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ABSTRACT

Evidence and Persistence of Education Inequality in an Early-Tracking System: The German Case

This article reviews empirical evidence on the early tracking system in Germany and the educational inequalities associated with it. Overall, the literature confirms the existence of considerable social, ethnic, gender- and age-related inequalities in secondary school track placement. Studies on tracking timing and track allocation mechanisms reveal that postponement of the selection decision and binding teacher recommendations may reduce certain (mainly social) inequalities. Furthermore, recent evidence concerning long-term consequences of tracking on labor market outcomes suggests that sizeable built-in flexibilities in the German system succeed in compensating for initial (age-related) education inequalities. The paper concludes with an outline and discussion of the most promising pathways for future research in order to help design inequality-reducing policy recommendations.

JEL Classification: I24, I28, J24

Keywords: tracking, educational inequality, school system, Germany

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1 Introduction

The first PISA report, released on December 4, 2001, traumatized Germany and caused the so-called 'PISA shock'. Historically being called the land of poets and thinkers, Germany used to see itself among the leading nations in the area of education. Yet, the country was ranked at the lower end of the spectrum in the PISA study, an assessment of knowledge and skills of 15-year-olds in OECD countries (OECD, 2001). Moreover, the PISA results revealed that in nearly no other country was the influence of social and ethnic background on achievement as strong as in Germany. The shock triggered an intense political debate, not least on the effectiveness and equitability of Germany's three-tier schooling system, which tracks pupils as early as age 10 into different school types.

Theoretically, the impact of tracking on student performance is ambiguous (see Betts, 2011). On the one hand, grouping students according to their ability or achievement across different schools or separate classes within schools may generate considerable efficiency gains of schooling by focusing on the specific needs of distinct groups of students. On the other hand, tracking might perpetuate and even aggravate inequality in outcomes. International evidence based on cross-country comparisons suggests for the most part that in particular early tracking (at around the age of 10 as it is common in Germany) reduces equal opportunities in education and reinforces the effects of socio-economic family background on educational outcomes (e.g., Hanushek and Wößmann, 2006; Brunello and Cecchi, 2007; Schütz *et al.*, 2008).

This article examines country-specific studies of the German case and summarizes what we know about the effects of the German early tracking system on education inequality. The focus will be mainly on the consequences with respect to social, ethnic, gender, and age inequalities. Next to general considerations of equal opportunities, demographic change and considerable skill shortages in the German labor market underline the importance of studying barriers to educational progression for particular population groups. Finally, this article will discuss empirical evidence pointing at potential pathways to remedy the formation of un-intentional inequalities in an early tracking system.

2 Institutional Background

The crucial point in time for the tracking decision in Germany is at the transition from primary to secondary schooling. Primary school starts at age six and typically covers four grades, so that pupils are around ten years old when they are tracked into three different types of secondary schooling. These three school tracks are public, tuition-free and include the following traditional school types: *a)* lower secondary school (*Hauptschule*), which prepares pupils for manual and blue-collar professions, *b)* intermediate secondary school (*Realschule*), which prepares for administrative and lower white-collar jobs, and *c)* upper secondary school (*Gymnasium*), which lasts around three years longer than the other tracks, prepares for higher education and allows for direct access to universities. Next to these three separate school types, comprehensive school (*Gesamtschule*) is another school form which offers the preparation for all three types of degrees within one school. However, comprehensive schools do not exist in all federal states and usually play a minor role. Only less than ten percent of all students in Germany attend this school type.

The decision of secondary school placement is in most cases made jointly by parents and teachers. At the end of primary school, teachers give a recommendation for a secondary school

track, but these recommendations are not binding in most federal states.¹ Mobility between schools tracks is in principle possible at any grade throughout secondary schooling; in practice, however, only very few students (less than two percent) do so (Schnepf, 2003; Dustmann et al. 2014).

3 Tracking and Inequality

In theory, tracking should be based solely on assessments of pupils' innate ability and academic interest. Insofar as allocation to tracks is also based on factors such as socio-economic family background or gender, early streaming introduces a selection in the schooling process, which most likely affects equality of opportunity and reinforces or even aggravates initial disadvantages, i.e. early inequality in achievement. In this section, we review empirical evidence on factors other than ability that directly or indirectly determine track choice in Germany. We focus on four dimensions, namely social, ethnic, gender and age inequality.

3.1 Socio-economic Inequality

Concern about equality of opportunity in schooling is predominantly voiced in terms of social inequality in education. While it appears desirable that educational progression be mostly independent of socio-economic background, an effect of family background on educational outcomes is apparent in every single OECD country (OECD, 2001). Germany presents a country, where student achievement is particularly highly influenced by family background and which belongs to those countries where this influence is highest in international comparisons. However, while more recent PISA results confirm that social background in Germany is still a strong predictor of student achievement, they also show that this influence has somewhat reduced over time between 2000 and 2009 (see Ehmke and Jude, 2010).

Some of the literature has suggested that the strong association of achievement and social background in Germany can partly be attributed to early tracking reinforcing such inequality. Specifically, if inequality in achievement at primary school age is largely associated with differences in family background, track placements into secondary schooling will consequently be associated with socio-economic background as well. Moreover, family background may play a direct role in track choice even beyond its impact on early achievement levels.

Schnepf (2003) employs data from the 1995 Trends in International Mathematics and Science Study (TIMSS) and PISA 2000 to show that in spite of ability-based tracking, educational achievement varies greatly within each school type with considerable overlap of ability between tracks. Importantly, she further finds that children from a lower socio-economic background face considerable disadvantages in the access to the highest secondary schooling track (*Gymnasium*), even conditional on ability. Among children with similar ability levels, a child whose parents finished upper secondary schooling faces a 15 percent higher chance of placement in the highest track.

Using longitudinal microdata from the German Socio-Economic Panel (SOEP), Dustmann (2004) provides additional evidence of a strong positive relation between parental background (maternal as well as paternal education and occupation) and children's secondary school track with a slight tendency towards convergence across family backgrounds over the last six decades. Further results provide evidence on earnings differentials later in life being related to parental

¹ Although education policy in Germany lies in the authority of federal states, the main features of the educational system are nearly identical across states. See Lohmar and Eckhardt (2013) for a detailed description of the German school system and differences across federal states.

background, where individuals with a working class background earn substantially lower wages than those with an academic background.

While Schnepf (2003) and Dustmann (2004) provide evidence on relatively low intergenerational mobility in education and consider the German early tracking system an important factor in explaining this fact, Checchi and Flabbi (2013) point in a slightly different direction. They use PISA 2003 data to compare the dependence of track choice on family background in Italy and Germany. Despite Italy tracking at a later age than Germany, they find relatively greater influence of family background in Italy and attribute this finding to Italy's greater flexibility in track choice with respect to parental wishes. Based on these results, Checchi and Flabbi (2013) argue that an early tracking system might not *per se* produce low intergenerational mobility. Rather, its efficiency crucially depends on the extent to which tracking rules are truly based on ability and dependence on parental background can be avoided.

3.2 Ethnic Inequality

The observation of migrant children's lower average performance and higher enrollment rates into lower secondary school tracks in Germany represents another major factor in the policy discussion and focus in academic research on educational inequalities. The main research question in this regard is whether the reasons for migrant-native differences lie in migrant-specific characteristics, such as lower German language proficiency, discrimination, or in the different average composition of family background in the migrant and native population.

While there is some evidence pointing towards migrant-specific factors being responsible for ethnic inequalities (OECD, 2006; Ammermüller, 2007), a large part of the literature finds that after controlling for socio-economic family background, migrant-native differences in test scores as well as track choices disappear (see, e.g., Lüdemann und Schwerdt, 2013; Krause *et al.*, 2014). Moreover, there is even some evidence of a migrant *advantage* over native children. For example, Luthra (2010) finds migrant children with a low socioeconomic background exerting a higher probability to acquire the highest secondary school degree (*Abitur*) than native children with a similarly low socioeconomic background. In general, these findings refer the discussion about *ethnic* inequality back to a discussion about *social* inequality.

3.3 Gender Inequality

Next to the ethnic and more generally the social dimension, gender differences prove to be another possible source of educational inequality. Evidence for Germany shows that boys face a lower placement probability in the upper secondary school track than girls (Jürges and Schneider, 2011), even conditional on achievement (Schnepf, 2003). Part of an explanation is the timing of puberty and that at young age, girls are biologically and psychologically more mature than boys and hence perform better when secondary school recommendations are made. Additionally, girls might be better in meeting social expectations by teachers.

Pekkarinen (2008) shows that compared to early tracking, late tracking favors female educational attainment even more strongly, possibly due to increasing gender differences in academic ability and aspirations throughout the puberty period. This finding is evident cross-country when comparing early and late tracking countries as well as when using a reform in Finland which postponed tracking timing from age 11 to age 16. Jürges and Schneider (2011) show tentative evidence for the German case suggesting that postponed tracking by two years does not reduce the gender gap.

Interestingly, Wölfel and Heineck (2012) find that parental risk attitudes might also play a role in generating gender differences in track choice. Using 2004 SOEP data, they show that parents' risk attitudes have a stronger impact for daughters' than for sons' secondary school track placement. In particular, daughters of risk-loving rather than risk-neutral fathers are more likely to attend the upper track, so that education appears to be seen as risky investment.

Overall, the literature on gender inequality in track choice reveals the need for a normative discussion on whether educational disparities based on gender should be avoided given that gender is assigned beyond the individuals control. Similar questions can be raised with respect to age-differences given that also timing of birth can be seen as randomly assigned, but seems to affect students secondary school placement.

3.4 Age-related Inequality

Recent studies have analyzed the role of children's age in determining track choice. In Germany, the school-entry age is determined by an age regulation that allows children who turned six before June in a given year to start school in August/September in that year, whereas children who turn six in July and later are supposed to wait another year.² It is however, possible to deviate from that regulation if the child's development is (not) mature enough to start school, so that parents and schools may make a different decision than predicted by the age regulation and hence, enrolment may be anticipated or deferred. In the literature, it is common to use this *assigned* school-entry age as an instrument for the potentially endogenous *actual* school entry age. The empirical evidence points to a lower probability to enroll in the upper secondary school track for children who entered first grade at relatively younger age (for Germany see Puhani and Weber, 2007; Mühlenweg and Puhani, 2010; Jürges and Schneider, 2011; for Austria see Schneeweis and Zweimüller, 2014).

This effect does not appear to diminish when tracking takes place after 6th grade as it is the case in two of the 16 German federal states (Jürges and Schneider, 2011). For the federal state of Hesse, Mühlenweg and Puhani (2010) show, however, that after 10th grade when students get a second chance of upgrading to higher track schools, the age effect is mitigated. For Austria, Schneeweis and Zweimüller (2014) similarly find that the age effect fades with schooling duration, however not for children with a less favorable family background.

Generally, the conclusion from this strand of literature seems to be that the tracking timing at the end of primary school is too early for teachers and parents to take a fully informed decision about track placement. We discuss the policy option of so-called de-tracking more closely in the next section.

4 Potential Remedies of Adverse Tracking Effects

The empirical evidence on educational inequalities inherent in Germany's early tracking system shows a clear need to examine the capability of educational policies and other mechanisms to reduce, prevent or offset the adverse effects in the selection process and its potential long-term effects. In the following, we review the existing literature with respect to potential mechanisms to avoid or correct unequal tracking in Germany.

4.1 De-Tracking

Often mentioned in the academic discussion is so-called 'de-tracking', that is, a postponement of the selection process toward a tracking at relatively later age. The question which arises at this

² This cut-off date varies by federal state.

point is whether there is an optimal timing for the tracking decision in order to benefit from the positive efficiency effects of specialization and at the same time avoid misallocation of students due to biased or missing information about ability and academic potential. A simple model of optimal timing of tracking by Brunello *et al.* (2007) illustrates this trade-off between efficiency and distributional considerations.

In fact, some states or schools in Germany track after 6th instead of 4th grade. Mühlenweg (2008) investigates the effect of later tracking within the federal state of Hesse, where next to the typical tracking schools, there are some schools with an ‘orientation phase’ where tracking is postponed for two more years. Using 2000 PISA-E data, she finds that in particular children with a disadvantaged family background benefit from the later tracking in terms of better test scores in 9th grade. Piopiunik (2014) also investigates within-state variation in tracking timing by analyzing a school reform in Bavaria in 2000, where tracking into lower and intermediate schools was anticipated from 6th to 4th grade. Using children placed in the upper track (who were tracked after 4th grade already before the reform) and those in other German states as control groups, he finds that the reform decreased student performance in 9th grade.

This within-country evidence is in line with the cross-country evidence on early tracking being hurtful in terms of educational inequality and at least tendencies to reduce mean performance (Hanushek and Wößmann, 2006). Yet, although this literature overall suggests that later tracking may be a viable option to reduce *social* inequalities, other evidence shows that postponing the selection decision might be less effective in avoiding gender- and age-biases (Jürges and Schneider, 2011).

Related to the timing of tracking is the discussion about comprehensive schools in Germany. Some comprehensive schools were introduced in the early 1970s as an experiment and then established as a fourth secondary school type in the 1980s. Comprehensive schools offer within-school tracking, dividing pupils either only for certain subjects according to their performance (*Integrierte Gesamtschule*) or into three separate classes which lead to the three different degrees (*Kooperative Gesamtschule*).

Early research finds that social selection is considerably lower in the comprehensive schools (Tillmann, 1988). However, more recent descriptive evidence based on PISA as well as TIMSS data shows that test scores of children in science and mathematics are comparatively low in the comprehensive schools, and on average even lower than in the lowest secondary school track (Schnepf, 2003; Prenzel *et al.*, 2007). The low mean achievement of students attending these schools raises doubts about whether comprehensive schools in their current setup constitute a valid alternative to the traditional tracking system. Yet, there is a clear need to examine the extent of education inequality and student achievement in German comprehensive schools more rigorously. Importantly, future research needs to take the potential endogeneity bias in school choice into account since especially low-performers seem to select into comprehensive schools.

4.2 Track Assignment Mechanism

Another starting point for potential modifications of the German tracking system are teacher recommendations. For example, the study by Checchi and Flabbi (2013) suggests that it may make a difference, whether the teacher alone or also the parents are have a say in secondary school placement (see Section 3.1). They suggest that less influence of parental wishes might lead to decreasing educational inequalities at transition to secondary school.

Indeed, case studies for Germany suggest that teacher recommendations might be less prone to background effects. Dollmann (2011) analyzes a policy change in the federal state of North-Rhine Westphalia in 2006 that made teacher recommendation binding. His findings suggest that

the system change toward binding teacher recommendations reduced family background effects in track placement. The reduction is especially apparent for placement in the highest track. Kimura and Ochsén (2013) exploit the same reform and show that such effects are driven by regions with a high share of immigrants. A drawback of these studies is that they are not able to control for a measure of children's ability. Yet, the results still point to an important direction for future research, namely to analyze the decision making process at the transition to secondary school in more detail and investigate what inequalities may be reduced at this stage.

4.3 Built-in Flexibilities

The final important question we would like to discuss is whether an improvement in the permeability of the German secondary and post-secondary schooling system is a viable mechanism for correcting inequalities in the tracking process. In fact, recent studies suggest that there are considerable built-in flexibilities in the German education system which allow for opportunities to revise initial track choices at a later stage, after middle school.

Mühlenweg and Puhani (2010), for example, show that such flexibilities can mitigate the age-related achievement bias (see Section 3.4). Dustmann, Puhani and Schönberg (2014) find that for marginal students – defined by the entry age cut-off date – the early track choice does not have an impact on wages, days worked, unemployment, or occupational choice. They attribute this finding to possibilities of up- or downgrading after the initial track placement. In contrast, evidence from Austria using a similar methodology suggests that initial track choice does hurt students who are younger when entering school in terms of their highest education level obtained and starting wage (Zweimüller, 2013). Opportunities for later upward mobility hence do not seem to sufficiently compensate for the initial disadvantage in Austria.

These opposite findings provide the ground for further research in this area, which is heavily needed to reach at a more conclusive picture of the actual long-term effects of an early tracking system and the effectiveness of a system's built-in flexibilities in reducing the negative distributional effects of tracking.

5 Concluding Remarks

This article provides an overview of the existing empirical evidence on educational inequalities in the German early tracking system and discusses several pathways for future research to identify mechanisms that may contribute to reducing inequalities in education opportunities. Overall, the literature reviewed here indicates that family background has a strong impact on track choice with ethnic inequalities actually emerging from socio-economic inequalities. Also, boys and children enrolled at relatively younger age appear to face disadvantages and risk of misallocation in the German school system.

Consequently, in light of the apparent education inequalities at the transition from primary to secondary schooling, it is important to identify which modifications would contribute to remedy the early formation of un-intentional inequalities in the German education system. In this respect, studies on variation in tracking timing and studies on different degrees of parental influence in the allocation decision in Germany reveal that selection postponement and binding teacher recommendations may help reducing certain, mainly social, inequalities. Further, recent evidence shows that built-in flexibilities in the German education system contribute to reduce or even to offset early inequalities suggesting that early disadvantage may not necessarily persist throughout a child's educational and labor market career. However, recent evidence from Austria suggests that later possibilities for up-and downward mobility in the education system

can only partly compensate initial disadvantages. Further research is needed to understand in how far these flexibilities may as well contribute to a reduction of gender and social inequality.

Moreover, we identify a clear lack of evidence concerning comprehensive schools in Germany. There is considerable scope for future research to evaluate strengths and weaknesses of the within-school tracking approach (comprehensive schools) compared to the traditional three-tier school system to design policy recommendations more carefully.

It goes without saying that policies should in any case aim at preventing early education inequalities - in particular those based on socio-economic family background - already at pre-school age and at primary school. Some features of the German education system might be reconsidered in this light. The fact that children enter school at age six when important stages in their development process have already passed or the predominant provision of schooling on a half-day basis might create barriers to educational progression already before tracking, and disproportionately so for children from disadvantaged family backgrounds.

References

- Ammermüller, A. (2007), «Poor Background or Low Returns? Why Immigrant Students in Germany Perform so Poorly in the Programme for International Student Assessment», *Education Economics*, 15(2), 215–230.
- Betts, J.R. (2011), «The Economics of Tracking in Education», in: E.A. Hanushek, S. Machin, and L. Wößmann (eds.), *Handbook of the Economics of Education Volume 3*, Amsterdam, North Holland, 341–381.
- Brunello, G. and Checchi, D. (2007), «Does School Tracking affect Equality of Opportunity? New International Evidence», *Economic Policy*, 22(52), 781–861.
- Brunello, G., Giannini, M., and Ariga, K. (2007), «The Optimal Timing of School Tracking: A General Model with a Calibration for Germany», in L. Wößmann and P.E. Peterson (eds.), *Schools and the Equal Opportunity Problem*, Cambridge, MIT Press, 129–156.
- Checchi, D. and Flabbi, L. (2013), «Intergenerational Mobility and Schooling Decisions in Germany and Italy: The Impact of Secondary School Tracks», *Rivista di Politica Economica*, VII-IX, 7–60.
- Dollmann, J. (2011), «Mandatory and Non-mandatory Teacher recommendations and Social Inequalities at the Transition from Primary to Secondary Education», *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 63, 595–621.
- Dustmann, C. (2004), «Parental Background, Secondary School Track Choice, and Wages», *Oxford Economic Papers*, 56(2), 209–230.
- Dustmann, C., Puhani, P.A. and Schönberg, U. (2014), «The Long-Term Effects of Early Track Choice», IZA Discussion Paper 7897, Institute for the Study of Labor (IZA), Bonn.
- Ehmke, T. and Jude, N. (2010), «Soziale Herkunft und Kompetenzerwerb», in: E. Klieme, C. Artelt, J. Hartig, N. Jude, O. Köller, M. Prenzel, W. Schneider, P. Stanat (eds.), *PISA 2009. Bilanz nach einem Jahrzehnt*, Münster, Waxmann, 231–254.
- Hanushek, E.A. and Wößmann, L. (2006), «Does Educational Tracking affect Performance and Inequality? Differences-and-Differences Evidence across Countries», *The Economic Journal*, 116(510), C63–C76.
- Jürges, H. and Schneider, K. (2011), «Why Young Boys Stumble: Early Tracking, Age and Gender Bias in the German School System», *German Economic Review*, 12(4), 371–394.
- Kimura, M. and Ochs, C. (2013), «Teachers vs. Parental Choice and the Tracking Distribution of Students: A Natural Experiment», unpublished manuscript, University of Rostock.
- Krause, A., Rinne, U. and Schüller, S. (2014), «Kick It Like Özil? Decomposing the Native-Migrant Education Gap», *International Migration Review*, forthcoming.
- Lauer, C. (2003), «Family Background, Cohort and Education: A French–German Comparison based on a Multivariate Ordered Probit Model of Educational Attainment», *Labour Economics*, 10(2), 231–251.
- Lohmar, B. and Eckhardt, T. (2013), *The Education System in the Federal Republic of Germany 2011/2012*, Bonn: Secretariat of the Standing Conference of the Ministers of Education and Cultural Affairs (KMK).

- Lüdemann, E. and Schwerdt, G. (2013), «Migration Background and Educational Tracking: Is there a Double Disadvantage for Second-Generation Immigrants?», *Journal of Population Economics*, 26(2), 455–481.
- Luthra, R. R. (2010), «Assimilation in a New Context: Educational Attainment of the Immigrant Second Generation in Germany», ISER Working Paper 2010-21, Institute for Social and Economic Research (ISER), Essex.
- Mühlenweg, A.M. (2008), «Educational Effects of Alternative Secondary School Tracking Regimes in Germany», *Schmollers Jahrbuch: Journal of Applied Social Science Studies*, 128(3), 351-379.
- Mühlenweg, A.M. and Puhani, P.H. (2010), «The Evolution of the School-Entry Age Effect in a School Tracking System», *Journal of Human Resources*, 45(2), 407–438.
- OECD (2001), *Knowledge and Skills for Life. First Results from PISA 2000*. Paris: Organization for Economic Cooperation and Development (OECD).
- OECD (2006), «Where Immigrant Students Succeed: A Comparative Review of Performance and Engagement in PISA 2003», Paris: Organization for Economic Cooperation and Development (OECD).
- Pekkarinen, T. (2008), «Gender Differences in Educational Attainment: Evidence on the Role of Tracking from a Finnish Quasi-Experiment», *Scandinavian Journal of Economics*, 110(4), 807–825.
- Prenzel, M., Schöps, K., Rönnebeck, S., Senkbeil, M., Walter, O., Carstensen C.H. and Hammann, M. (2007), «Naturwissenschaftliche Kompetenz im internationalen Vergleich», in M. Prenzel, C. Artelt, J. Baumert, W. Blum, M. Hammann, E. Klieme and R. Pekrum (eds.), *PISA 2006. Die Ergebnisse der internationalen Vergleichsstudie*, 63–105.
- Piopiunik, M. (2014), «The Effects of Early Tracking on Student Performance: Evidence from a School Reform in Bavaria», *Economics of Education Review*, 42, 12-33.
- Puhani, P.A. and Weber, A.M. (2007), «Does the Early Bird Catch the Worm? Instrumental Variable Estimates of Early Educational Effects of Age of School Entry in Germany», *Empirical Economics*, 32(2/3), 359–386.
- Schneeweis, N. and Zweimüller, M. (2014), «Early Tracking and the Misfortune of Being Young», *Scandinavian Journal of Economics*, forthcoming.
- Schnepf, S.V. (2003), «Inequalities in Secondary School Attendance in Germany», S³RI Applications Working Paper A03/16. Southampton: Southampton Statistical Sciences Research Institute.
- Schütz, G., Ursprung, H.W. and Wößmann, L. (2008), «Education Policy and Equality of Opportunity», *Kyklos*, 61(2), 279–308.
- Tillmann, K.-J. (1988), «Comprehensive Schools and Traditional Education in the Federal Republic of Germany», *International Journal of Educational Research*, 12(5), 471–480.
- Wölfel, O. and Heineck, G. (2012), «Parental Risk Attitudes and Children's Secondary School Track Choice», *Economics of Education Review*, 31(5), 727–743.
- Zweimüller, M. (2013), «The Effects of School Entry Laws on Educational Attainment and Starting Wages in an Early Tracking System», *Annals of Economics and Statistics (Annales d'Économie et de Statistique)*, 111-112, July-December, 141–169.