

Schools as sorting machines: the case of vocational tracking in Chile

The expansion of secondary education during the 20th century was accompanied by contrasting expectations. Some scholars, based on the universal access to high school, argue that its expansion is an equalizing process, giving the same opportunities and a similar set of skills to students from different social backgrounds (Raftery & Hout, 1993; Raudenbush and Eschmann, 2015). In contrast, others have maintained that school expansion was accompanied by an increasing differentiation in different types of schools of varying quality (Van der Wefhorst & Mijs, 2010), which in combination with students' socially constrained decisions (Brand & Xie, 2010) reproduce the social inequality through schooling. Students from disadvantaged backgrounds receive an education of lower quality and prestige, contributing to maintain their social position despite having more schooling than their parents, while the opposite is true for socially advantaged students. In this sense schools are “sorting machines” (Domina et al., 2017)

One example of this process is school tracking. Students' separation into different tracks can occur either within the same school (v.gr., streaming, ability grouping) or between schools (vocational tracking). Previous research have shown that, although both types of separation affect students' outcomes, the higher degree of institutionalization in tracking practices when they occur between schools leads to more inequality in students results, including academic performance and expectations of future educational attainment (Bol and Van de Werfhorst, 2013; Chmiliewski, 2014; Parker et al., 2016).

Between Germany and the US? The Chilean Vocational Education

In this research I will study the Chilean educational system, asking for the consequences of attending vocational schools on students' academic performance and expectations, variables predictive of future educational attainment and labor market performance (Karlson, 2015). The selection of the Chilean case is compelling for both theoretical and methodological reasons.

Regarding the first, Chilean educational system lies somewhere between heavily vocationally oriented systems such as the German dual model, whose functioning relies on a strong coordination between public schools and private firms, and more comprehensive systems such as the US high schools, that works without such coordination (Hall & Soskice, 2001; Schneider, 2009). In fact, almost 50% of Chilean high

school students attend vocational education, mirroring the enrollment level in Germany. At the same time, however, those schools lack institutional coordination with private firms, closer to the US case.

In addition, while in Germany attending vocational schools means receiving instruction based on a specialized curriculum, and in the US students could take vocational courses within their comprehensive curriculum, in Chile the vocational curriculum does not map perfectly onto vocational high school institutions. Therefore, although the curricular specialization officially includes grades 11th and 12th (ages 16 to 18), the majority of vocational schools starts at grade 9th, making students choose between the vocational and the academic track at age 13. These particular characteristics of the Chilean vocational system would allow me to test the relative importance of certain mechanisms that could explain the effect of tracking on students' outcomes, such as institutional differentiation, curricular specialization, and teacher's and students' body composition.

The Chilean case is also attractive on methodological grounds. The availability of administrative census data measuring repeatedly students', families', and schools' characteristics at grades 4th, 8th, 10th, and 12th, in combination with administrative data on higher education admission and enrollment, gives the opportunity to design empirical strategies to identify the causal effect of interest, exploiting the longitudinal nature of our data to account for selection bias, the major concern in previous research. Further, the data at hand also permits the study of heterogeneity in the effect of vocational education for different subpopulations, a question with important policy implications.

In moments in which vocational education, under the label of Career and Technical Education, is being proposed in the US as a solution for the otherwise frustrating transitions from school to work of their students, and as an alternative to the "College for all" ideal, more research on other countries' experiences is warranted. In this sense, the current project is the first step towards a more systematic comparison between the vocational education in the Chilean and US systems.

Tracking effects on students' performance and expectations

International comparative studies (Woessmann, 2009; Hanushek and Woessmann, 2006), along with national studies using quasi-experimental designs (van Elk et al., 2011; Holm et al., 2013; Malamud and

Pop-Eleches, 2011), have shown that educational systems with early and highly specialized vocational tracking tend to exacerbate inequality of academic performance between students of different social origins. Research has also shown that students with higher previous performance are more affected by vocational track placement (Fariás, 2013). This brings a first set of hypotheses about vocational education's impact on academic performance:

- H1: Students attending vocational schools would decrease their academic performance, in comparison to similar students in the general track.*
- H2: The higher the previous academic performance, the higher the detrimental impact of attending a vocational school on students' academic achievement would be.*
- H3: Students with higher previous expectations that attend vocational education would decrease their academic achievement more, because of the higher motivational impact that the track placement would have on them.*

On the other hand, there is an active debate on the extent to which educational expectations are subjected to updating during students' school trajectory. Several scholars have shown that students from disadvantaged backgrounds are more likely to receive contradictory signals from their environment, leading to changes and often decreasing their expectations (Alexander et al., 2008; Bozick et al., 2010). Otherwise, according to Andrew and Hauser (2011) the only possible source of a late significant modification in students' expectations would be "sharp and drastic exogenous changes, or shocks, in information about and/or perceptions of future academic success and attainments."

As demonstrated by Karlson (2015), school tracking is precisely the type of experience that could lead to modification in students' expectations. In addition, researchers have also found detrimental tracking effects in relation to students' beliefs, expectations and self-esteem (Van Houtte et al., 2012), and that students in vocational tracks tend to blame themselves for their academic failure more than general education students (Mijs, 2016). This brings a last set of hypotheses:

- H4: Students attending vocational schools would decrease their educational expectations, in comparison to similar students in the general track.*
- H5: The higher the students' previous expectations, the greater the downward adaptation of their future expectations would be.*
- H6: The higher the previous academic performance, the greater the downward adaptation of their future expectations would be.*

Methodological Approach and Preliminary Findings

My empirical strategy is based on two sets of identification assumptions: selection on observables (a.k.a. conditional ignorability), and parallel trends (difference-in-difference). The first of these identification strategies states that, after conditioning for a rich set of covariates, the treatment status that each unit received is as-if random. With enough overlap between treatment groups (in our case, academic and vocational students) and good balance in those covariates, one can estimate the Average Treatment effect on the Treated (ATT) (Keele and Minozzi, 2013; King and Zeng, 2006). However, even after conditioning for theoretically relevant variables, one would probably still suspect that there are other unobserved students' and families' characteristics that drove the decision of what type of education a student would attend. To address this concern, the second strategy (parallel trends assumption) exploits the longitudinal character of our data to adjust for time-invariant characteristics of the students. Finally, I will make use of sensitivity analysis and placebo test to estimate how sensitive the estimations are to remaining confounding.

My preliminary findings show that, using different reweighting methods, it is possible to achieve a very good balance in students', families', and schools' characteristics (see Figures 1, 2, and 3). Based on this reweighted sample, I estimated the effect of attending a vocational school during years 9th and 10th in academic performance in mathematics at the end of year 10th (Figure 4). All the methods that achieved good balance (everyone but Propensity Score Weighting, psw) estimate a negative impact of attending vocational schools in Mathematics test scores. In further analysis I will apply the same strategy for Spanish test scores, and students' expectations of future educational attainment.

Figure 1.

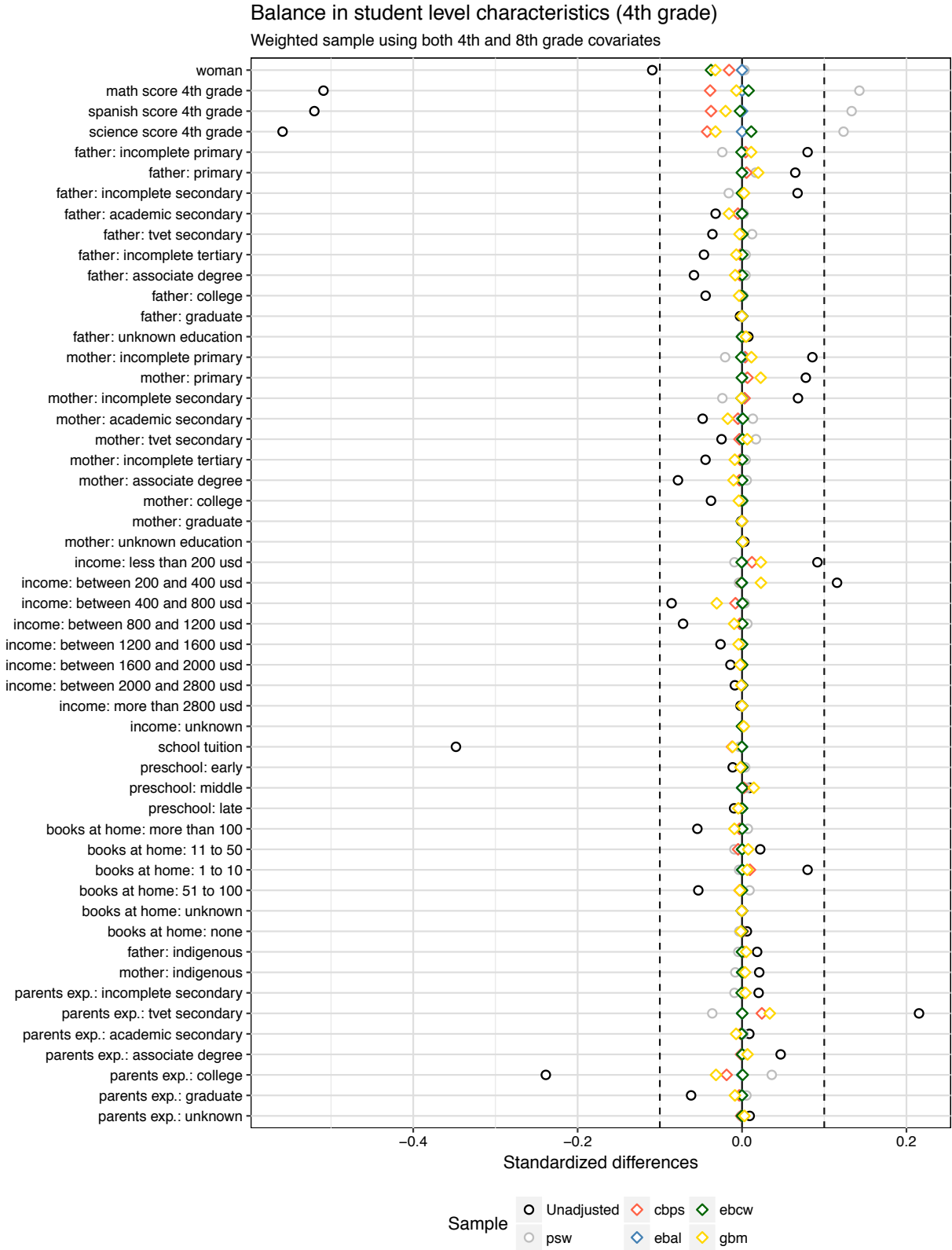


Figure 2.



Figure 3.

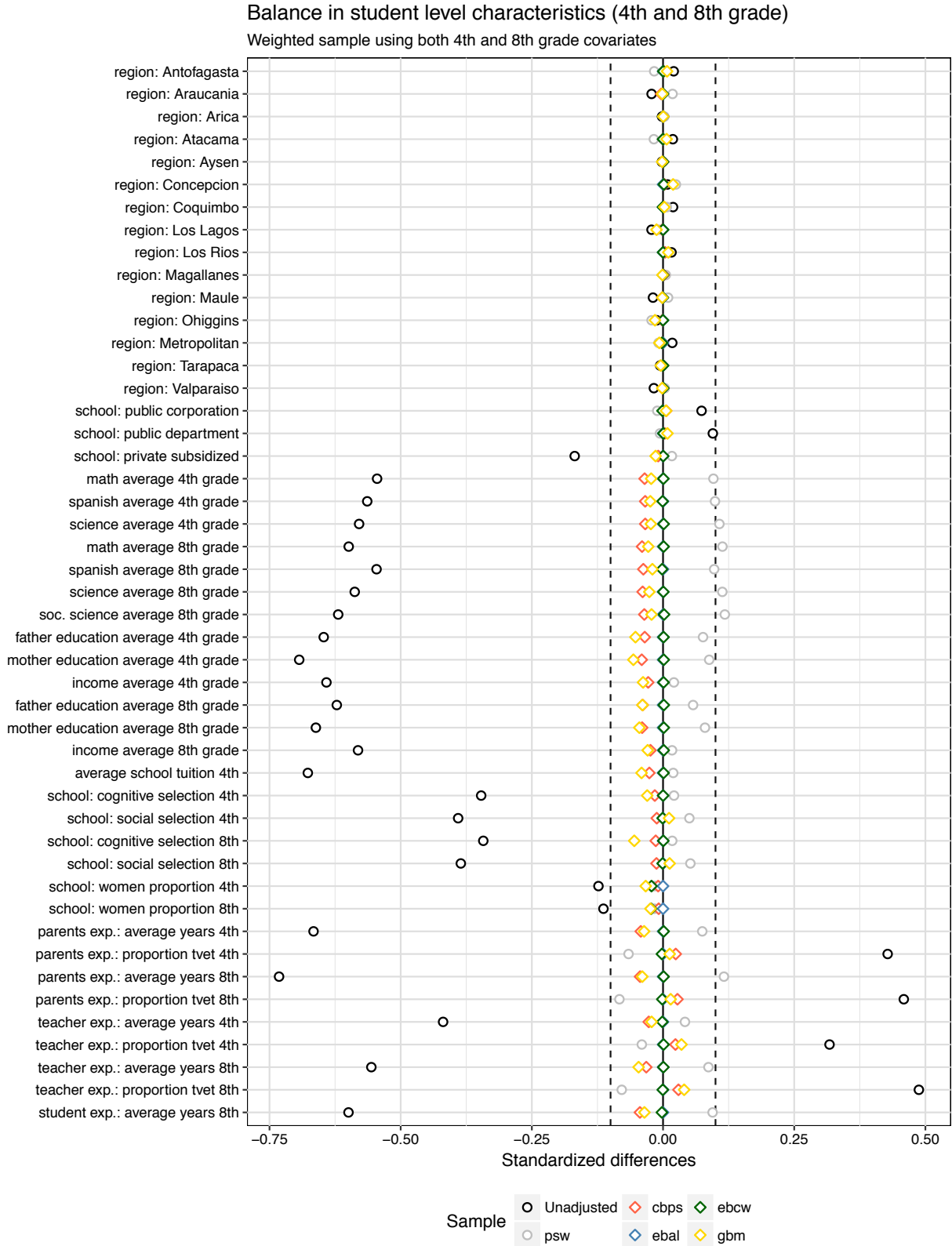


Figure 4.

TVET Effect on Mathematics Standardized Scores

Weighted sample using both 4th and 8th grade covariates

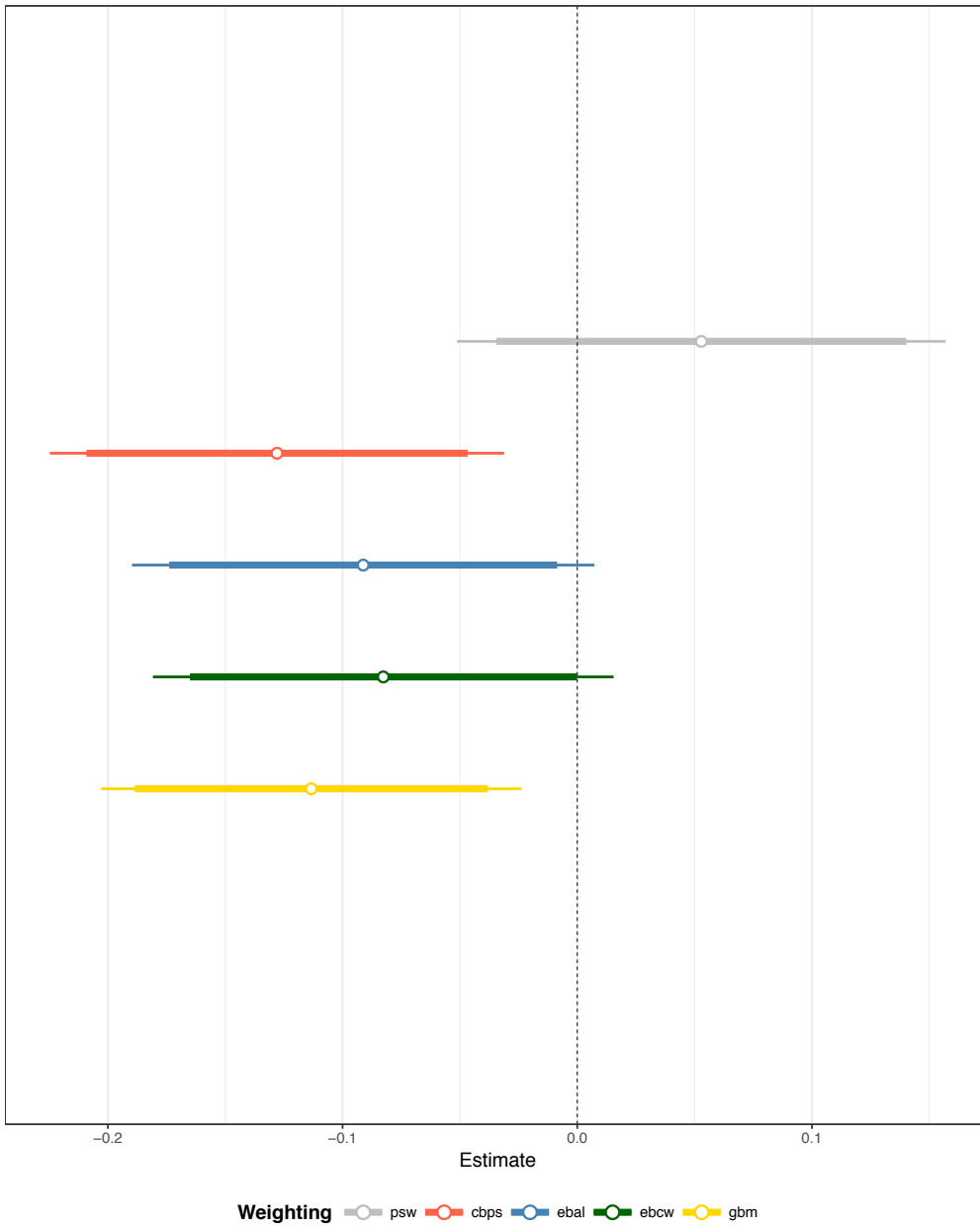
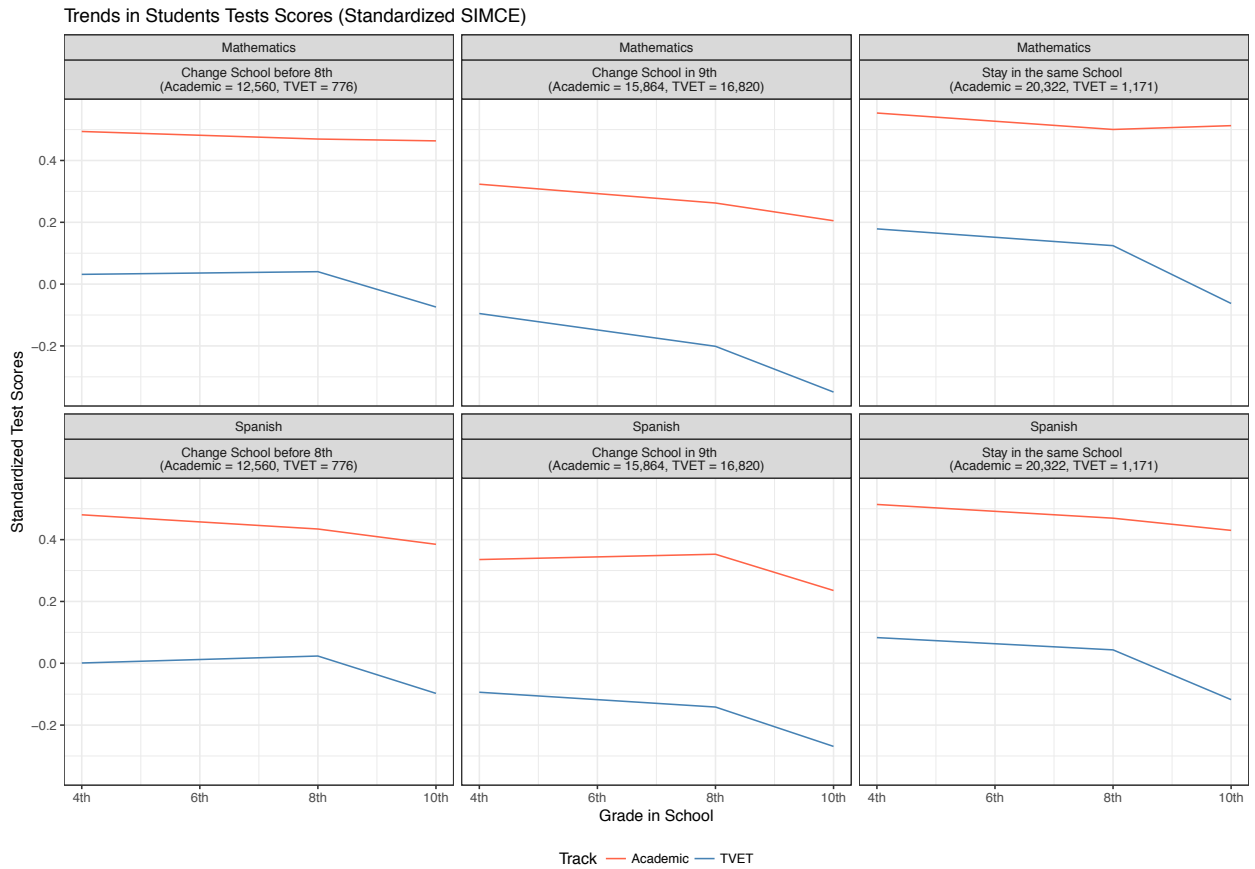


Figure 5.



References

- Alexander, K., Bozick, R., & Entwisle, D. (2008). Warming Up, Cooling Out, or Holding Steady? Persistence and Change in Educational Expectations After High School. *Sociology of Education*, 81(4), 371–396. <https://doi.org/10.1177/003804070808100403>
- Andrew, M., & Hauser, R. M. (2011). Adoption? Adaptation? Evaluating the Formation of Educational Expectations. *Social Forces*, 90(2), 497–520. <https://doi.org/10.1093/sf/sor005>
- Bol, T. and van de Werfhorst, H. G. (2013). Educational Systems and the Trade-Off between Labor Market Allocation and Equality of Educational Opportunity. *Comparative Education Review*, 57(2):285–308.
- Bol, T., Witschge, J., Van de Werfhorst, H. G., and Dronkers, J. (2014). Curricular Tracking and Central Examinations: Counterbalancing the Impact of Social Background on Student Achievement in 36 Countries. *Social Forces*, 92(4):1545–1572.
- Bozick, R., Alexander, K., Entwisle, D., Dauber, S., & Kerr, K. (2010). Framing the future: Revisiting the place of educational expectations in status attainment. *Social Forces*, 88(5), 2027–2052.
- Brand, J. E., & Halaby, C. N. (2006). Regression and matching estimates of the effects of elite college attendance on educational and career achievement. *Social Science Research*, 35(3), 749–770. <https://doi.org/10.1016/j.ssresearch.2005.06.006>

- Brand, J. E., & Xie, Y. (2007). Identification and estimation of causal effects with time-varying treatments and time-varying outcomes. *Sociological Methodology*, 37(1), 393–434.
- Brand, J. E., & Xie, Y. (2010). Who Benefits Most from College?: Evidence for Negative Selection in Heterogeneous Economic Returns to Higher Education. *American Sociological Review*, 75(2), 273–302. <https://doi.org/10.1177/0003122410363567>
- Brand, J., Pfeffer, F., & Goldrick-Rab, S. (2014). The Community College Effect Revisited: The Importance of Attending to Heterogeneity and Complex Counterfactuals. *Sociological Science*, 1, 448–465. <https://doi.org/10.15195/v1.a25>
- Chmielewski, A. K. (2014). An International Comparison of Achievement Inequality in Within- and Between-School Tracking Systems. *American Journal of Education*, 120(3):293–324.
- Domina, T., Penner, A., & Penner, E. (2017). Categorical Inequality: Schools As Sorting Machines. *Annual Review of Sociology*, 43, 311–330.
- Fariás, M. (2013). *Effects of Early Career Decisions on Future Opportunities: The Case of Vocational Education in Chile*. Stanford University.
- Hall PA, Soskice D. (2001) *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. Oxford University Press.
- Haller, A. O., & Portes, A. (1973). Status Attainment Processes. *Sociology of Education*, 46(1), 51–91. <https://doi.org/10.2307/2112205>
- Hanushek, E. A., & Woessmann, L. (2006). Does Educational Tracking Affect Performance and Inequality? Differences-in-Differences Evidence Across Countries*. *The Economic Journal*, 116(510), C63–C76.
- Holm, A., Jæger, M. M., Karlson, K. B., and Reimer, D. (2013). Incomplete equalization: The effect of tracking in secondary education on educational inequality. *Social Science Research*, 42(6):1431–1442.
- Karlson, K. B. (2015). Expectations on Track? High School Tracking and Adolescent Educational Expectations. *Social Forces*, 94(1):115–141.
- Malamud, O., & Pop-Eleches, C. (2011). School tracking and access to higher education among disadvantaged groups. *Journal of Public Economics*, 95(11–12), 1538–1549. <https://doi.org/10.1016/j.jpubeco.2011.03.006>
- Mijs, J. J. B. (2016). Stratified Failure: Educational Stratification and Students' Attributions of Their Mathematics Performance in 24 Countries. *Sociology of Education*, 89(2):137–153.
- Raftery, A. E., and Hout, M. (1993). Maximally maintained inequality: Expansion, reform, and opportunity in Irish education, 1921–75. *Sociology of Education*, 66(1):41–62.
- Raudenbush, S. W., & Eschmann, R. D. (2015). Does Schooling Increase or Reduce Social Inequality? *Annual Review of Sociology*, 41(1), 443–470.
- Schneider, B. (2009). Hierarchical Market Economies and Varieties of Capitalism in Latin America. *Journal of Latin American Studies*, 41(3), 553–575. doi:10.1017/S0022216X09990186
- Sewell, W. H., Haller, A. O., & Portes, A. (1969). The Educational and Early Occupational Attainment Process. *American Sociological Review*, 34(1), 82–92.
- van Elk, R., van der Steeg, M., & Webbink, D. (2011). Does the timing of tracking affect higher education completion? *Economics of Education Review*, 30(5), 1009–1021. <https://doi.org/10.1016/j.econedurev.2011.04.014>
- Van Houtte, M., Demanet, J., & Stevens, P. A. (2012). Self-esteem of academic and vocational students: Does within-school tracking sharpen the difference? *Acta Sociologica*, 55(1), 73–89. <https://doi.org/10.1177/0001699311431595>
- Woessmann, L. (2009). International Evidence on School Tracking: A Review. *Growth*, 6, 7.
- Xie, Y., Brand, J. E., & Jann, B. (2012). Estimating Heterogeneous Treatment Effects with Observational Data. *Sociological Methodology*, 42(1), 314–347. <https://doi.org/10.1177/0081175012452652>