Teacher effect in general

Student level data matters:

* (Aaronson et al., 2007) A brief sampling of other work on teacher effects includes Murnane (1975), Goldhaber and Brewer (1997), Angrist and Lavy (2001), Jepsen and Rivkin (2002), Rivers and Sanders (2002), Jacob and Lefgren (2004), Rockoff (2004), Kane and Staiger (2005), Rivkin, Hanushek, and Kain (2005), and Kane, Rockoff, and Staiger (2006). The earliest studies on teacher quality were hampered by data availability and thus often relied on state- or school-level variation. Ag- gregation and measurement error compounded by proxies such as student-teacher ratios and average teacher experience can introduce significant bias. More recent studies, such as Rockoff (2004), Kane and Staiger (2005), Rivkin et al. (2005), and Kane et al. (2006), use administrative data like ours to minimize these concerns.

Human capital characteristics

At large, researchers agree that human capital measures frequently used in teacher evaluation explain little of teacher’s contribution to student academic growth (e.g., Aaronson et al., 2007).

Teacher education background/teacher preparation

Aaronson et al., 2007:

* Measures
  + Graduate degree
  + Major
  + And more
* Findings
  + No relationship with teacher value-added on math in Chicago public high schools

Causal evidence

Teacher experience/return to teaching

Aaronson et al., 2007:

* Models and measures
  + Directly using years measure (age-education-6 then take average within teacher)
  + Also check the dummy variable years<=1
* Findings
  + No relationship with teacher value-added on math in Chicago public high schools

Clotfelter et al., 2007:

* Models and measures
  + Student fixed-effects
  + Specify years of experience as a series of indicator variables, with the base/left-out category being no experience

Papay and Kraft, 2015:

* Models
  + Censored growth model
  + Indicator variable model
  + Discontinuous career model
  + Two-stage model
* Findings
  + using “estimated contributions to student test score gains as a proxy for productivity”, we find “that teachers in the district improve most rapidly at the beginning of their careers.
  + However, across models, we find that teachers continue to improve, albeit at lesser rates, past their first five years in the classroom.
  + We also find suggestive evidence of continued returns to experience throughout the career, particularly in mathematics” in a large southern United States district.

Harris and Sass, 2011:

* Methods and measures
  + Student, teacher, and school fixed effects
* Findings
  + Largest gains from experience occur

Hu et al., 2017:

* using generalized additive modeling (GAM), a nonlinear method for “identifying likely thresholds by estimating the relations between an independent variable and a dependent variable without making any assumptions about whether the relation is linear or non-linear
  + likely thresholds are identified by graphically identifying the regions where there appears to by systematic change in the relation between the two variables and both baseline and ceiling thresholds are possible
  + also a graphic representation of the non-linear regression trend between the two variables
  + it doesn’t provide exact cut-off points, rather, it provides visual guidance on the score ranges within which thresholds are likely to exist
* then using piecewise regression (spline regression approach) to validate the possible thresholds
  + meaning to test whether the regression slopes vary across the different regions thus provide evidence of the validity of the GAM-derived thresholds
  + for each outcome variable, the results from the simple linear regression model (assuming one constant slope) and the piece- wise regression model (assuming varying slopes as defined by the thresholds) could be compared statistically. e.g., statistical test, adjusted R2s from two models, and the Akaike information criterion (AIC; Akaike, 1974) are available as evidence for the viability of the thresholds.
  + Lastly, compare linear regression with piecewise regression based on F statistics (statistical significance), adjusted R2 (higher value indicating better fit), and AIC (lower value indicating better fit)

Graphical user interface, text, application, email

Description automatically generated

Causal evidence

References

Aaronson, Barrow, L., & Sander, W. (2007). Teachers and Student Achievement in the Chicago Public High Schools. Journal of Labor Economics, 25(1), 95–135. <https://doi.org/10.1086/508733>

Athey, & Imbens, G. W. (2019). Machine Learning Methods That Economists Should Know About. Annual Review of Economics, 11(1), 685–725. <https://doi.org/10.1146/annurev-economics-080217-053433>

Athey, Tibshirani, J., & Wager, S. (2019). GENERALIZED RANDOM FORESTS. The Annals of Statistics, 47(2), 1148–1178. <https://doi.org/10.1214/18-AOS1709>

Boyd, Donald, Hamilton Lankford, Susanna Loeb, Jonah Rockoff, and James Wyckoff. 2008. “The Narrowing Gap in New York City Teacher Qualifications and Its Implications for Student Achievement in High-Poverty Schools.” National Bureau of Economic Research.

Cho. (2012). The effect of teacher–student gender matching: Evidence from OECD countries. Economics of Education Review, 31(3), 54–67. https://doi.org/10.1016/j.econedurev.2012.02.002

Clotfelter, Ladd, H. F., & Vigdor, J. L. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. Economics of Education Review, 26(6), 673–682. <https://doi.org/10.1016/j.econedurev.2007.10.002>

Dee, T. S. (2007). Teachers and the Gender Gaps in Student Achievement. *The Journal of Human Resources*, *42*(3), 528–554. <http://www.jstor.org/stable/40057317>

Gong, Lu, Y., & Song, H. (2018). The effect of teacher gender on students’ academic and noncognitive outcomes. Journal of Labor Economics, 36(3), 743–778. <https://doi.org/10.1086/696203>

Guarino, Dieterle, S. G., Bargagliotti, A. E., & Mason, W. M. (2013). What Can We Learn About Effective Early Mathematics Teaching? A Framework for Estimating Causal Effects Using Longitudinal Survey Data. Journal of Research on Educational Effectiveness, 6(2), 164–198. https://doi.org/10.1080/19345747.2012.706695

Harris, & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. Journal of Public Economics, 95(7), 798–812. <https://doi.org/10.1016/j.jpubeco.2010.11.009>

Hill, Charalambous, C. Y., & Chin, M. J. (2019). Teacher Characteristics and Student Learning in Mathematics: A Comprehensive Assessment. Educational Policy (Los Altos, Calif.), 33(7), 1103–1134. <https://doi.org/10.1177/0895904818755468>

Hu, Fan, X., Wu, Y., & Yang, N. (2017). Are structural quality indicators associated with preschool process quality in China? An exploration of threshold effects. Early Childhood Research Quarterly, 40, 163–173. <https://doi.org/10.1016/j.ecresq.2017.03.006>

Hunter, & Springer, M. G. (2022). Critical Feedback Characteristics, Teacher Human Capital, and Early-Career Teacher Performance: A Mixed-Methods Analysis. Educational Evaluation and Policy Analysis, 44(3), 380–403. <https://doi.org/10.3102/01623737211062913>

Jacob, & Lefgren, L. (2004). The impact of teacher training on student achievement: Quasi-experimental evidence from school reform efforts in Chicago. The Journal of Human Resources, 39(1), 50–79. <https://doi.org/10.2307/3559005>

Kraft, Marinell, W. H., & Shen-Wei Yee, D. (2016). School Organizational Contexts, Teacher Turnover, and Student Achievement: Evidence From Panel Data. American Educational Research Journal, 53(5), 1411–1449. <https://doi.org/10.3102/0002831216667478>

Kane, Rockoff, J. E., & Staiger, D. O. (2008). What does certification tell us about teacher effectiveness?: Evidence from New York City. Economics of Education Review, 27(6), 615–631. <https://doi.org/10.1016/j.econedurev.2007.05.005>

Ladd, & Sorensen, L. C. (2017). Returns to Teacher Experience: Student Achievement and Motivation in Middle School. Education Finance and Policy, 12(2), 241–279. <https://doi.org/10.1162/EDFP_a_00194>

Lim, & Meer, J. (2017). The impact of teacher-student gender matches: Random assignment evidence from South Korea. The Journal of Human Resources, 52(4), 979–997. <https://doi.org/10.3368/jhr.52.4.1215-7585R1>

Marioni, Freguglia, R. D. S., & Menezes-Filho, N. A. (2020). The impacts of teacher working conditions and human capital on student achievement: evidence from brazilian longitudinal data. Applied Economics, 52(6), 568–582. <https://doi.org/10.1080/00036846.2019.1650885>

Papay, & Kraft, M. A. (2015). Productivity returns to experience in the teacher labor market: Methodological challenges and new evidence on long-term career improvement. Journal of Public Economics, 130, 105–119. <https://doi.org/10.1016/j.jpubeco.2015.02.008>

Rice. (2013). Learning from Experience? Evidence on the Impact and Distribution of Teacher Experience and the Implications for Teacher Policy. Education Finance and Policy, 8(3), 332–348. https://doi.org/10.1162/EDFP\_a\_00099

Rockoff. (2004). The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data. The American Economic Review, 94(2), 247–252. <https://doi.org/10.1257/0002828041302244>

Sansone. (2017). Why does teacher gender matter? Economics of Education Review, 61(December), 9–18. <https://doi.org/10.1016/j.econedurev.2017.09.004>

Sansone. (2019). Teacher Characteristics, Student Beliefs, and the Gender Gap in STEM Fields. Educational Evaluation and Policy Analysis, 41(2), 127–144. <https://doi.org/10.3102/0162373718819830>

Wayne, & Youngs, P. (2003). Teacher characteristics and student achievement gains: a review. Review of Educational Research, 73(1), 89–122. https://doi.org/10.3102/00346543073001089

Winters, Haight, R. C., Swaim, T. T., & Pickering, K. A. (2013). The effect of same-gender teacher assignment on student achievement in the elementary and secondary grades: Evidence from panel data. Economics of Education Review, 34, 69–75. <https://doi.org/10.1016/j.econedurev.2013.01.007>

Wiswall. (2013). The dynamics of teacher quality. Journal of Public Economics, 100, 61–78. <https://doi.org/10.1016/j.jpubeco.2013.01.006>

Xu, & Li, Q. (2018). Gender achievement gaps among Chinese middle school students and the role of teachers’ gender. Economics of Education Review, 67, 82–93. <https://doi.org/10.1016/j.econedurev.2018.10.002>

Model specifications

Graphical user interface, text, application

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