



D e-tracking schools: helping the weak, keeping the best

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 PEOPLE

 PROSPERITY

 PROTECTION

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Tracking school systems separate students into schools which differ in educational programme or objectives. Usually the best students are selected into academic schools and vocational training is provided for less talented. In most developed countries students are tracked into different programmes in secondary schools, but countries differ in the timing of tracking. No country separates students into different programmes earlier than the 4th grade. Some countries, however, track students to vocational schools as early as at the age of 10, while others keep the same programme for all secondary school students.

Tracking students at early ages into different educational programmes and schools is one of the most important features of a school system. Early tracking of students might have consequences not only on student achievement but also on social integrity. In late tracking systems students follow the same curriculum usually till they are 15 or 16 with many of them having large chances of enrolling into higher education. On the other hand, it is often argued that not all students can excel academically, while they deserve good vocational education that enables them to successfully enter labour market. Recent discussions about youth unemployment in Europe are often supported by examples of countries like Germany where unemployment among young people is one of the lowest and proponents of the tracking system suggest that this is due to a good vocatio-

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nal education that starts early and equips less talented students with skills necessary on the labour market.

This paper discusses the effect of tracking on academic achievement. It is assumed that in modern economies even vocational school students shouldn't lack basic reading, math or science skills as those represent skills that are now often found necessary even in jobs that before didn't require any academic knowledge. Nowadays, even car mechanics might need general skills that allow them to understand, for example, complex manuals or to search for information using computers and foreign languages. The evidence summarized in the paper shows the effect of early selection of students into different tracks on reading skills that are usually considered as a basic requirement for any member of a modern society.

Evidence from international studies

In one of the most influential papers analysing the effects of early selection on student achievement Eric Hanushek and Ludger Woessmann (2006) argued that tracking does not help in increasing overall student performance while it increases educational inequalities. Specifically, they showed that standard deviation of scores in secondary schools (PISA) in tracking countries is higher than in non-tracking countries controlling for score variation in primary schools (PIRLS). Ammermueller (2005), Waldinger (2007) and Jakubowski (2010) used the same PIRLS, TIMSS and PISA data as Hanushek and Woessmann to come to different conclusions. While Ammermueller suggested that tracking negatively affects student performance and increases inequalities, Waldinger found that tracking has no effect on the relation between family background and achievement and concluded that there is no evidence of its negative impact on equity. Jakubowski (2010) found that tracking has negative impact on overall performance, but also suggested that this might be due to stronger effect in Eastern European countries and might be confounded with the effect of other policies common in these countries. Brunello and Checchi (2007) analysed IALS data, another popular source for international comparisons. Their findings are also ambiguous suggesting negative impact of tracking on performance, but positive effect on earnings.

International comparisons can be biased due to incomparability of results from different surveys. In fact, achievement data collected in PIRLS, TIMSS or PISA studies cannot be compared directly unless adjustments are made to samples and scaling of achievement data is redone in

a comparable way. Jakubowski and Pokropek (forthcoming) recalculated student level data from PIRLS and PISA to compare achievement progress between primary and secondary schools across countries. These data can be used to compare achievement progress in countries that select students into different tracks before the age of 15 (early tracking countries) and countries that keep students in the same schools till they are 15 or 16 (late tracking countries). In both PIRLS 2006 and PISA 2009 there are 16 participants that select students into different programmes before the age 15: Austria, Belgium (Flemish), Belgium (French), Bulgaria, Germany, Hungary, Italy, Lithuania, Luxembourg, Netherlands, Romania, Russian Federation, Singapore, Slovak Republic, Slovenia and Trinidad and Tobago. There are also 21 participants where students are kept together till the age of 15 or 16: five provinces of Canada (Alberta, British Columbia, Nova Scotia, Ontario and Quebec), Denmark, Great Britain (England and Scotland), Hong Kong-China, Iceland, Indonesia, Israel, Latvia, New Zealand, Norway, Poland, Qatar, Spain, Sweden, Taipei and United States.

Figure 1 compares reading achievement progress between primary and secondary schools based on participants of PIRLS 2006 and PISA 2009. The achievement progress is compared for all students, and boys and girls separately. The achievement was rescaled with the same method in both surveys (3PL IRT plausible values model) and regression was used to adjust samples for differences in gender and age distributions across PIRLS and PISA. Finally, scores were put on PISA scale but standardized to have mean 400 in primary school and 500 in secondary school, so average achievement progress is 100 score points (see Jakubowski, Pokropek, forthcoming, for details).

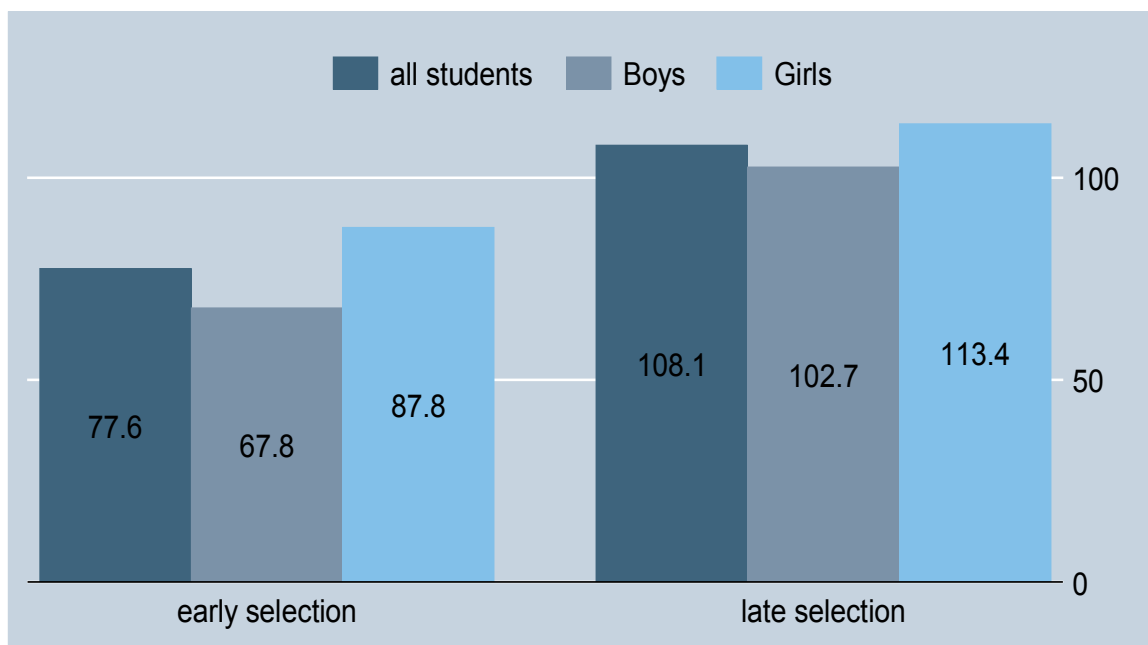
On average, students in tracking countries show

lower achievement progress between primary and secondary education. These students were in the same primary schools in PIRLS, while they were in different schools when tested in PISA. These results suggest that early selection of students into different schools negatively affects progress of their reading skills.

The figure also displays achievement progress among boys and girls. Although for both genders achievement progress is larger in non-tracking countries, the gap is almost two times bigger for boys. This suggests that tracking might be more harmful for reading progress among boys. This is worrisome as in general boys have much lower reading skills than girls and lower progress of boys between primary and secondary education might increase this gap.

Figure 2 compares the same reading achievement progress among low and high performing girls and boys. High performing boys and girls have similar achievement progress in countries with early and late selection, which is not surprising as even in tracking countries high performing students usually end up in general schools. On the other hand, low performing students in general have lower achievement progress in early selecting countries, but the negative impact of tracking is much more evident for boys. The achievement progress gap among low performing boys in early and late tracking countries is around 30 score points, which is close to 1/3 of standard deviation. This suggests that early selection is mainly harmful for low performing students, especially low performing boys.

Figure 1. Student reading achievement progress between primary and secondary schools (adjusted performance from PIRLS 2001 compared to PISA 2009).



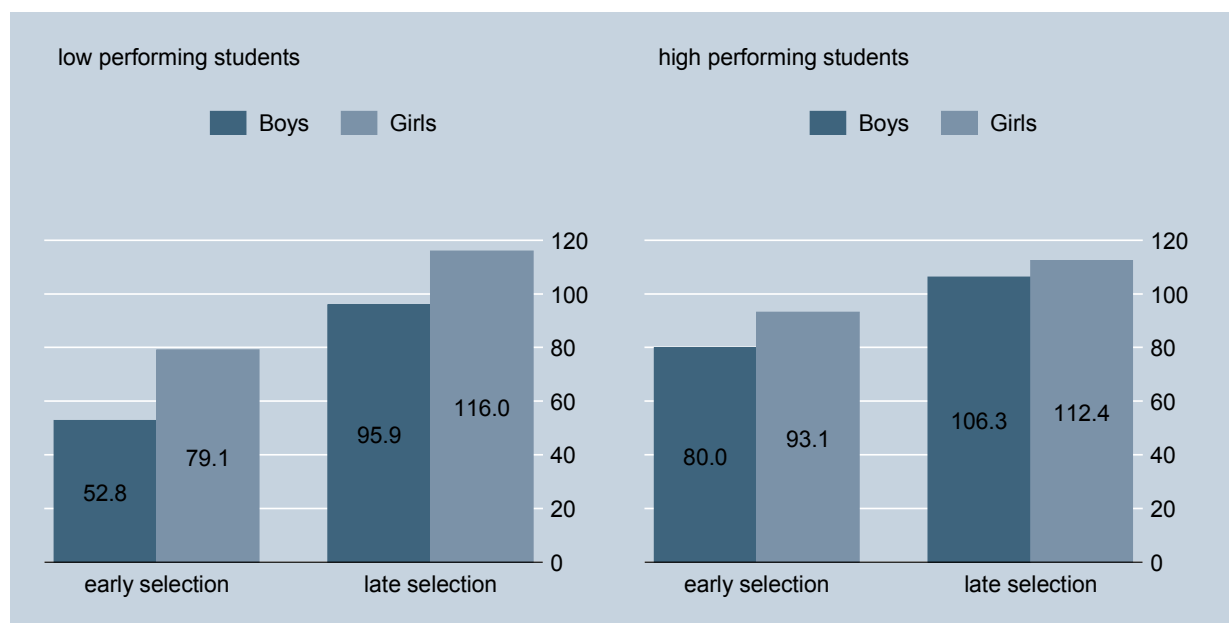
Source: Jakubowski, Pokropek, forthcoming.

Evidence from national studies

Papers analysing tracking policies within countries are more numerous. Meier and Schütz (2007) provide good review of these works and conclude that impact of tracking is ambiguous, with some researchers finding negative, some positive, and in most cases insignificant effects (see also Brunello and Checchi, 2007, for an overview of several studies). The most interesting papers explore natural experiments to assess tracking. They are usually based on difference-

academic track to a bigger number of students increased educational attainment in Northern Ireland controlling for the change in achievement in neighbouring England where no reform was conducted at that time. Mühlenweg (2007) uses different time of tracking in German states to compare the impact of later and earlier tracking on educational outcomes. She reports that while overall effect of tracking is insignificant, there is positive impact of later tracking on low achieving students, while there is no effect on high achieving students. Pekkarinen (2005) explores the

Figure 2. Student reading achievement progress among the lowest and the highest performing boys and girls (adjusted performance from PIRLS 2001 compared to PISA 2009).



Source: Jakubowski, Pokropek, forthcoming.

in-differences approach benefiting from the variation in timing tracking across the country or variation in timing of reforms introduced to eliminate or postpone tracking. For example, Maurin and McNally demonstrate that opening the

fact that the reform in Finland which replaced early tracking system with comprehensive schools was introduced sequentially, starting in the north provinces and implemented several years later in the south. Using again difference-in-diffe-

rences strategy he demonstrated that the reform positively affected girls, but had negative impact on boys from disadvantage families, increasing the gender gap not only in educational outcomes but also in wages. The only natural experiment on tracking we are aware of was conducted in Kenya and analysed by Duflo, Dupas, and Kremer (2008). They found that tracking positively affects student performance regardless of their ability. The effects were relatively strong and persisted over one year. However, it is dubious whether these results can be easily generalized to developed countries.

The Polish reform of 1999/2000

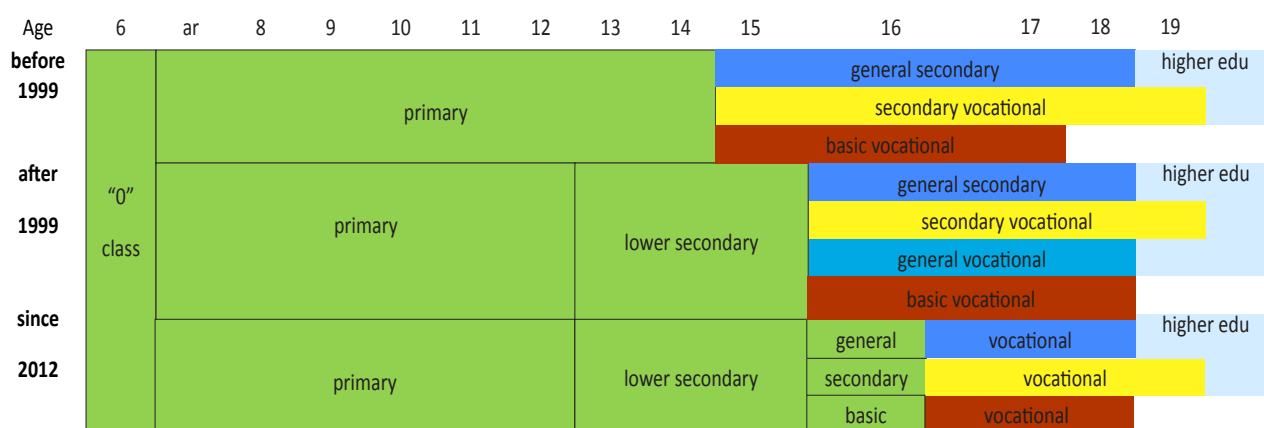
Poland implemented a large school reform in 1999 to improve the quality of education and increase educational opportunities. The basic primary school was shortened from eight years to six. Students continued their education in comprehensive lower secondary schools instead of different programmes to which they used to be

selected. In the new system, all students followed the same curriculum for nine years and then are selected to different upper secondary schools.

Figure 3 compares the old and the new system introduced in 1999. The new system extended the period of comprehensive education (green part of Figure 3) from eight to nine years. Upper secondary education was shortened by one year and new type of general/vocational school was introduced. As before, only basic vocational school didn't allow students to directly apply to higher education, while all other schools now finish with a standardized "matura" exam which also serves as the entrance exam to higher education.

Figure 3 also shows the newest changes in the system which extend the common curriculum to the first grade of upper secondary schools. While this is not depicted in the Figure, the obligatory education starts at the age of five with obligatory preschool classes, while at the age of 6 students can go to preparatory "0" class or start school directly. It is planned to introduce obligatory school education for all 6-year-olds in

Figure 3. Changes in the structure of the Polish school system over time.



2014/2015. These reforms continue the direction established by the major reform in 1999 as they extend the period of obligatory comprehensive education for all students.

The reform of 1999 not only reshaped the structure of the Polish school system but also introduced core curriculum which gave much more autonomy in terms of pedagogical issues to teachers and schools. On the other hand, a system of external standardized national examination at the end of primary, lower secondary and upper secondary school was established to see the effects of teaching at the end of every school level.

The reform was fully implemented over the years with the first obligatory standardized matura exam introduced in 2005, with the curricular reform just recently completed. Although no study was planned to see the effects of the reform, the OECD PISA study was first conducted in Poland in 2000 and covers a representative sample of Polish 15-year-olds who at that time were in the first grade of one of the old-type secondary schools: general secondary, vocational secondary or basic vocational. Already in 2003, PISA study covered 15-year-olds in the last grade of newly introduced comprehensive lower secondary schools. Thus, PISA study can serve as a tool to evidence the effects on the reform, especially the extension of comprehensive education to 15-year-olds.

Evidence on the effect of the Polish reform

The variation created by the policy change in 1999 can be used to see how the reform affected reading skills of 15-year-olds in Poland. For more detailed discussion please see the original paper with full analysis by Jakubowski, Patrinos, Porta and Wiśniewski (2010). The paper uses a difference in difference model that compares the change in test scores of the likely vocational school students that were able to study in the general, academic track because of the change in school policy. The group of “likely vocational students” is constructed using propensity score matching method by comparing 2003 comprehensive school students who have similar characteristics (e.g. gender, socio-economic background) to students who were in vocational schools in 2000.

Table 1 presents the factual results from PISA 2000, 2003 and 2006 studies and counterfactual averages constructed from samples of matched students. The overall achievement of Polish students increased significantly between 2000 and 2003 with additional improvement between 2003 and 2006. The most interesting question is, however, whether the reform affected students in general secondary, vocational secondary and basic vocational schools similarly.

Table 1. Factual and counterfactual scores of students in different upper secondary tracks

Reading achievement	PISA 2000 factual weighted score	PISA 2003 factual weighted score	PISA 2003 matched coun- terfactual score	PISA 2006 factual weighted mean score	PISA 2006 matched coun- terfactual score
All schools	479.1	496.6	483.1	507.6	504.8
Basic vocational	357.6	-	453.3	-	473.5
Vocational secondary	478.4	-	478.5	-	498.2
General secondary	543.4	-	516.4	-	532.0
General+vocational second- ary	513.6	-	498.3	-	513.4

Source: Jakubowski, Patrinos, Porta and Wiśniewski (2010)

Table 2 compares score improvement among 2003 and 2006 15-year-olds likely to go to different types of old secondary schools in 2000. In other words, these estimates assess trends in performance for all students and across groups of students who, without the reform, would be in different secondary tracks. Again, there is overall improvement of average performance among 15-year-olds in Poland. Score improvement for all students is remarkable, around 26 points from 2000 to 2006. Crucial estimates concern the hypothetical performance improvement from 2000 in different tracks. Performance improvement for potential students of former basic vocational schools is simulated to be slightly below 100 points from 2000 to 2003 and 116 points from 2000 to 2006. This is more than one standard deviation of PISA scores in OECD countries, which is a dramatic improvement. These estimates are statistically significant, supporting the hypothesis that 15-year-old students who without the reform would be placed in vocational tracks benefited greatly from the reform. However, the

benefits for students in other tracks are not that evident. Students in vocational secondary schools have similar scores in 2003 and improved by 20 score points in 2006. Students in the general track would potentially have lower scores in 2003 and similar performance in 2006.

These findings are in line with intuition. The short-term effects of the reform could be harmful for general-school students who were mixed with low achievers in the newly introduced lower secondary schools. In the longer term, however, this negative impact disappears. It could be that teachers adjusted their methods to suit more diverse classrooms or that segregation between and within lower secondary schools recreated the former stratification. It is clear that students in mixed-general schools benefited from the reform when one considers the general skills tested. The effects are again more evident over the long term, probably because of similar adjustments and mixing with high-achieving students. The

positive effects among vocational school students were expected because, after the reform, these students spent much more time learning non-vocational subjects. What is striking is the magnitude of the improvement at nearly one standard deviation and the speed with which students adapted to the new system. Clearly, adding just a few months of comprehensive education in the place of vocational education dramatically changes the general skills for a large number of students.

tracks of upper secondary schools. This gives a unique opportunity to compare achievement among 15-year-olds selected to different secondary schools before the reform and achievement among 16- and 17-year olds who after the reform were also selected to different types of secondary schools but after one more year of comprehensive education.

Estimates of mean achievement by PISA cycle, grade and type of school program are presented in Table 3. First, 16-year-old students in

Table 2. Propensity-score matching estimates of score change for students in different upper secondary school tracks.

Reading achievement	Score change:	Score change:
	PISA 2003 – PISA 2000	PISA 2006 – PISA 2000
All schools	3.9 (5.2)	25.6 (5.1)
Basic vocational	95.6 (8.4)	115.9 (7.1)
Vocational secondary	-5.5 (7.8)	19.7 (7.5)
General secondary	-27.0 (7.6)	-11.4 (7.0)
General + vocational secondary	-15.3 (5.4)	-0.2 (4.7)

Source: Jakubowski, Patrinos, Porta and Wiśniewski (2010). Standard errors in parentheses.

Poland used PISA 2006 to additionally test 16- and 17-year-old students with the same tools. After taking into account the difference in student age, the performance of 15, 16 and 17-year-olds could be compared across educational

the tenth grade score, on average, higher than do 15-year-olds in the ninth grade, and 17-year-olds in the eleventh grade score higher than 16-year-olds. This is in line with intuition that older students perform better and the difference

is around 7 to 8 points. However, when we look at the type of school program, it is clear that mainly students in general schools improved, while 11th grade students in vocational schools had even lower scores than those in the 10th grade. This seems to be counterintuitive, but there are two highly likely explanations. First, students change tracks, mostly in the tenth grade. Students who do not perform well are forced to move to vocational tracks and can further lower average achievement. Second, since students in vocational tracks devote more time to vocational training in higher grades, their general skills could decline. Thus, lowering achievement in vocational tracks should not be surprising.

More important from the perspective of this

paper is whether students in vocational schools perform better after the reform. In other words, we want to see if the positive effect of the reform for 15-year-olds remains substantial even when they finish comprehensive education and are selected to different types of upper secondary schools one year later in the new system. Evidence presented in Table 3 suggests that the effect is positive but much smaller than suggested by our estimates for 15-year-olds. The simple difference in average performance for 15-year-old students in vocational schools in 2000 and 16-year-old vocational school students in 2006 is around 30 score points.

Note, however, two things. First of all, the share of population in vocational schools decreased from 22% in 2000 to 15-16% in 2006. Most

Table 3. Mean achievement by PISA wave, grade and type of school program

	PISA 2000	PISA 2003	PISA 2006		
	9 th grade	9 th grade	9 th grade	10 th grade	11 th grade
All students	479.1	501.9	513.5	520.1	528.3
Lower secondary school	-	501.9	513.5	-	-
General secondary (% of all students)	543.4 42%	-	-	580.8 45%	592.6 47%
General (profiled) secondary (% of all students)	-	-	-	494.9 11%	494.6 13%
Vocational secondary (% of all students)	478.4 36%	-	-	505.9 29%	508.8 25%
Vocational basic (% of all students)	357.6 22%	-	-	388.8 16%	384.1 15%

Source: Jakubowski, Patrinos, Porta and Wiśniewski (2010)

students who would probably go to vocational schools in 2000 attended in 2006 not only basic vocational but also general (profiled) secondary schools or vocational secondary schools. Achievement of students in these schools is much higher, above the performance level of students in vocational secondary schools in 2000. Thus, the performance improvement is substantial for 16/17-year-olds even after selection to different school types. It is at least above 30 score points but probably higher. On the other hand, even if the reform has sustainable benefits for students in vocational schools, the gap between these students and those in other types of upper secondary schools remains large. Although fewer students go to these schools comparing to 2000, their performance level is still too low. The evidence in Table 3 suggests also that students in these schools do not progress in reading literacy from grade 10th to 11th which poses questions about the effectiveness of these schools when it comes to teaching general skills. In fact, it supports recent changes introduced in all types of lower secondary schools that extends the same general curriculum to the first grades of these schools and thus extends the period of general education for all students.

Conclusions

The age of selecting students into different school types is one the most important features of any education system. It affects lives of students, it shapes the economy and how socio-economic background is transmitted to future generations. The international evidence suggests that while there is no clear evidence on the impact of early selection on overall student achievement, it is clear that tracking is harmful for the lowest performing students and thus exacerbates inequalities without any clear effect for the best students.

In 1999 the Polish education system was revolutionized with new school structure giving all students one more year of comprehensive modernized education. This paper refers to a study by Jakubowski, Porta, Patrinos, Wiśniewski (2010) that uses the OECD PISA study to evaluate the effects of this reform. The results suggest that, on average, vocational schooling reduces test scores by at least one third to a full standard deviation. While the change improved overall achievement of Polish students due to other elements of the reform, students from former vocational schools benefited most in terms of gains in reading skills. The additional comparisons using data for 16- and 17-year-olds suggest that the effect of longer comprehensive education is sustainable, but students in vocational tracks experience decline in their reading skills. This supports recent reforms that further extend general education for these students.

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