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Student assessment and grade retention: evidence from a natural experiment

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Abstract

In Germany and many other countries, students are tracked into various secondary school types. This paper studies whether parents or teachers assess students potential educational performance more adequately. Educational attainment is measured by grade retention rates. We take advantage of a reform in the German state of North Rhine-Westphalia (NRW) in 2006. The reform replaced parents' choice about their children's secondary school type by a binding teacher recommendation. Our data comprises class-level information on all public secondary schools in the state. We find that binding teacher recommendations cause less grade retentions. The effect is mainly driven by students from better situated districts. This finding may capture that with free parental choice, overambitious parents tend to select too demanding tracks for their children.

Keywords: educational tracking, selective school systems, grade retention

JEL Code: I21, I24, I28, J24

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1 Introduction

Do parents or teachers do a better job assessing potential student performance at a specific age? And who should consequently decide on a child's future education?

Policies related to these questions are heavily discussed in some German states. Underlying these debates about students' level of education are links between human capital accumulation and earnings prospects¹. In countries where educational tracking is in place, this question typically arises at transition to secondary school². In this paper, we will focus on the track selection practice. Specifically, we are interested in whether free parental choice or binding teacher recommendations lead to a more appropriate allocation of students regarding their academic potential.

Proponents of free parental choice argue that parents know their children best: they have experienced a child's development as well as off-school behaviour. Moreover, parents are said to be more benevolent and put more effort into making the convenient tracking decision. Opponents meanwhile counter parental decision-making to be biased. Wishful thinking combined with selective perception could lead to misestimation of a child's abilities. Even though teachers might be less informed about the individual child, they would have a broader standard of comparison and be more objective. Indeed, recent (sociological) literature suggests that teacher recommendations are less prone to background effects³. This study compares the effect of binding teacher recommendations and parental choice from an equity point of view.

Our contribution is to evaluate the impact of the decision-maker from an efficiency point of view, i.e. to analyse the effect on students' academic success. Earlier theoretical and empirical literature has focused on the comparison of educational tracking and mixing in general⁴. We focus on one feature of the sorting method, namely the decision-maker who allocates stu-

¹An overview is provided by Peracchi [2006] and Heckman et al. [2006].

²In Germany for instance, only the highest school track grants university access.

³e.g. Kleine et al. [2010]

⁴For an overview see Meier and Schütz [2007].

dents according to ability. This issue has received considerably less attention so far.

Some studies evaluate parental deviations from teacher recommendations⁵. However, this kind of approach only allows one party to misjudge student potential, i.e. the teachers. In order to incorporate both possibilities, we analyze this problem in the context of a natural experiment setting.

To examine whether parents' or teachers' assessment of the student's potential is more adequate, one needs information on student performance after the tracking decision. We use grade retention rates in 6th and 8th grade as measure. In particular, we will discuss whether the grade retention rate has changed as a result of a reform in 2006 in the German state of North Rhine-Westphalia (NRW). The reform replaced parental choice about children's secondary school type by a binding teacher recommendation.

In order to determine the causal effect of binding teacher recommendations on educational attainment, we use a school data set from the Bureau of Statistics of North Rhine-Westphalia (NRW). The data has the following advantage: It comprises several cohorts and grades over a period of four years, i.e. two years before and after the reform. This design allows us to employ a difference-in-differences (DiD) strategy which exploits the policy induced variation. At the same time, it accounts for time consistent differences in retention rates between treated and non-treated cohort-grade combinations. In addition, the data contain school and grade-level information on the population of all public schools in NRW. We merge this data with information on district characteristics from the Federal Institute for Research on Building, Urban Affairs and Spatial Development in Germany (INKAR). This way we can examine determinants of student achievement including some basic background characteristics.

Our study shows that binding teacher recommendations cause less grade retentions. The effect is mainly driven by students from low unemployment and high income districts. This finding may capture that with free parental

⁵Ochsen [2011] argues that parental deviations from teacher recommendations have a sizeable and significant positive effect on children's educational attainment in Germany.

choice, overambitious parents tend to select too demanding tracks for their children. Since one of the goals of the reform in NRW was to prevent overoptimistic track choices, it may have achieved its aim.

The remainder of the paper is organized as follows. The next section presents the institutional setting. Section 3 introduces the data. Section 4 explains the empirical strategy, while the main results and their robustness analysis follow in section 5. Section 6 concludes.

2 Institutional setting

Many school systems assign students to various tracks according to academic performance - either by tracking between schools or within schools. Germany is one of the countries where sorting takes place to differing-ability schools⁶.

2.1 School system in Germany

The general structure of the German school system is illustrated by figure 1. It consists of primary and secondary schools which are for the most part tuition-free state schools. First, all children attend primary school (*Grundschule*) which usually lasts until age 10. Afterwards, the school system's structure becomes tripartite and subdivides into general school (*Hauptschule*), intermediate school (*Realschule*) and high school (*Gymnasium*). The highest, most academic track lasts until 12th grade and grants university access. The intermediate track lasts until 10th grade and leads to higher vocational school and apprenticeship training. Particularly strong performing students in the intermediate track may switch to the high track and graduate. Students in the lowest track finish school after 9th grade and attend vocational school or do an apprenticeship. Although switching the track is technically possible after the initial choice is made, few students actually do so. In NRW for instance, only 1.8% of all students switched the

⁶Other tracking countries include e.g. Austria, Hungary and Slovakia (c.f. Hanushek and Wössmann [2006]).

track between grades 5 and 10 in school year 2010/11. 85% of them were downgrades⁷. The school system is therefore said to be quite restrictive⁸.

Figure 1: THE GERMAN SCHOOL SYSTEM

Grade				Age
13	Vocational School (full-time or part-time)	Vocational School (full-time or part-time) or High School		18
12				17
11				16
10	(some schools have a 10 th year)	Intermediate School (Realschule)	High School (Gymnasium)	15
9	Secondary General School (Hauptschule)			14
8				13
7				12
6				11
5				10
4	Primary School (Grundschule)			9
3				8
2				7
1				6
	Pre-school (Kindergarten)			5
				4
				3

Source: Lüdemann and Schwerdt [2013]

Education in Germany is organized at the state level by the so-called *Länder*. In most states, transition from primary to secondary school takes place after finishing 4th grade⁹. It is also state-dependent whether parents or teachers have the final say regarding the secondary school decision. In some states, e.g. Bavaria, teachers give a binding track recommendation. In the majority of states though, teachers give a tendency and then parents decide which school track to send their child to.

⁷c.f. Bellenberg and Forell [2012]

⁸A more detailed description of the German education system can be found in Winkelmann [1996] and Pischke and von Wachter [2008].

⁹Exceptions are the states Berlin and Brandenburg where the transition takes place at the age of 12.

2.2 The NRW educational reform

With their mid-term reports, 4th grade students in NRW have always received a track recommendation based on their performance and a counselling interview with the parents. While the track recommendation was non-binding at first, it became binding after a reform that was enacted in 2006¹⁰. In other words, while the parents did not need to follow the teacher's assessment before the reform, they had to afterwards. It became solely the teachers' responsibility to recommend a track which suits the student's abilities. Parents were thus restricted in their freedom of choice.

In case of discontent though, students were allowed to participate in a 3-day probation in the respective track. If they passed, they were allowed to pursue this track. However, only 0.7% of all students effectively made use of this option, s. table 1. Hence we disregard this possibility in the following.

According to the Ministry of Education of NRW the stated objective of the reform was that the most talented students visit higher tracks, not the ones with the most ambitious parents¹¹.

Another interesting feature is that the teacher recommendation is only upward-binding: while it prohibits upgrading to a higher school track, a downgrade is nevertheless possible. Table 1 contrasts upward-binding teacher recommendations and visited school tracks for students attending 5th grade in school year 2009/10 and 2010/11¹². Around 8% of all students attending the lowest school type had a higher track recommendation by the teachers. The same is true for intermediate school students. This information suggests that parental underestimation might be an issue. Most importantly, table 1 illustrates that teachers' and parents' decision differ, thus supporting our question.

¹⁰c.f. Second Law of the Reform of School Law of the State of North Rhine-Westphalia, June 27th, 2006: § 11, Section 4

¹¹c.f. Ministry of Education of North Rhine-Westphalia 2006, p. 55f

¹² We chose those years because IT-NRW started selecting data explicitly on teacher recommendations in 2009. For the pre-reform period, we only have information on parental track choice, i.e. the actual school track.

2.3 Grade retention

In Germany, a student faces grade retention if his performance is not sufficient to be promoted to the next grade. The idea behind grade retention is to give the student more time to increase his school achievement, and eventually avoid downgrading into another track. A distinction is drawn between mandatory and voluntary grade retention: Grade retention is *mandatory* if the student does not meet the formal requirements to be promoted to the next year. The requirements to be promoted are defined in the examination regulations of the state of NRW¹³. They are very similar among the different tracks: in high school and intermediate school for instance, one failed subject needs to be compensated by an equivalent subject with a minimum grade of “satisfactory”. In general school, students must not fail two (or more) main subjects as well.

Grade retention is *voluntary* if the student decides to repeat the grade, regardless of meeting the criteria to be promoted. Typically, voluntary grade retention occurs if the student is close to not meeting the formal requirements. The rationale is to catch up earlier rather than later¹⁴.

3 Data

Our school data set was provided by the Bureau of Statistics of NRW. It contains grade- and school-level information on student achievement and school composition for all public secondary schools in NRW for the school years 2006/07 – 2009/10¹⁵. Hence, it comprises two years before and two years after the reform¹⁶. In the following, we refer to school year 2006/07

¹³For more detailed information, see “Examination Regulation for Secondary Schools in NRW” of 29.04.2005.

¹⁴The results by ? and Jacob and Lefgren [2004] indicate that early grade retention is indeed more beneficial than grade retention in later years.

¹⁵The data set includes all secondary school types, i.e. general, intermediate, comprehensive and high schools.

¹⁶Although the reform was enacted in 2006, the cohort starting secondary school in August 2007 was the first one to be affected.

as 2006 and so forth in order to avoid abuse of notation. The data include public schools only. To simplify matters, special needs education is excluded from the analysis. In this paper, we use information on students attending 6th and 8th grade in secondary school.

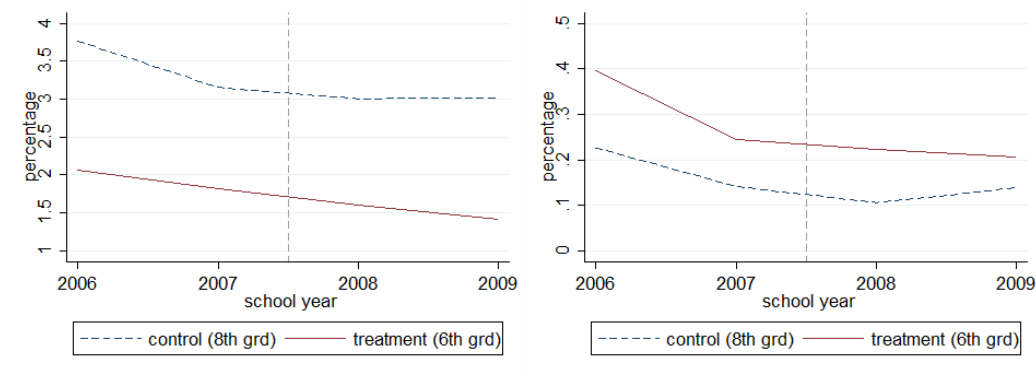
The data are merged with socio-economic characteristics on NRW's counties from INKAR. They cover the years 2006 to 2009. We use these data as additional independent variables in our analysis and account for the differing levels of aggregation by clustering.

3.1 Summary statistics

Student achievement is measured by the ratio of repeating students over the total number of students per grade. This so-called *retention* rate is the dependent variable for our regressions. Table 2 presents descriptive statistics of all variables. They are displayed separately for treatment and control group, i.e. 6th and 8th grade. As mentioned before, the data comprises information on different granularity levels, i.e. grade, school and district level. Available on grade level are *grade retentions*, *female* and *migration background*. *Female* and *migration background* describe the share of female students and the share of students with migration background, respectively. Information collected on school level are *student-teacher-ratio* as well as *subject teaching certificate*: The former displays the number of students per full-time equivalent teacher. The latter describes the ratio of the lessons instructed by teachers who possess a teaching certificate for the corresponding subject, to the total lessons taught in the school. This variable can be interpreted in two respects: both how well the school is endowed with teachers from different subjects and how it allocates its resources. In some schools, staffing shortages lead to continued substitution by teachers with no background in the subject. Hence, both variables are a proxy for the quality of teaching. Net income, unemployment rate and share of high skilled¹⁷ are based on district information.

¹⁷*High skilled* is specified by the share of all college graduated employees which are subject to social insurance contributions over all employees subject to social insurance contributions.

Figure 2: DEVELOPMENT OF GRADE RETENTION RATES



(a) Mandatory grade retentions

(b) Voluntary grade retentions

Source: Bureau of Statistics of NRW, own calculations

3.2 Development of retention rates

Figure 2 and table 4 display the development of mandatory and voluntary retention rates according to grades. For mandatory retention rates, we observe the following: First, they decrease over time. Second, mandatory retention rates are higher in 8th grade than in 6th grade. In 6th grade, the mandatory retention rate decreases from 2.06% to 1.41% during the observation period. Likewise, it declines from 3.76% to 3.02% in 8th grade.

Voluntary retention rates decrease over time as well. Unlike the mandatory ones however, the voluntary retention rates are higher in 6th grade than in 8th grade. This makes sense because the *raison d'être* of voluntary retention is to rather catch up earlier than later. From both figures we infer that the development of grade retention rates follows a similar pattern in 6th and 8th grade.

4 Empirical strategy

4.1 Empirical specification

Until school year 2006/07, parents were eligible to choose tracks for their children. The cohort starting 5th grade in school year 2007/08 was the first

one to be affected by binding teacher recommendations. However, focusing on 5th grade students is not convenient for our purpose because mandatory retention does not exist in 5th grade¹⁸. The first time mandatory retention occurs in secondary school is at the end of the introductory phase, i.e. 6th grade. Hence, we use 6th grade retention rates and add one year to the date the reform came into effect.

Figure 3 illustrates our approach: the treatment group consists of students in 6th grade, while the control group comprises 8th grade students in the same years. At the same time, 6th graders in the last two years are bound to the teacher recommendations, whereas 8th graders are not. We can make this classification because during our observation period, the cohorts affected by the reform will not have proceeded to 8th grade. In fact, the cohort of 8th grade students in 2008/09 (2009/10) corresponds to the cohort of 6th grade students in 2006/07 (2007/08).

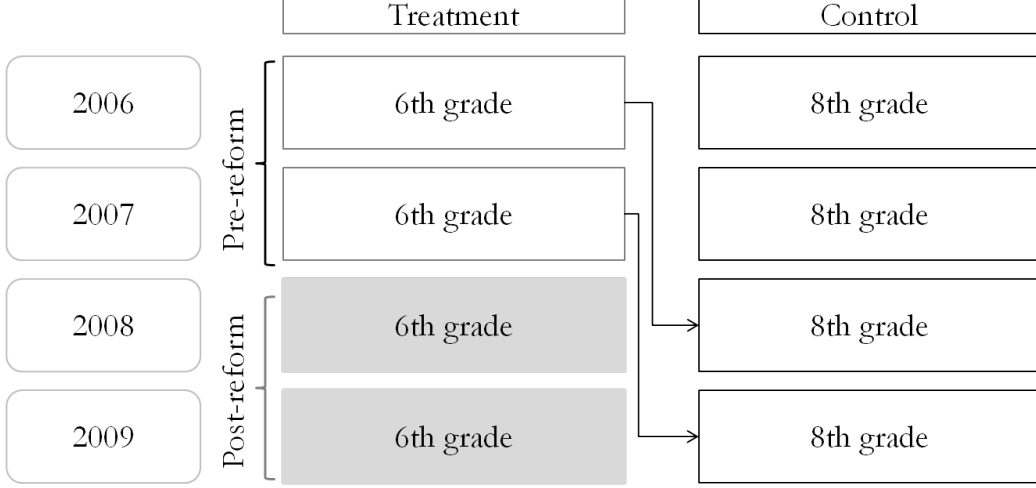
A simple differences-in-differences (DiD) regression exploits the policy induced variation to estimate the effect of binding teacher recommendations on student performance. By using this approach, we take into account time consistent differences in retention rates between treatment and control group, as seen in the previous section. Furthermore, DiD considers changes in retention rates over time which similarly affect both groups. Conceivable reasons for these common trends include teachers' attitudes towards retention¹⁹ as well as socio-demographic characteristics. Variations in family background for instance are likely to affect 6th and 8th graders in the same way.

In order to analyse the reform effect, we use the following specification

¹⁸ c.f. NRW examination regulations.

¹⁹The effectiveness of grade retention is a controversial topic with mixed empirical evidence. While earlier studies report a negative correlation between class repetition and educational attainment (Jimerson [1999], Jimerson et al. [2002]), recent literature accounting for selection bias mostly finds positive or non-significant effects depending on the retention age, e.g. ?, Jacob and Lefgren [2004] and for Germany ? .

Figure 3: SETTING



and choose 2007 as base year:

$$\begin{aligned}
 retention_{i,c,t} = & \beta_0 + \beta_1 treat_{i,c,t} + \beta_2 2008_{i,c,t} + \beta_3 (treat_{i,c,t} \times 2008_{i,c,t}) \\
 & + \beta_4 2009_{i,c,t} + \beta_5 (treat_{i,c,t} \times 2009_{i,c,t}) \\
 & + \beta_6 2006_{i,c,t} + \beta_7 (treat_{i,c,t} \times 2006_{i,c,t}) \\
 & + \gamma_1 Z_{i,c,t} + \gamma_2 X_{i,c,t} + \gamma_3 Macro_{c,t} + \epsilon_{i,c,t}
 \end{aligned} \tag{1}$$

where the subscripts i, c, t represent schools, grades and years, respectively. The dependent variable *retention* specifies the ratio of repeating students over total number of students per grade, school and year. *treat* is an indicator variable taking the value 1 for 6th grade students in school i and year t . 2008 is a dummy for the year 2008. The parameter of interest capturing the reform is β_3 .

Furthermore, equation 1 includes covariates on various aggregation levels as well as leads and lags. The former check the common trend assumption, i.e. they make sure there is no reform effect in a non-reform year. The latter are incorporated in the manner of Autor [2003] to account for delayed reform effects due to adoption processes.

The vectors Z and X represent grade and school controls, respectively²⁰.

²⁰Since there are multiple grades within one school and every grade can unambiguously

Z includes female and migration background. X consists of student-teacher-ratio, teaching certificate and rural. *Macro* comprises district characteristics such as net income, unemployment rate and high skilled.

To control for correlated errors and serial correlation, standard errors are clustered within districts²¹.

4.2 Policy exogeneity

Serving as a natural experiment, the reform allows us to capture the impact of the sorting method on educational attainment in terms of grade retention. Since students are assigned to either pre- or post-reform depending on their year of birth, we consider the assignment as being random.

Furthermore, we can rule out that parents react to the anticipated change for the following reasons: First, neither preponing nor postponing of the secondary school transition is of any importance. The former is not relevant because only exceptionally talented students are eligible to skip one grade. The latter, i.e. postponing via grade retention, will not help circumventing the reform. Second, primary school choice did not alter during the considered time period in NRW, e.g. Schneider et al. [2012]²². This is important because primary school choice among families with diverging background characteristics would confound the tracking decision.

We also check feasible confounding influences of the private education sector. The estimates would be biased if the student distribution to private school tracks shifted after the reform. One obvious scenario would be that

be attributed to one school, every c can be associated with exactly one i .

²¹c.f. Bertrand et al. [2004].

²²In fact, Schneider et al. [2012] analyse the introduction of free primary school choice in NRW in 2008. If the choice is practised primarily by socio-economically advantaged families, this change in primary school law may cause biases regarding the tracking decision. However, Schneider et al. [2012] do not find any effects regarding the amount of school choice and segregation. In addition to the effects of the reform not being significant, we can rely on the fact that we analyse students on the verge of secondary school: the primary school reform in 2008 is more likely to affect the initial primary school choice (1st grade) than to provoke a transfer to another school one year before secondary school transition (4th grade).

children from better educated households selected into private high schools after the reform. To check this hypothesis, we refer to the share of 6th grade students attending private high schools²³.

Figure 4 displays the share of 6th grade students attending private schools by track. We find that for the period in question 2006 – 2009, there is no clear trend in the share of private school students. In particular, the share of private high school students remains roughly constant. In the years 2010 and 2011 though, the share of private school students increases in all tracks. This might be an adjustment response to the reform in terms of boosted private school formation and/or a general time trend.

5 Results

This section presents the results of binding teacher recommendations' impact on mandatory and voluntary grade retention. Mandatory retention is discussed in more detail because it is determined by formal requirements and thus more relevant for our purpose. At the same time, mandatory retention occurs far more often than voluntary retention.

5.1 The effect of binding teacher recommendations on mandatory retention

Table 5 reports estimation results of equation 1. Specification (1) regresses retention rates on the reform variables only. This reflects the idea of DiD that except for track selection practice, treatment and control group face the same environment. We find a negative effect for the cohort in the second year (2009). The results suggest that binding teacher recommendations lead to less grade retentions than free parental choice. This finding implies that on average, teachers assess student attainment more adequately than parents. However, for the first cohort affected by the reform (2008), binding teacher recommendations do not exert any significant effects.

²³i.e. 6th grade students attending private high schools over the total number of 6th grade students in high school; source: state-level data by the Bureau of Statistics of NRW.

One possible interpretation of this finding is that the first cohort is subject to an adaptation process, i.e. the teachers realizing they have the power to decide. From the insignificant leads, it can be seen that the common trend assumption is met.

Specification (2) includes covariates in order to control for unobserved time varying influences, such as *migration background* or *female*. The size of the reform effect remains stable and the significance increases to the 1% level. Our controls have the expected signs. We find that a higher share of female students goes along with less mandatory retentions, c.f. Jacob [2002] and Machin and McNally [2005]. Similarly, more students with migration background are accompanied by higher retention rates. Unsurprisingly, adverse learning environments are correlated to high retention rates: an increase in the student-teacher-ratio leads to a higher retention rate, just as fewer lessons taught from teachers with subject specific education are correlated with more retentions. This goes in line with recent evidence of the teacher-student ratio's impact on examination results, e.g. Graddy and Stevens [2003], Dustmann et al. [2003], Krueger and Whitmore [2001], Boozer and Rouse [2001], Angrist and Lavy [1999]. The effects of unemployment rate and net income on mandatory retentions are significant, yet small.

5.2 Subgroup estimates

Our estimates so far refer to the average treatment effect of the population. Not covered in our analysis are heterogeneities in treatment effects across subgroups. This is the case if in some parts of the population, the reform effect is more pronounced than in others. In table 6 and 7, we present evidence for subgroups based on quartiles of unemployment and net income. The results indicate that the effect stems from subgroups with the lowest unemployment rate or the highest net income in the district. In fact, the size of the effect almost doubles for the subgroup with the lowest unemployment rate. This pattern suggests that binding teacher recommendations reduce mandatory retention primarily for households who are better off. In other words, parents' track choice was overoptimistic (compared to teachers' assess-

ment) especially among better situated households. Indeed, overestimating student achievement typically occurs when well-educated parents try to impose their sense of entitlement on their children²⁴. As discussed above, one goal of the reform was to prevent overoptimistic track choices by families of comparatively low-achieving students. In this respect, the reform may have achieved its aim.

5.3 Pooled results

Another robustness check addresses a potential serial correlation problem in DiD estimation. Bertrand et al. [2004] point out that DiD estimation with numerous time periods causes biased standard errors. One method they propose for solving this problem is aggregating the data into two periods: pre- and post intervention. Although Bertrand et al. [2004] refer to a survey of papers with 16.5 time periods on average, we give consideration to our data suffering from a serial correlation problem. Hence, we remove the time series dimension by aggregating four years into pre- and post intervention. Table 8 provides evidence that pooled estimation does not change our findings compared to table 6. Teachers' track choice continues to lead to less mandatory retentions in prospering districts.

5.4 The effect of binding teacher recommendations on voluntary retention

Results from the voluntary grade retention rate as dependent variable are reported in table 9. Again, we regress retention rates on the reform variables (1) and include controls (2).

The coefficients prove not to be significant for voluntary retentions. Hence, changing the decision-making unit from parents to teachers does not affect voluntary retention at all. These results are robust to including controls. As before, the leads are not significant, confirming the common trends assumption. The covariates do not follow the same pattern as with mandatory

²⁴c.f. Paulus and Blossfeld [2007], Spera et al. [2009].

retention. Although the coefficient estimates of migration background are significant, yet smaller than the values above, the effects of student-teacher-ratio, female, unemployment rate and net income do not affect voluntary retention. Consequently, the decision process leading to and the determinants of voluntary retention seem to be different from mandatory ones.

6 Concluding remarks

In this paper, we use a school data set to examine the effect of a reform aimed at improving student allocation to different tracks. The reform replaced parental choice regarding the tracking decision by binding teacher recommendations. Using a difference-in-differences approach, we analyse whether teachers' or parents' assessment of students is more reliable in terms of less grade retentions. The results show that binding teacher recommendations cause less retentions. Several robustness checks confirm these findings. The effect is mainly driven by students from districts that are well-off, i.e. characterized by high net income and low unemployment. One interpretation is that with free parental choice, overambitious parents tend to select too demanding tracks for their children. Teacher's choice in contrast seems to provide a more effective selection mechanism. Since one of the goals of the 2006 educational reform in NRW was to prevent overoptimistic track choices, it may have achieved its aim.

In a second paper, we analysed the NRW reform of 2006 regarding the overall distribution of students to various school tracks. We found that the distribution to school tracks barely changed as a result of the reform. In combination with our findings above, this suggests that while the numbers per track remain roughly constant, the composition of students may have changed.

Presumably, the effect of (upward-)binding teacher recommendations would have been even larger, if there was not such a phenomenon as *voluntary downgrading*, i.e. choosing a lower track than the one recommended by the teacher. In fact, table 1 shows that 8% of all general and intermediate school

students in 2009/10 and 2010/11 received a teacher recommendation for a higher track than the one they ended up attending. Therefore, the size of the effect might be limited by parental downgrading even in the presence of upward-binding teacher recommendations.

Our results are new to the existing literature in choosing result-oriented measures when investigating the role of the decision-maker in the transition to secondary school. Future research will attempt to examine the reform effect exploiting additional measures for student attainment, for instance standardized tests or the share of students switching the track. Furthermore, an investigation of voluntary downgrading and its determinants deserves further study to avoid waste of potential.

7 Appendix

Table 1: RECOMMENDED VERSUS VISITED TRACKS (2009 - 2010)

Recommended	General		Intermediate		Comprehensive		High		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
General	40950	91.60	974	1.08	20678	33.83	22	0.02	62624
General/Int	2466	5.52	14581	16.14	7369	12.06	60	0.05	24476
Intermediate	1185	2.65	66761	73.88	22574	36.93	1114	0.99	91634
Int/High	90	0.20	6779	7.50	4915	8.04	17356	15.38	29140
High	16	0.04	1273	1.41	5587	9.14	94269	83.56	101145
Total	44707	100	90368	100	61123	100	112821	100	309019
Voluntary Downgrades (aggregated)									
> General	3757	8.40							
> Intermediate			8052	8.91					
									3.82%
Upgrades (aggregated)									
< Intermediate			974	1.08					
< High							1196	1.06	
									0.70%

Recommendation for comprehensive school does not exist.
 Upgrade is permitted under strict restrictions, i.a. passed probation.

Table 2: SUMMARY STATISTICS, 2006 - 2009

Variable	Mean	Mode	Std. Dev.	Min.	Max.
<i>6th grade</i>					
Grade retention	0.021		0.032	0	0.449
Student-teacher-ratio	16.247		3.215	6.9	25.3
Teaching certificate	0.798		0.152	0.283	1
Female	0.467		0.083	0.091	1
Migration background	0.268		0.217	0	1
Rural		4		1	4
Net income	1.628		0.17	1.277	2.111
Unemployment rate	9.354		2.914	3.9	20.1
High skilled	8.471		3.039	4.3	20.2
<i>8th grade</i>					
Grade retention	0.036		0.041	0	0.731
Student-teacher-ratio	16.182		3.251	5.5	25.3
Teaching certificate	0.796		0.153	0.283	1
Female	0.473		0.082	0.143	1
Migration background	0.251		0.212	0	1
Rural		4		1	4
Net income	1.627		0.17	1.277	2.111
Unemployment rate	9.359		2.918	3.9	20.1
High skilled	8.468		3.03	4.3	20.2

15282 observations. Grade retention includes mandatory and voluntary retentions. Net income is scaled in thousands; unemployment rate and high skilled are expressed in percent. All other variables are expressed as ratios. Grade retention, student-teacher-ratio, teaching certificate, female and migration background are collected on grade level. Unemployment rate, net income and high skilled are collected on district level.

Table 3: COMPARISON OF MEANS, 2006 - 2009

Variable	Treatment (6th)	Control (8th)	Comparison of means	
	Mean	Mean	6th - 8th	Sign.(p < 0.05)
Grade retention	0.021	0.036	0.015	0.000

15282 observations. Grade retention includes mandatory and voluntary retentions. Grade retentions are collected on grade level. Two-sided t-test.

Table 4: COMPARISON OF GRADE RETENTIONS, 2006 - 2009

		Treatment (6th)		Control (8th)		6th - 8th
		Freq.	%	Freq.	%	%
<i>Mandatory Grade Retention</i>						
Pre-Reform	2006	3489	2.06	6982	3.76	-1.70
	2007	3086	1.82	5667	3.15	-1.34
Post-Reform	2008	2829	1.61	5118	3.01	-1.40
	2009	2362	1.41	5148	3.02	-1.61
<i>Voluntary Grade Retention</i>						
Pre-Reform	2006	672	0.40	420	0.23	0.17
	2007	414	0.24	254	0.14	0.10
Post-Reform	2008	394	0.22	180	0.11	0.12
	2009	346	0.21	236	0.14	0.07

15282 observations. Includes all tracks. Grade retention includes mandatory and voluntary retentions.

Figure 4: SHARE OF STUDENTS IN PRIVATE SCHOOLS (6TH GRADE)

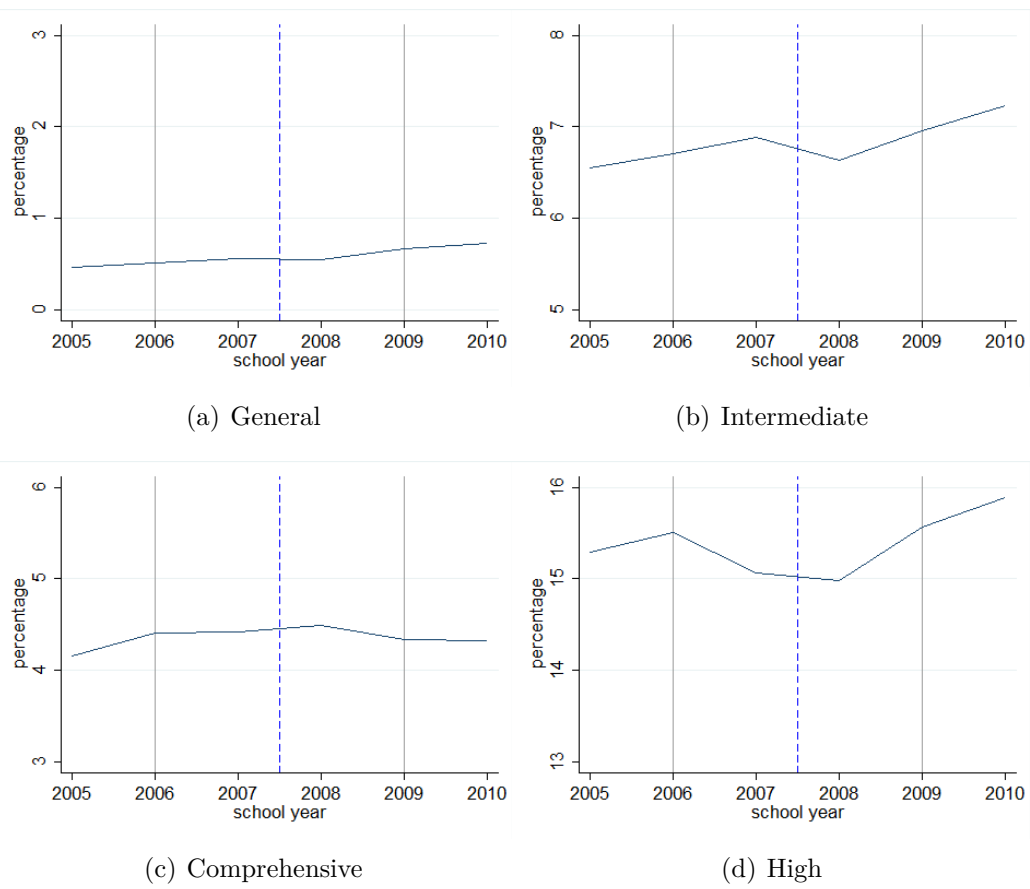


Table 5: EFFECT OF BINDING TEACHER RECOMMENDATIONS ON MANDATORY GRADE RETENTION

	(1)	(2)
Treat x 2009	-0.0043** (0.0017)	-0.0046*** (0.0017)
Treat x 2008	-0.0017 (0.0017)	-0.0017 (0.0018)
Treatment	-0.0126*** (0.0012)	-0.0131*** (0.0013)
Treat x 2006	-0.0026 (0.0017)	-0.0027 (0.0017)
Student-teacher-ratio		0.0031*** (0.0002)
Teaching certificate		-0.0525*** (0.0038)
Female		-0.0360*** (0.0041)
Migration background		0.0255*** (0.0024)
Rural		-0.0009 (0.0005)
Unemployment rate		0.0011*** (0.0003)
Net income		0.0123*** (0.0033)
High skilled		-0.0002 (0.0002)
N	15282	15065
R^2	0.0445	0.1255
F	90.9396	105.8662

The dependent variable is $retention_{i,c,t}$. Period 2006 - 2009. Year effects included.

** p<.05, *** p<.01. Clustered robust standard errors in parentheses. Base year 2007.

Table 6: EFFECT OF BINDING TEACHER RECOMMENDATIONS ON MANDATORY GRADE RETENTION - BY UNEMPLOYMENT RATE

	(1)	(2)	(3)	(4)
Subgroup	1st quartile	2nd quartile	3rd quartile	4th quartile
Treat x 2009	-0.0081*** (0.0030)	-0.0051 (0.0029)	-0.0056 (0.0028)	0.0002 (0.0038)
Treat x 2008	-0.0034 (0.0021)	-0.0000 (0.0026)	-0.0031 (0.0037)	-0.0026 (0.0051)
Treatment	-0.0103*** (0.0015)	-0.0119*** (0.0021)	-0.0130*** (0.0019)	-0.0169*** (0.0029)
Treat x 2006	-0.0006 (0.0020)	-0.0056 (0.0036)	-0.0005 (0.0024)	-0.0006 (0.0035)
Student-teacher-ratio	0.0020*** (0.0003)	0.0031*** (0.0004)	0.0033*** (0.0003)	0.0041*** (0.0003)
Teaching certificate	-0.0255*** (0.0056)	-0.0452*** (0.0084)	-0.0526*** (0.0074)	-0.0893*** (0.0064)
Female	-0.0269*** (0.0090)	-0.0428*** (0.0070)	-0.0401*** (0.0102)	-0.0309*** (0.0076)
Migration background	0.0296*** (0.0052)	0.0315*** (0.0046)	0.0253*** (0.0040)	0.0202*** (0.0047)
Net income	0.0001 (0.0048)	0.0139** (0.0063)	0.0095 (0.0072)	0.0018 (0.0049)
Rural	-0.0044*** (0.0016)	-0.0020*** (0.0007)	0.0003 (0.0006)	-0.0000 (0.0007)
High skilled	-0.0001 (0.0004)	-0.0001 (0.0003)	-0.0005 (0.0003)	0.0001 (0.0003)
N	3612	3879	3781	3793
R^2	0.1102	0.1172	0.1274	0.1533
F	40.6060	32.0450	55.6175	58.9679

The dependent variable is $retention_{i,c,t}$. ** p<.05, *** p<.01. Year effects included. Clustered robust standard errors in parentheses. Period 2006 - 2009. Base year 2007. (1) - (4) show the quartiles of unemployment, (1) being the subgroup of districts with the lowest unemployment rate.

Table 7: EFFECT OF BINDING TEACHER RECOMMENDATIONS ON MANDATORY GRADE RETENTION - BY NET INCOME

	(1)	(2)	(3)	(4)
Subgroup	1st quartile	2nd quartile	3rd quartile	4th quartile
Treat x 2009	-0.0037 (0.0024)	-0.0019 (0.0034)	-0.0058 (0.0035)	-0.0064** (0.0029)
Treat x 2008	-0.0014 (0.0032)	-0.0021 (0.0042)	-0.0015 (0.0035)	-0.0020 (0.0023)
Treatment	-0.0103*** (0.0019)	-0.0139*** (0.0028)	-0.0165*** (0.0028)	-0.0117*** (0.0018)
Treat x 2006	-0.0029 (0.0025)	-0.0014 (0.0033)	-0.0012 (0.0042)	-0.0055 (0.0029)
Student-teacher-ratio	0.0038*** (0.0003)	0.0030*** (0.0003)	0.0024*** (0.0003)	0.0032*** (0.0003)
Teaching certificate	-0.0717*** (0.0068)	-0.0381*** (0.0080)	-0.0463*** (0.0066)	-0.0550*** (0.0077)
Female	-0.0289*** (0.0084)	-0.0396*** (0.0067)	-0.0380*** (0.0071)	-0.0311*** (0.0112)
Migration background	0.0120*** (0.0037)	0.0316*** (0.0046)	0.0316*** (0.0053)	0.0295*** (0.0050)
Unemployment rate	0.0017*** (0.0004)	0.0022*** (0.0005)	0.0002 (0.0006)	-0.0010 (0.0009)
Rural	0.0005 (0.0007)	-0.0002 (0.0010)	-0.0004 (0.0010)	-0.0031*** (0.0012)
High skilled	-0.0008** (0.0004)	-0.0005 (0.0003)	0.0001 (0.0003)	0.0000 (0.0003)
N	3710	3802	3766	3787
R^2	0.1133	0.1481	0.1435	0.1276
F	56.5826	23.8223	64.0846	51.1028

The dependent variable is $retention_{i,c,t}$. ** p<.05, *** p<.01. Year effects included.

Clustered robust standard errors in parentheses. Period 2006 - 2009. Base year 2007.

(1) - (4) show the quartiles of average net income, (1) being the subgroup of districts with the lowest average net income.

Table 8: EFFECT OF BINDING TEACHER RECOMMENDATIONS ON MANDATORY GRADE RETENTION - BY UNEMPLOYMENT RATE, POOLED

	(1)	(2)	(3)	(4)
Subgroup	1st quartile	2nd quartile	3rd quartile	4th quartile
Treat x After	-0.0051*** (0.0018)	-0.0012 (0.0023)	-0.0040 (0.0023)	-0.0007 (0.0030)
Treatment	-0.0104*** (0.0012)	-0.0139*** (0.0018)	-0.0134*** (0.0012)	-0.0173*** (0.0017)
Student-teacher-ratio	0.0020*** (0.0003)	0.0031*** (0.0004)	0.0033*** (0.0003)	0.0041*** (0.0003)
Teaching certificate	-0.0256*** (0.0056)	-0.0452*** (0.0084)	-0.0526*** (0.0074)	-0.0893*** (0.0064)
Female	-0.0267*** (0.0090)	-0.0429*** (0.0070)	-0.0400*** (0.0102)	-0.0310*** (0.0076)
Migration background	0.0295*** (0.0052)	0.0315*** (0.0046)	0.0254*** (0.0040)	0.0202*** (0.0047)
Net income	0.0001 (0.0048)	0.0139** (0.0063)	0.0095 (0.0072)	0.0018 (0.0049)
Rural	-0.0044*** (0.0016)	-0.0020*** (0.0007)	0.0003 (0.0006)	-0.0000 (0.0007)
High skilled	-0.0001 (0.0004)	-0.0001 (0.0003)	-0.0005 (0.0003)	0.0001 (0.0003)
N	3612	3879	3781	3793
R^2	0.1094	0.1161	0.1273	0.1532
F	42.3346	30.9651	59.0718	67.6333

The dependent variable is $retention_{i,c,t}$. ** p<.05, *** p<.01. Year effects included.

Clustered robust standard errors in parentheses. Period 2006 - 2009. Base year 2007.

(1) - (4) show the quartiles of unemployment, (1) being the subgroup of districts with the lowest unemployment rate.

Table 9: EFFECT OF BINDING TEACHER RECOMMENDATIONS ON VOLUNTARY GRADE RETENTION

	(1)	(2)
Treat x 2008	-0.0002 (0.0005)	0.0000 (0.0005)
Treat x 2009	-0.0007 (0.0005)	-0.0005 (0.0005)
Treatment	0.0013*** (0.0004)	0.0011*** (0.0004)
Treat x 2006	0.0004 (0.0006)	0.0007 (0.0006)
Student-teacher-ratio		-0.0000 (0.0000)
Teaching certificate		0.0006 (0.0011)
Female		-0.0007 (0.0015)
Migration background		0.0038*** (0.0007)
Rural		-0.0001 (0.0001)
Unemployment rate		-0.0000 (0.0001)
Net income		-0.0003 (0.0008)
High skilled		0.0000 (0.0000)
N	15265	15048
R^2	0.0058	0.0123
F	10.7258	8.6419

The dependent variable is $retention_{i,c,t}$. Period 2006 - 2009. Year effects included.

** p<.05, *** p<.01. Clustered robust standard errors in parentheses. Base year 2007.

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