

You get what you pay for: wages and motivation in the school workforce¹

Joshua Fullard, Lecturer in Economics at the University of Essex, shares the findings of his data-driven research into teacher pay and student outcomes.

A consistent finding among labour economics is that higher wages often lead to individuals working harder, or more productively, in some quantifiable way. One of the most famous examples of this is when Henry Ford introduced the ‘five-dollar day’ at his Ford Motor Company in 1914, which, in the process of more than doubling wages, resulted in an [increase in productivity of up to 70 per cent](#).

Interestingly, the relationship between wages and productivity holds in a range of settings including those who work in vocational occupations. Two notable examples are shown in the work of [Ferraz and Finan](#) (2011), who find that higher wages improve the performance of politicians in Brazil, and of [Mas](#) (2006), who finds that higher wages improve the performance of the police in New Jersey.

In [my recent work](#), I add to this literature by investigating if higher salaries can be used to motivate teachers to work harder, or more productively, in any way that affects pupil test scores or enjoyment of learning. To do this, I used data from five waves of the [Trends in International Mathematics and Science Study](#) (TIMSS). The study is conducted by the [International Association for the Evaluation of Educational Achievement](#) (IEA) and provides international comparative assessments of student achievement in more than 60 countries. For the purposes of my research, I looked at the TIMSS data relating to year 5 and year 9 pupils in England.



¹ This was originally written for the UK Data Service Data Impact Blog released on the 31st of January 2022. Link: <https://blog.ukdataservice.ac.uk/wages-motivation-school-workforce/>

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Methodological challenges

To investigate the relationship between teachers' wages and pupil outcomes, the most obvious solution is to regress pupil outcomes on teachers' wages. However, due to data limitations, this is rarely possible as most datasets, including TIMSS, do not contain data on individual pupil attainment and their teachers' wages. Even if teachers' wages were included in the dataset, there's a risk that teachers' wages (my explanatory variable) are correlated with other factors that influence pupil outcomes that are not controlled for in my model (the error term) and this would produce an omitted variable bias. Consequently, my estimates would not clearly identify the effect of wages on pupil outcomes.

To give an example, there are two forms of selection that would bias my estimates. The first is between school selection. Students from more affluent households, or higher ability students, could select into schools that put a greater emphasis on academic achievement. Such schools could also pay teachers higher salaries. This would produce an upward bias in my estimates. Conversely, we might have a situation where schools that have a higher proportion of students from less affluent backgrounds, or with lower academic ability, might have to pay higher salaries to attract teachers. This would produce a downward bias. As discussed in [my work published last year](#), headteachers in the state funded sector in England have complete autonomy in setting teacher pay and pay progression, meaning that between school selection could bias my estimates if I used actual wages.

The second form of bias is within school selection. More able students might be separated into different classes and taught by more able/higher paid teachers. Conversely, we might have a situation where less able students are separated into different classes that are taught by more able/higher paid teachers. This issue is mostly applicable to secondary education in England, as most secondary schools tend to sort students into classes by ability. So again, this would produce either an upward or downward bias depending on which teachers are selected to teach which students/abilities.

Finding a solution

Obtaining data on teachers' actual wages was therefore not sufficient for exploring my research question, as the issues with between school and within school selection outlined above meant that actual pay may not have provided me with the causal effect of teachers' wages on pupil performance.

To get round this, I opted to instead look at teachers' predicted wages. Using the [Labour Force Survey](#) (LFS), accessed via the [UK Data Service](#), I estimated how much money I would expect a teacher in England to earn based on their sex, age, and year in the LFS. I then assigned each teacher in TIMSS a predicted wage based on their sex, age and the year they are observed.

As teachers' predicted wages are correlated with actual wages, but not the omitted variables that also influence pupil outcomes, I argue that the estimates are less likely to be affected by omitted variable bias (endogeneity) and can be interpreted as the causal effect of teachers' wages on pupil performance and enjoyment of learning.

While using predicted wages can be useful for circumnavigating data limitations and endogeneity issues, researchers need to be mindful that, when using an estimated regressor, standard errors calculated in the usual way are biased. The additional sampling variance from using an estimated regressor needs to be considered when calculating the variance of the final parameter estimates – remember to bootstrap!

Research findings

Using teachers' predicted wages and controlling for a rich set of classroom, school, and household level covariates, I found that teachers' predicted wages have a positive effect on pupils' test scores. Specifically, over an academic year a 10 percent increase in teachers' wages has roughly the same effect as that of [a 1 pupil reduction in class sizes](#) and [a one hour increase in weekly instruction time](#).

TIMSS also contains data about student wellbeing, measured by enjoyment of learning. As teachers play an important role in student development that goes beyond developing academic skills alone, I extended my analysis to look at the effect of teachers' wages on student wellbeing. My results show that higher teachers' wages also have a positive effect on student wellbeing.

As the correlation between learning enjoyment and test scores is relatively weak it is unlikely that the effect of wages on pupil performance is being driven by changes in pupil happiness and vice versa. Therefore, I argue that teachers' wages have a causal effect on two distinct outcomes: pupil happiness and pupil performance.

Policy implications

My results indicate that paying teachers higher (or lower) salaries will influence pupil outcomes through teacher motivation. As the government has [frozen teachers' pay \(as of September 2021\)](#), my findings suggest that a pay freeze could worryingly reduce the effectiveness of current teaching and reinforce the negative effects from lost learning due to the pandemic.

The [government has previously committed to increasing teachers' starting salaries to £30,000 by 2022](#), with more experienced teachers getting a more modest increase. Due to the financial pressures caused by the pandemic, this increase [has been pushed back to September 2023](#).

While giving a significantly higher pay rise to less experienced teachers makes sense from a recruitment and retention perspective – younger teachers are more likely to leave the profession – to many more experienced teachers this will not seem fair. After all, it could be argued that the teachers who have remained committed to the profession deserve to be rewarded, not new entrants.

As my research also indicates that concerns about equity and fairness influence teacher motivations and, though it, pupil outcomes, giving less experienced teachers a larger pay rise could adversely affect the outcomes of students taught by more experienced teachers. Therefore, policymakers should consider a more equitable pay rise that doesn't risk alienating a large proportion of the school workforce.

Bibliography

- FERRAZ, CLAUDIO, AND FEDERICO FINAN (2011): "Electoral Accountability and Corruption: Evidence from the Audits of Local Governments," *American Economic Review*, 101, 1274-1311.
- FULLARD, JOSHUA (2021a): "Bad Economy, Good Teachers? The Countercyclicality of Enrolment into Initial Teacher Training Programmes in the UK," Institute for Social and Economic Research.
- FULLARD, JOSHUA (2021b): "Relative Wages and Pupil Performance, Evidence from Timss," *ISER Working Paper*.
- FULLARD, JOSHUA (2021c): "Teacher Pay Policy: One Size Fits All? ," <https://epi.org.uk/publications-and-research/teacher-pay-policy-blog/>: Education Policy Institute.
- FULLARD, JOSHUA (2022): "Labour Market Expectations and Occupational Choice. Evidence from Teaching.," *Mimeo*.
- FULLARD, JOSHUA, AND JAMES ZUCCOLLO (2021): "Local Pay and Teacher Retention in England."
- KRUEGER, ALAN B (1999): "Experimental Estimates of Education Production Functions," *The Quarterly Journal of Economics*, 114, 497-532.
- LAVY, VICTOR (2015): "Do Differences in Schools' Instruction Time Explain International Achievement Gaps? Evidence from Developed and Developing Countries," *The Economic Journal*, 125, F397-F424.
- MAS, ALEXANDRE (2006): "Pay, Reference Points, and Police Performance," *The Quarterly Journal of Economics*, 121, 783-821.
- RAFF, DANIEL MG, AND LAWRENCE H SUMMERS (1987): "Did Henry Ford Pay Efficiency Wages?," *Journal of Labor Economics*, 5, S57-S86.