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Researching the Association between Teachers and School Outcomes (Based on TALIS Data and Lower Secondary School Examination Results)

Abstract

The purpose of this paper is to identify potential links between information about teachers and the academic achievement of schools. Data regarding teachers, collected by TALIS (Teaching and Learning International Survey), is analysed simultaneously with school examination scores. There are some general considerations and conclusions based mostly on the analysis of linear regression coefficients.

As the presented relations apply to averaged school characteristics rather than individual characteristics of teachers or students, they should be interpreted with caution, mainly as statistical ones. ‘Teacher’ data from schools do not differ much and do not provide firm grounds for the identification of relations between them and the lower secondary school examination scores- which vary considerably. We should investigate the teacher and student level rather than use averaged school characteristics.

Keywords: TALIS, teacher qualities, school examination results

Background

For several decades, a number of countries have measured academic achievement using more complicated, but more objective, tools than traditional grading by teachers. This continuously improved system of assessment of student knowledge and skills has led to the establishment of institutions of international renown.

Researchers focus not only on identifying the achievements of students, schools, regions and countries, but also on explaining how and why the results vary and the underlying nature of this differentiation. Hence, international research projects, which involve students and teachers from several dozen countries, have gained growing interest. The most widely recognised study on student achievement and skills is PISA. As part of this programme, sample groups of 15-year-old students were assessed in more than 60 countries in 2012.

One of the newer projects co-ordinated by the OECD and IEA is TALIS (Teaching and Learning International Survey), which focuses on the working conditions of teachers, their attitudes towards teaching and classroom practices. The first survey, which was conducted in 2008, is followed by another one in 2013. Researchers and education officials analyse the results of various projects, to identify any links between the data gathered in one project and the findings of other projects carried out by different teams.

The purpose of this paper is to compare, on a smaller, national scale, the 'teacher' indicators and data from TALIS with the academic achievement data of schools involved in TALIS, namely scores of their students from the lower secondary school examination (LSSE).

For several years, the added value in education (AVE) has been assessed for lower secondary schools in Poland, and this is also accounted for in this analysis.

This paper tries to answer the following question: are there any associations between 'teacher' indicators at the school level and the academic achievement data of schools?

This manuscript is a changed and shortened version of the report which is placed on the OECD page (OECD/TALIS/TALIS in research: R. Piwowski, (2012) Teacher and School Achievement).

I. Methods and Data Characteristic

The main goal of the 2008 survey (2013 too), was to provide data and analysis of some key aspects of schooling, such as:

- Teachers' professional development;
- teachers' beliefs about teaching and teaching practices;
- the role and functioning of school leadership (Creating Effective Teaching, 2009).

In Poland, a representative sample was selected from among 5,310 lower secondary schools, the selection criteria being school location (urban/rural), ownership

(public/non-public) and number of students (small/large). As in other countries, all special schools, schools for adults and schools with fewer than four teachers were excluded from the sampling procedure.

As a result, data from 172 lower secondary schools (and thus 172 principals) and 3,184 teachers were considered for further analysis (Piwowarski and Krawczyk 2009).

It should be remembered that the TALIS survey results are based on answers provided (marked) by respondents and thus represent only the opinions, views and beliefs of teachers and school principals.

1. Teachers (according to TALIS data)

General characteristics

In Poland, 76.3% of the teachers surveyed were female. In all the participating countries, the majority of school principals were male (55%), which means that the female domination observed in teacher positions decreases at higher levels of professional career. In Poland, 69% of the principals of the schools surveyed were female, which means that the disproportion between the share of female teachers and female principals was relatively small.

In nearly all the participating countries, the teaching staff is getting older, Italy and Austria having the least favourable situation in this respect. Poland still has a relatively good teacher age structure, as 50% of the teachers from the schools surveyed were under 40 years of age. In Poland, only 0.3% of the teachers had not completed higher education. Furthermore, Poland and the Slovak Republic had the highest rate of teachers with the Master's degree at 94 and 96.2%, respectively.

Professional Development

Almost 44% of the teachers surveyed in Poland stated that they would like to "achieve more" in terms of their professional development. The fact that their needs were not fully satisfied was declared more frequently by the women than men (45% vs. 39%) and by younger teachers (under 40) than older ones (50% vs. 37%).

Relations between financial support and undertaking professional development were not obvious. Data analysis implied a negative relation between time spent on development and the costs unpaid by teachers: generally, the teachers who covered the costs of professional development themselves, either whole or in part, spent the highest number of days on their own development. This relation might suggest that in the majority of countries free training was unsatisfactory for teachers, so they attended additional paid forms of development. It seems that

Poland belongs to this group. Further analysis of the data collected implies that the teachers who paid the costs of their professional development, in whole or in part, were more frequently dissatisfied and would like more benefit from the paid forms of development.

Alarming, 39% of the teachers in Poland (41% in TALIS) wanted to take part in professional development, but no suitable training was available. This leads to the conclusion that offers of professional training should be subject to constant monitoring by both representatives of teachers and educational authorities.

Teaching Practices, Attitudes and Beliefs

Teachers' practices, attitudes and beliefs about teaching may be related to students' academic achievement reflected in test results, added value or student motivation indicators.

The TALIS analysis was based on the differentiation between two opposing ideas about teaching, namely direct transmission beliefs and constructivist beliefs.

In Poland, like in the majority of countries, teachers believe that their task is not only to present facts and demonstrate how to solve problems, but also to support students in their active acquisition of knowledge. Variation (measured with variance) was relatively low, which means that this belief was shared by the majority of teachers in each country.

Three scales were formed to determine classroom practices used by teachers: a) teaching structuring, b) student-oriented practices and c) enhanced activities.

Data analysis indicates that in all the participating countries, including Poland, classroom practices were structured. As declared by the teachers, enhanced activities were undertaken least frequently.

There was a statistically significant relationship between the teachers' age and professional experience and their teaching beliefs with preference for direct transmission of knowledge or constructivism. This relationship varied in different countries. In Poland, it was unique mainly in high indices among young teachers (especially regarding direct knowledge transmission). However, the highest rates of both types of beliefs were observed in Poland in the group of teachers over 40–50 years of age. In general, the teachers who strongly supported constructivist beliefs declared more frequent use of student-oriented and enhanced practices. It seems, therefore, that pedagogical constructivism should be supported and its methods cautiously promoted. However, this may be hampered by traditional beliefs about the effectiveness of direct knowledge transmission. Finally, it is worth remembering the discrepancy between declared constructivist beliefs and the actual classroom practice (generally structuring).

School Leadership and Management

Factor analysis was used to determine the leadership and management styles of the school principals involved in the TALIS survey.

Using five scales of principals' management actions, two school leadership styles were defined. Techniques of test item response modelling and factor analysis were used again. These two leadership styles are as follows:

- Instructional style (dominated by management for school goals, instructional management and direct supervision of instruction in the school);
- Administrative style (dominated by accountable management and bureaucratic management).

In Poland, school principals significantly more frequently exercise instructional leadership as opposed to the administrative style and female principals tended to adopt instructional leadership more frequently than male ones.

2. Lower secondary school examination score

As in previous years, students leaving secondary schools had higher scores in the humanities than in mathematics and science (the maximum score of either part was 50).

The schools differed in their exam scores, i.e. in the arithmetic means of the scores of all their students, though the differences between lower secondary schools in rural and urban areas were decreasing. The rural schools continued to have a minor advantage over the schools in small towns with the population of 20,000 and below. There was still a considerable difference between the scores of public and private schools. Understandably, the mean scores of the schools varied less than the student scores.

In the analysis of the schools whose principals and teachers were included in the TALIS 2008 survey, a more objective procedure for the appraisal of LSSE scores of schools was adopted. In order to mitigate the potential random fluctuations of the scores of all lower secondary schools in Poland (including TALIS schools) in 2008, the mean value for three subsequent years (2006, 2007 and 2008) was considered as the standardised average score equal to 100.

3. Added value in education

The system of external examinations introduced in Poland in 2002 for lower secondary schools and subsequently for primary and higher secondary schools started a heated debate, which came down to the question of whether or not it was an objective measure of students' academic achievement.

For a number of people, especially some journalists and politicians, the exam score reflected exclusively the outcome of teachers' and schools' efforts. Others

believed that although the nationwide examination system greatly contributed to the objective appraisal of students' academic achievement and was a better metric than grades, it remained far from being perfect. Clearly, student skills and knowledge are the product of several groups of factors: (i) individual personal characteristics, (ii) social and family background, and (iii) school-related pedagogical factors. Therefore, researchers kept searching for some additional tools for the appraisal of academic achievement.

The history of 'Polish' AVE is short, yet fruitful and sufficiently interesting (at the school level). To a great extent, the AVE index eliminates personal, social and cultural factors in student scores. As a result, both good and poor exam scores are not fully attributed to schools or teachers.

The following procedure was developed for estimating AVE for lower secondary schools:

1. The expected LSSE score is estimated on the basis of student scores from the sixth grade examinations in primary schools.
2. A difference between the actual LSSE score and the expected student score ("the remainder") is calculated.
3. The mean remainder, i.e. AVE, is calculated for a particular lower secondary school.
4. The confidence interval is determined for AVE (to estimate the measuring error) (Dolata, 2007).

Added value in education provides information on the mean gain (if positive) or loss (if negative) in student/school score compared to the expected score based on sixth grade test results. Hence, its scale is the same as for the sixth grade examination. The standardised LSSE scores (Poland's average score = 100, SD = 15) for three subsequent years 2006–2008 are analysed further in this paper.

II. Results and discussion- investigating the association between the teacher data and LSSE score/AVE

It was assumed that the dependent variable is the mean LSSE score attributed to each school, whereas the independent variables are teacher data derived from the answers provided by the teachers in the TALIS questionnaire. It is important to point out that the schools surveyed, i.e. the mean results attributed to them, vary considerably in terms of LSSE scores and AVE, whereas the percentage distributions of 'teacher' indicators are somewhat diverse. Consequently, treating them in the form of averaged constructs as independent

variables may not always be efficient with respect to LSSE scores treated as the dependent variable.

Thus, it is important to remember that the presented relations apply to average school characteristics rather than individual characteristics of teachers or students. The analysis of these relations is based on linear regression coefficients.

1. Teachers and Selected Teacher Work Indicators

- Schools with higher median teacher age also had a slightly higher mean LSSE scores.
- There was some relationship between the LSSE score and the percentage of teachers with the permanent employment status.
- There was also a statistically significant relationship between the median years of teachers' work experience and the LSSE score.

2. Professional Development of Teachers

- It emerged that only the percentage of the teachers declaring participation in observation visits and research had a statistically significant, though weak, relation with the mean LSSE score of the students from the given school.
- There was a distinct relationship between some of the declared reasons preventing participation in more professional development activities and the LSSE score of the schools. This was fairly obvious: in the schools where the rate of the teachers who did not have the pre-requisites, e.g. qualifications, experience, seniority, was higher than in other schools the mean LSSE score was lower. Similarly, lack of employer support corresponded to a lower score.

3. Teacher Appraisal

- In the 'Teacher Appraisal and Feedback' section of TALIS, only a few 'teacher' indicators related in any way to the LSSE score of the schools. If the percentage of the teachers declaring that they received external appraisal of their work 'less frequently than once every two years' or 'never' was higher than in other schools, the mean LSSE score of the school was lower.
- There was a positive relationship between the LSSE score of schools and the percentage of the teachers declaring that the following aspects were considered with high importance in their appraisal: 'Innovative teaching practices' and 'Student discipline and behaviour'.

Such a survey should be repeated at the teacher and student level in order to verify whether external appraisal is more effective than teacher appraisal by the principal or other teachers.

- Only one out of ten statements regarding the effects of teacher appraisal included in the regression model and marked ‘Strongly agree’ corresponded to the school mean score to a similar extent. This single statement related to the LSSE score concerns persistently underperforming teachers. If the rate of teachers declaring that such teachers would be dismissed was higher, the LSSE score of the school was also higher.

4. Teacher Beliefs about Teaching and Classroom Practices

- Most relationships between teacher declarations or characteristics (independent variables) and the LSSE score and AVE were identified in the section regarding teaching beliefs, attitudes and practices. It was the result of the most detailed questions and thus the largest pool of information received from teachers.
- Neither the direct knowledge transmission characteristics nor constructivist data show the highest magnitude of the relationship with the school score. There were a total of four such non-profiled statements in the survey. The LSSE score of schools had the strongest relationship with the rate of teachers agreeing with the statement ‘Good performance means performance that lies above the previous achievement level of the student.’ An almost equally strong relationship, though reciprocal, was identified with the percentage of teachers in the school who agreed with a corresponding statement on ‘poor performance’. The schools where the rate of teachers who strongly agreed with the statement ‘Poor performance is a performance that lies below the previous achievement level of the student’ was higher scored an average was lower at the LSSE.

In this section there were notable, but considerably weaker associations with added value in education which were generally the strongest for the variables/ characteristics discussed above.

There was a slightly weaker positive relationship between the percentage of teachers who strongly agreed with the statement ‘Teachers know a lot more than students; they should not let students develop answers that may be incorrect when they can just explain the answers directly’ and the mean LSSE score of the school. AVE is associated with this variable in a similar way, though to a lesser extent.

- The activities indicating teacher collaboration generally had very weak associations with the mean LSSE scores of schools. The exception was in the schools with a higher rate of teachers who frequently ‘ensure common standards in evaluations for assessing student progress’ or ‘discuss and

coordinate homework practice across subjects'. The mean LSSE score in such schools was higher.

- Out of four items constituting the basis for forming teachers' profile in terms of self-efficacy, only one emerged to be statistically related to the mean LSSE score of schools. The schools where the rate of teachers agreeing with the statement 'I feel that I am making a significant educational difference in the lives of my students' was higher, scored higher at the LSSE.
- Similarly, only one out of four statements which formed the teacher-student relation indicator was associated with the school score, but to a weaker extent. In the schools where the rate of teachers who strongly agreed with the statement 'In this school, teachers and students usually get on well with each other' was higher, the LSSE score was also higher.
- There was some relationship between classroom discipline and the LSSE score of the schools. In the schools where the rate of teachers who strongly disagreed with the statement 'When the lesson begins, I have to wait quite a long time for students to calm down,' the LSSE score was lower. Naturally, like in a number of other items, this might simply be a statistical relationship rather than a causal link, but it might also indicate that sometimes silence in the classroom may not contribute to better student achievement. In any case, this potential link was of small significance.

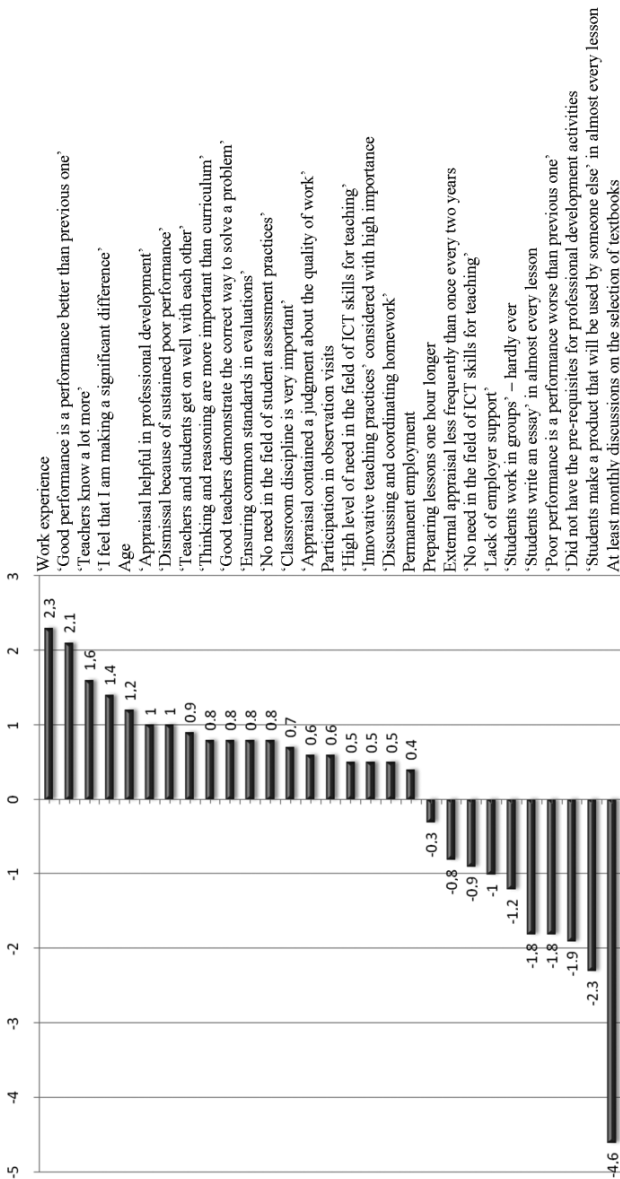
Conclusions

An attempt to identify relationships between the information about Polish lower secondary school teachers obtained from the TALIS survey and the academic achievement of schools measured with the mean LSSE score has only partially met the researcher's expectations in terms of clear and strong associations which allow for firm conclusions.

The detailed analysis of statistical indicators demonstrated that the associations described are not numerous and generally weak. Nearly all of them are based on linear regression coefficients. These relations should not be interpreted as causal links also for another important reason: the presented relations concern averaged school characteristics rather than individual characteristics of teachers or students.

Since schools do not differ much in terms of teacher characteristics, 'teacher' data from schools do not provide firm grounds for identification of relationships between them and the lower secondary school examination score or added value

Figure 1. Magnitude of relationships between the teacher data and the mean LSSE score of schools



Source: prepared by R. Piwowski

in education. There are, of course, significant differences between schools in terms of LSSE scores and AVE.

Two statements, not mutually exclusive, can be made with respect to the observed facts:

- Firstly, more controversial: Teachers are not the main factor which differentiates the academic achievement of schools and students; this statement might be an important argument for the advocates of the theory dismissing the strong influence of the school, teachers, curricula, etc., and stressing the importance of personal characteristics and family, social and cultural background.
- Secondly, more of methodological nature: Such aggregated (averaged) teacher data may not 'form relations' with the student/school achievement. What is the meaning of this paper? In terms of methodology and, partly, research, it seems to be useful to a certain extent, as it clearly demonstrates that we should look for alternative methods to find a reliable answer to the question about the magnitude of the impact of teachers/schools on the student/school achievement. This leads to an important conclusion, though difficult to implement in methodological, organisational and political terms, **that in any such surveys we should investigate the teacher and student levels rather than use averaged school characteristics, which are an aggregate product of LSSE scores of numerous students and work of several teachers, as well as a number of other factors, sometimes even more important, which are often beyond teachers' control.**

The significance of the above-discussed relationships has been shown in an aggregate graph. Some of these relations are obvious and some may be interesting for researchers. However, there is also a number of relationships for which it is difficult to suggest a reasonable explanation. This applies especially to some reciprocal relations, plotted left of the vertical axis, that correspond to a negative impact on the academic achievement. One should also remember that the presented LSSE score increments/decrements refer to the mean level of 100.

List of abbreviations used

AVE – Added value in education

IEA – The International Association for the Evaluation of Educational Achievement

LSSE – Lower secondary school examination

OECD – Organisation for Economic Co-operation and Development

PISA – Programme for International Student Assessment

SD – Standard deviation

TALIS – Teacher and Learning International Survey

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