated coefficients suggest that differences in the overall TES-score of teachers predict a substantial part of the differences in value added between teachers. More specifically, they obtain differences of 0.40 standard deviations in math, 0.40 in spelling and 0.25 in reading between children who have been taught by teachers from the top quartile of the TES-score distribution and children who have been taught by teachers from the bottom quartile of distribution. In addition, the authors find that TES seems to be particularly effective in identifying relatively weak teachers. Van der Steeg and Gerritsen (2016) conclude that the use of TES may stimulate targeted investment and improvement plans to develop and maintain the necessary skills among teachers.

Improvement plans are the main subject of the paper by Roel van Elk and Suzanne Kok—in the fourth contribution to this *issue*. In Amsterdam, several schools have implemented an ambitious quality-improvement programme, which has been largely based on TES. The approach includes observations during classes and feedback to teachers based on these observations. [Van Elk and Kok \(2016\)](#) show that TES-scores can induce improvement, measured by children's test scores. However, test scores can also decrease (in the short run) as a result of introducing a rigorous method that forces

teachers to change. 4 years after implementation of this method, the improvement of test scores was relatively disappointing. One explanation is job mobility among teachers. It seems to be the case that the implementation of the improvement programme has led to turnover among teachers. Some teachers left voluntarily, because they disliked the methods, while others were forced to leave, because they did not meet the required quality standards. New teachers were hired, but improvement measured by test scores seems to be absent up to now.

4 Conclusion

This special *issue* on measuring the contribution of primary-school teachers to the education outcomes in the Netherlands provides new empirical insights into teacher quality. Teachers are an important input into the production of human capital, but most of the existing empirical literature on teacher quality and effectiveness is based on U.S. studies. The research in this *issue* aims to shed light on teacher quality in the Netherlands, which is likely to be of interest to the policymakers. Taken together, the papers present a rich but complex picture of the teacher profession in the Netherlands. This means that policy recommendations are not straightforward.

The first two contributions in this *issue* show that teacher quality seems to be appropriate. The first paper shows that the cognitive skills of teachers are higher compared to those of equally educated employees in other professions. However, the empirical literature does not find support for the fact that higher levels of cognitive skills of teachers improve children's outcomes. One explanation might be that teachers embody relatively high overall levels of cognitive skills. If so, policies designed to increase levels of cognitive skills could be ineffective. The second contribution reveals that teachers are better at forecasting future performance and behaviour of children than cognitive tests alone. However, the policy consequences of these forecasting abilities are not obvious. Should tracking decisions be based on these abilities, given the distribution of teacher quality? Non-cognitive teacher skills are also found to be of importance for transmitting skills. Non-cognitive skills foster higher test scores and can be trained. Moreover, does society want to accurately predict outcomes or give optimal opportunities to children? Furthermore, the fourth contribution argues that training schemes focused on non-cognitive skills can also lead to a decrease in test scores (at least in the short run), because of increased teacher turnover.

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