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The impact of special needs students on classmate performance☆

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ABSTRACT

Does the presence of special needs students in regular schools affect the academic achievement of their classmates? I examine this question in the context of primary and secondary education in the Netherlands, where the per student budget for special needs students in regular schools is roughly twice the amount of the regular student budget. I use three independent identification approaches: student fixed effects models, school fixed effects models, and neighborhood variation. For both education levels and all three identification approaches, the estimates indicate that special needs students do not have a statistically significant effect on the academic achievement of their classmates. The estimates are precise enough to rule out even modest effects.

1. Introduction

The inclusion of students with special educational needs (SEN) in regular education classrooms is a controversial issue in many countries and topic of one of the most heated debates in education policy. While inclusive education[1] was endorsed by 92 countries in the UNESCO Salamanca Statement (UNESCO, 1994) already 20 years ago, the empirical evidence in favor of inclusion is still thin (Dyson, 2014; Göransson & Nilholm, 2014; Lindsay, 2007; Ruijs & Peetsma, 2009).

Advocates of inclusive education often argue from a human rights perspective, claiming that it is a right of all pupils to be educated in regular schools (Ainscow & César, 2006; Farrell, 2000). One of the main concerns of the opponents, on the other hand, is that inclusion may have a negative impact on students without special educational needs (from hereon referred to as 'regular' students). The argument is that regular students get distracted by the behavior of SEN students and that SEN students need more teacher attention at the expense of regular students. The additional support that is available in inclusive classrooms, however, might also be of benefit to the regular students. This paper therefore investigates the impact of inclusive education on the academic achievement of regular students.

Recent studies support the concern of inclusive education critics by finding that disruptive peers have a negative impact on student achievement (Carrell & Hoekstra, 2010; Figlio, 2007; Neidell & Waldfogel, 2010). These studies, however, do not focus on students with diagnosed special educational needs. Figlio (2007) uses an IV strategy that exploits misbehavior of boys having girls' names, Carrell and Hoekstra (2010) study the peers of students who are exposed to domestic violence and Neidell and Waldfogel (2010) use teacher ratings on externalizing problems. Students with diagnosed SEN generally have more severe problems. At the same time, their eligibility for special education also yields additional resources and support.

Focusing on students with diagnosed SEN, the picture that emerges is less clear.[2] Regarding students with diagnosed behav-

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[1] In this paper, inclusive education is defined as educating children with special educational needs in regular schools instead of in special schools.

[2] Another strand of the literature compares the achievement of regular students in more and less inclusive classes. From such comparisons (e.g. Farrell, Dyson, Polat, Hutcheson, & Gallannaugh, 2007; Kalambouka, Farrell, Dyson, & Kaplan, 2007; Ruijs, Van der Veen, & Peetsma, 2010; Salend & Garrick Duhaney, 1999), causal inferences on the effects of inclusion cannot be drawn.

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ioral or emotional problems, Fletcher (2010) and Kristoffersen, Krægpøth, Nielsen, and Simonsen (2015) find negative effects on classmates' academic achievement. Gottfried (2014) finds that students with disabilities also negatively affect non-cognitive outcomes of regular students. On the other hand, Aizer (2008) finds that the presence of students with undiagnosed ADD harms peer achievement, but once the ADD is diagnosed and behavior improves, peer achievement also improves. Hanushek, Kain, and Rivkin (2002) and Friesen, Hickey, and Krauth (2010) find statistically insignificant effects of the inclusion of students with behavioral problems.

Further, Friesen et al. (2010) find no significant impact of including students with learning difficulties or 'other' disabilities. Hanushek (2002) even finds that an increase in the proportion of students with 'other' disabilities (i.e. not learning disabled, emotionally disturbed or speech impaired) increases test score gains for regular students.[3]

Because the current literature is small and results differ, it is important to get more evidence on the effects of inclusive education on the academic achievement of students without special educational needs. This study focuses on the Dutch context, which is particularly interesting since inclusive education is highly subsidized in the Netherlands. The per student budget for SEN students is roughly twice the amount of the regular student budget. I use two large administrative datasets to investigate inclusion in both primary and secondary education. Further, I distinguish between students with different types of special educational needs and I investigate whether inclusive education has a different impact on high and low achieving regular students.

Since the presence of SEN students is related to school and peer characteristics, three different empirical strategies are pursued to deal with selection issues. First, a central feature of the Dutch secondary school system is exploited: students take a limited number of courses within the secondary school program. Since different students take different courses, there is within-student-between-course variation in classroom composition. I use student fixed effects to compare student achievement in courses with varying percentages of SEN students, which is akin to identification strategies in other contexts, including Aslam and Kingdon (2011) and Dee (2007). The second strategy follows a widely used approach in the literature on peer effects (e.g. Hoxby, 2000; Lavy, Paserman, & Schlosser, 2012b) by using school fixed effects that exploit within school cohort-to-cohort variation in the percentage of SEN students. Using cohort level data, the school fixed effects strategy is also used to investigate differential effects of inclusive education on high and low achieving regular students. Third, additional evidence for primary education is obtained by utilizing neighborhood variation in the percentage of SEN students.

Even though the three strategies hinge on different assumptions, the results consistently show that the percentage of SEN students is unrelated to student achievement. This indicates that the presence of SEN students does not adversely or favorably affect the achievement of regular students. The results are not driven by a lack of precision: the standard errors are small and the point estimates are close to zero.

Remarkably, distinguishing between different types of SEN does not change the results: there is no differential effect of the presence of students with visual problems, hearing problems, physical/intellectual disabilities or behavioral problems. This contrasts with earlier research findings, in which the inclusion of students with behavioral or emotional problems seems to have more negative externalities to regular students than the inclusion of students with other types of SEN. No evidence is found for heterogeneous effects of the presence of SEN students across the ability distribution. Although this cannot be studied directly, it seems that the additional funds are currently sufficient to avoid negative externalities of the presence of SEN students in regular primary and secondary education classrooms.

The paper is structured as follows. Section 2 provides background information on the Dutch education context and on inclusive education in the Netherlands. Section 3 describes the data and Section 4 describes the empirical strategies. The results are presented and discussed in Section 5. Section 6 concludes.

2. The Dutch context

2.1. Primary and secondary education in the Netherlands

In the Netherlands, school choice is free and virtually all schools are completely publicly funded.[4] The government funding of schools is to a large extent dependent on student numbers, in which money follows the student. The per student funding is nationally determined and averages to €6030 per student in primary education and €7730 per student in secondary education for 2012 (Ministerie van Onderwijs, 2012a).

Schools can get additional funding for students from disadvantaged backgrounds. In primary education, the 'weighted student funding' adds 0.3 or 1.2 times the regular per student funding to the base level funding. Eligibility is dependent on the educational background of the parents. In secondary education, schools can get €750 for each student from a disadvantaged neighborhood, if the number of such students exceeds a substantial threshold (Staatscourant, 2011). Further, secondary schools can apply for funding for additional support to students who lag behind significantly when starting secondary education in the vocational tracks. Student level eligibilities for these arrangements are used as control variables in this study.

Dutch primary education starts at age 4 and lasts until age 12. Students are generally educated by one or two teachers for an entire school year. At the end of primary education, most students take a standardized national test called the 'citotoets'. Together with the advice of the primary school teacher, this test determines which track a student should take in secondary education. The outcomes of this high stakes test are used as a measure of student performance in primary education.

The Dutch secondary school system is highly tracked. The lowest track (pre-vocational secondary education, vmbo) lasts four years, and gives access to vocational education programs. Within the pre-vocational track, there are four different levels, each giving access to different levels of vocational education programs. Here, they are denoted by the numbers I to IV, with I being the lowest level. The intermediate track (senior general secondary education, havo) takes five years, and gives access to higher professional education. The highest track (pre-university education, vwo) takes six years, and gives access to university education (Eurydice, 2009). Not all secondary schools offer all school tracks. Dependent on student achievement and school policies, students can change track during secondary education. Also, they can decide to take a higher track after finishing a lower track.

[3] The question of the impact of inclusive education on regular students is also related to the literature on peer effects. There, experimental (e.g. Booij, Leuven, & Oosterbeek, 2014; Duflo, Dupas, & Kremer, 2011; Sacerdote, 2001; Zimmerman, 2003) and different fixed effects methods (e.g. Ammermueller & Pischke, 2009; Burke & Sass, 2013; Hanushek, Kain, Markman, & Rivkin, 2003; Lavy et al., 2012b) are used to counter the endogeneity issues that hamper this question (Angrist, 2014; Manski, 1993).

[4] Some schools, mainly in the large cities, are oversubscribed. Secondary schools generally conduct school admission lotteries to allocate the available places. Primary schools conduct lotteries or use a first-come, first-served strategy.

In the second half of secondary education, students choose their exam courses. Part of the exam courses are clustered in a specialization, such as "Science and Technology" or "Economics and Society". Other courses are obliged for all students (e.g. Dutch, English) and part of the courses can be freely chosen. Students have different teachers for each course. Secondary schools have to follow national curriculum guidelines, and students take centrally determined national exams at the end of secondary school. The national exams count for 50% of students' final grades, the other 50% is determined by school specific exams.

2.2. Inclusive education

In the Netherlands, special schools coexist next to inclusive education. In total, about 3.7% of the Dutch primary school students and about 5% of the Dutch secondary school students are identified as having severe Special Educational Needs (SEN) (DUO, 2010). Compared to the US, where approximately 13% of the students in public schools are supported by special education programs (Snyder & Dillow, 2012), this number appears low. In addition to the programs for students with severe SEN, however, there are education programs for students with less severe SEN. These programs are not taken into account, this study specifically focuses on students with 'backpack' funding.

Backpack funding is meant for students with severe SEN, who are also eligible for special education schools ('speciaal onderwijs'). The backpack is a pupil-bound-budget. It was introduced to facilitate inclusive education by funding the additional support needed to educate children with severe SEN in regular schools. The additional funding is substantial: for primary education, it ranges from about €7050 for students with severe social, emotional or behavioral problems, to €13.550 for deaf children. On top of the budget for the regular primary school, special education schools get around €5000 for an included student, in order to provide additional specialist support to the regular primary schools. In secondary education, the yearly backpack budget for the regular school is about €3500. The affiliated special education school receives between €2923 and €5234 (Staatscourant, 2012).[5] The use of the additional funds depends on the needs of the student. For example, it can include physical adaptations in the class, remedial teaching support or the presence of a teaching assistant.

Whether a student is eligible for special education or backpack funding is decided by a regional committee; parents have to apply for it. The committee requests official reports on the disability of the student, made by a certified psychologist. The student needs to score at least two standard deviations below average on relevant psychological tests and the disability of the student needs to be a stable trait. For example, a student is considered to have an intellectual disability when he or she has an IQ below 60, an IQ between 60 and 70 with additional problems or Down syndrome (LCTI, 2006).

When the committee decides that a child is eligible, parents can choose for a special school or a regular school with backpack funding. About 2% of the children in regular primary education and 1% of the children in regular secondary education gets educated with backpack funding. The choice for a regular or special school depends on the preferences of the parents and the specific needs of the child. Moreover, regular schools can reject backpack students when they have a good motivation to do so. Even though not every student is accepted in regular education, it is important to stress that students included under the backpack policy are students with severe SEN. When a child is accepted to a regular school, he or she mainly follows education in the regular classroom.

The special education schools and the specialist support for students with severe SEN are organized in four clusters, dependent on the type of special needs. The first cluster is meant for students with a visual disability causing problems in educational participation. The second cluster focuses on communicative handicaps, including students with significant hearing loss or students with very weak communicative abilities. The third cluster is for students with physical and cognitive handicaps, including students with intellectual disabilities, physically handicapped students and students with a long-term desease. The fourth cluster is for students with severe social, emotional or behavioral problems. This includes students with formally diagnosed[6] behavioral disorders, developmental disorders and psychiatric problems, such as conduct disorder. It is possible that students with different types of problems have different effects on regular education students. Therefore, I study whether there are differential effects of including students with different types of special educational needs.

3. Data

3.1. Data primary education

For primary education, the data used in this study are data on all Dutch students leaving primary education in 2009, 2010 and 2011. The data are provided by DUO, the government organization that finances schools and administrates educational data. The data include information on citotest scores,[7] receiving backpack funding and on background characteristics including gender, weighted student funding, ethnicity and student post code area.

Descriptive statistics on SEN and non-SEN students are reported in Table 1. It turns out that SEN students included in regular classrooms are more often male, Dutch and from non-disadvantaged backgrounds. As expected given their eligibility for special education, SEN students have a lower participation rate for the citotest, and when they do participate, they score lower. Since we are interested in the effect of the percentage of SEN students on regular students, all SEN students are dropped from the sample.

As can be seen in the table, 18% of the students in cito participating schools do not take the citotest. Table 1 shows that students who do not take the citotest are slightly more disadvantaged than students who do: they are more often students with weighted student funding, less often Dutch and they are slightly older. This is likely to be caused by the fact that schools are free to decide which students participate in the citotest. When schools exclude bad performing students, they increase their average testscores at the same time. Therefore, cito participation is used as an outcome next to citoscore. The citoscores are standardized to ease interpretation.

For the neighborhood analyses, the selection of students is somewhat different. Here, we are interested in students who would be in the final grade of primary education when following the typical primary school path. A cohort is defined as all students in a 4-digit post code area who are 11 years old at October 1st

[5] When a student is also eligible for additional support for students who lag behind in the vocational track, the backpack funding for the regular secondary school decreases to €1617. The average budget for students with severe special educational needs in special education schools amounts to €22.600 per student (Ministerie van Onderwijs, 2012b). In August 2014, there was a substantial reform in special education. The backpack funding was abolished, and the budgets were shifted towards collaborating groups of schools.

[6] Formally diagnosed refers to disorders fitting in standardized classification systems such as DSM-IV and ICD-10.

[7] Although the citotest is taken by the majority of primary school students, it is not obliged. About 15% of the schools does not take the citotest. These schools are slightly different from schools that do take the citotest: they have slightly more SEN students, more Dutch students and fewer weighted students. Since there is no other standardized test available, these schools are dropped from the sample. 1 case was dropped because of missing gender information.

Table 1
Descriptive statistics for students in primary education.

	Students in final grade of primary education				
	Difference between SEN and non-SEN students		Differences by cito participation for non-SEN students		Neighbor- hood sample
	non-SEN	SEN	with cito	without cito	
Boy	0.49	0.76***	0.49	0.49	0.49
Dutch	0.78	0.85***	0.78	0.76***	0.78
Non-western non-Dutch	0.16	0.09***	0.16	0.17***	0.16
Western non-Dutch	0.06	0.05**	0.06	0.06***	0.06
Unknown ethnicity	0.00	0.00**	0.00	0.01***	0.00
No additional funding	0.86	0.89***	0.86	0.84***	0.86
0.30 funding weight	0.08	0.08***	0.08	0.09***	0.08
1.20 funding weight	0.06	0.03***	0.06	0.07***	0.06
Age at October 1st	11.13	11.34***	11.13	11.16***	11
Share of cito participation	0.82	0.75***			0.57
Mean standardized citoscore	0.00	−0.30***			0.11
SD standardized citoscore	1.00	1.05			0.95
Number of non-SEN students	462,227		377,228	84,999	522,095
Mean number of non-SEN per cohort	26.77				50.10
SD number of non-SEN per cohort	16.89				49.91
Number of SEN students		8775			30,274
Mean number of SEN per cohort	0.50				2.63
SD number of SEN per cohort	0.83				3.24
% SEN students per cohort		2.05%			4.95%
SD % SEN per cohort		4.04			6.12
% Visual problems		0.05%			
% Hearing problems		0.29%			
% Physical and intellectual disabilities		0.41%			
% Behavioral problems		1.30%			
Number of schools	5958				

Note: This table reports descriptive statistics for the primary school samples. The first 9 rows report differences between SEN and non-SEN students, and between non-SEN students who do and do not participate on the cito test. The two columns on cito participation refer to students in schools taking the citotest for at least one student in the sample. The numbers for the neighborhood sample refer to non-SEN students. The mean and SD of the number and percentages of (non-)SEN students per cohort refer to the mean and SD over cohorts within schools, using one observation per school per cohort. The stars refer to the p-values of two-group mean comparison *t*-tests. $^{*}P < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

2009, 2010 or 2011. A 4-digit post code area is an administrative neighborhood area with an average of 4153 inhabitants (Statistics Netherlands, 2013). Since October 1st is a weak cutoff date[8] and since it is common to repeat or skip classes in the Netherlands, only 79.9% of the regular education students is actually in the final grade of primary education at age 11. 19.1% of the students is in the penultimate grade. Since repeaters are 12 years old in the final grade, their citoscores are not taken into account when using neighborhood information. Therefore, the average citoscore is somewhat higher in this sample. The descriptive statistics for this sample are also listed in Table 1.

Students at schools not participating on the citotest are taken into account in the neighborhood analyses. SEN students are defined as all students eligible for special education, which includes both students with backpack funding and students educated at special education schools.[9] Again, SEN students are dropped from the sample.

3.2. Data secondary education

For secondary education, administrative data on all Dutch students taking secondary school exams in 2009, 2010 and 2011 are used. The data are provided by DUO. The central exam grade for each course is available for each student. To ease interpretation, the exam grades are standardized within school tracks. When a student is in the sample twice because of failing the exams the first time or because of attaining a higher school track, each observation is treated as a separate entry. Next to exam grades, the data include a rich set of background characteristics: gender, age, ethnicity, living in a disadvantaged neighborhood, missing neighborhood information and getting additional support in the pre-vocational tracks.

Further, the data include information on receiving backpack funding.[10] This information is used to compute the percentage of SEN students per cohort. Since students get educated within their own school track, each school track within a school is treated separately. Descriptive statistics on the number and percentages of SEN and non-SEN students are reported in Table 2. Note that the percentage of SEN students gets lower for higher school tracks. Table 3 shows descriptive statistics for students with and without SEN. SEN students are more often male, Dutch and from non-disadvantaged neighborhoods.

Given the severity of the special educational needs, it is surprising that students with SEN have higher exam grades than students without SEN. Based on the exam results, it seems that secondary schools place students with SEN in a lower track than their actual academic level. SEN students in primary education (where students are not tracked) are scoring lower than their regular education classmates. It is important to remember that the students included under the backpack policy have severe and diagnosed special educational needs. Through their behavior and need for additional support, these included students may affect their classmates. Since

[8] Virtually all students start primary education at age 4, but the first two grades are similar to kindergarten. October 1st refers to a cutoff for 6 year olds, when the primary school curriculum starts.

[9] Students in other types of non-regular primary education ('speciaal basisonderwijs') are not taken into account in the analyses. Changing the definition of SEN to include these students does not change the results.

[10] For 0.03% of the students, the information on receiving backpack funding is missing or inconsistent. These cases are dropped from the sample. Additionally, 0.21% of the students do not have information on central exam grades. These students are not taken into account in the analyses.

Table 2
Number and percentages of SEN and non-SEN students for secondary education.

	All school tracks	Pre-voc. I	Pre-voc. II	Pre-voc. III	Pre-voc. IV	Senior gen.	Pre-uni.
Number of students without SEN	518,985	56,048	70,283	14,955	125,023	143,847	108,829
Number of schools	1036	441	451	299	741	500	516
Number of cohorts	8251	1220	1252	768	2068	1446	1497
Mean number of non-SEN students per cohort	63.69	46.94	56.94	19.72	61.40	100.56	73.12
SD number of non-SEN students per cohort	41.70	30.35	32.99	21.16	36.45	44.43	35.85
Total number of SEN students	5472	949	861	172	1750	1203	537
Mean number of SEN per cohort	0.67	0.79	0.69	0.22	0.85	0.84	0.36
SD number of SEN per cohort	1.17	1.18	1.04	0.55	1.54	1.15	0.69
% SEN students per cohort	1.27%	1.84%	1.37%	1.17%	1.72%	0.89%	0.50%
SD % SEN per cohort	3.25	3.38	2.74	4.20	4.57	1.55	1.03
% visual problems	0.03%	0.04%	0.02%	0.01%	0.03%	0.04%	0.05%
% hearing problems	0.12%	0.25%	0.16%	0.11%	0.11%	0.07%	0.03%
% physical and intellectual disabilities	0.22%	0.32%	0.22%	0.22%	0.24%	0.21%	0.11%
% behavioral problems	0.90%	1.23%	0.96%	0.83%	1.35%	0.57%	0.30%

Note: This table reports numbers and percentages of SEN and non-SEN students in (each school track) of secondary education. The means and SD's of the number and percentages of (non-) SEN students refer to the means and SD's over cohorts within schools and school tracks, using one observation per school track per cohort.

Table 3
Descriptive statistics for students with and without SEN in secondary education.

	All tracks		Pre-voc. I		Pre-voc. II		Pre-voc. III		Pre-voc. IV		Senior gen.		Pre-uni.	
	non-SEN	SEN	non-SEN	SEN	non-SEN	SEN	non-SEN	SEN	non-SEN	SEN	non-SEN	SEN	non-SEN	SEN
Standardized exam grade	0.00	0.32***	0.00	0.17***	0.00	0.31***	0.00	0.32***	0.00	0.40***	0.00	0.38***	0.00	0.23***
SD std. exam grade	1.00	1.09	1.00	1.07	1.00	1.10	1.00	0.96	1.00	1.10	1.00	1.11	1.00	0.98
Additional support	0.10	0.20***	0.58	0.63***	0.24	0.34***	0.06	0.10**	0.03	0.11***				
Boy	0.50	0.75***	0.57	0.75***	0.53	0.77***	0.48	0.74***	0.50	0.79***	0.48	0.73***	0.46	0.68***
Dutch	0.79	0.87***	0.68	0.83***	0.75	0.87***	0.85	0.88	0.78	0.87***	0.83	0.90***	0.84	0.90***
Surinamese	0.03	0.01***	0.04	0.01***	0.04	0.01***	0.02	0.01	0.03	0.01***	0.02	0.01***	0.02	0.01
Aruban	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00**	0.01	0.01
Turkish	0.03	0.01***	0.08	0.03***	0.05	0.02***	0.03	0.02	0.04	0.01***	0.02	0.01***	0.01	0.01
Moroccan	0.03	0.01***	0.07	0.03***	0.05	0.02***	0.02	0.01	0.03	0.01***	0.02	0.01***	0.01	0.00
Non-western	0.05	0.03***	0.06	0.02***	0.05	0.03***	0.03	0.02	0.05	0.03***	0.05	0.03***	0.05	0.02***
Western	0.06	0.05**	0.05	0.06	0.05	0.05	0.04	0.06	0.06	0.06	0.06	0.05	0.07	0.05**
Disadvantaged neighborhood	0.13	0.10***	0.22	0.11***	0.16	0.09***	0.09	0.08	0.13	0.11***	0.10	0.09	0.09	0.07
Missing neighborhood information	0.01	0.00*	0.00	0.00*	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Age	16.12	16.08***	15.61	15.71***	15.47	15.68***	15.32	15.53***	15.37	15.58***	16.58	16.86***	17.16	17.43***
Number of courses	10.17	9.43***	7.74	7.56***	8.09	8.06***	9.39	9.37	9.25	9.21*	10.56	10.55	13.40	13.12***
Cohort size	91.09	82.14***	66.61	62.85***	76.07	73.49**	42.38	41.40	83.14	74.79***	120.21	116.94**	90.69	89.09

Note: The stars refer to the p-values of a two-group mean comparison *t*-test comparing SEN and non-SEN students. ***p< 0.01 **p< 0.05 *p< 0.10.

we are interested in the effect of the percentage of SEN students on regular students, SEN students are dropped from the sample.

4. Empirical strategy

4.1. Empirical strategy 1: student fixed effects

In this study, three strategies are used to identify the effect of the presence of SEN students on regular education students. The first strategy is for secondary education only, and is based on the fact that secondary school students follow a personal selection of courses. Using student fixed effects, I exploit within-student-between-course variation in the percentage of SEN students. Basically, this strategy compares student achievement in courses with varying percentages of SEN students:

$$y_{icst} = \delta_1 SEN_{cst} + W'_{cst}\gamma_1 + \zeta_{1,i} + \kappa_{1,c} + \varepsilon_{1,icst} \quad (1)$$

Here, y_{icst} indicates the standardized exam grade of student i in course c in school s in year t. SEN_{cst} indicates the percentage of students with special educational needs in course c in school s in year t, which makes δ_1 the parameter of interest. W'_{cst} is a vector of peer characteristics in course c in school s in year t, such as the percentage of boys in the course. $\zeta_{1,i}$ is an individual fixed effect, picking up student constant characteristics. $\kappa_{1,c}$ is a course fixed effect, which picks up general differences between courses. $\varepsilon_{1,icst}$ is an individual and course specific error term, which is assumed to be exogenous apart from the individual and course fixed effects. To account for the possibility that course characteristics change between years, Eq. 2 is estimated. In this equation, the course fixed effect $\kappa_{1,c}$ is replaced for a course*year fixed effect $\lambda_{2,ct}$.[11]

$$y_{icst} = \delta_2 SEN_{cst} + W'_{cst}\gamma_2 + \zeta_{2,i} + \lambda_{2,ct} + \varepsilon_{2,icst} \quad (2)$$

Since the course content is different for each school track, secondary school tracks are analyzed separately. By using this student fixed effects strategy, a number of potential selection problems are solved. The student fixed effects capture all student constant characteristics, including the student's background and ability, the characteristics of the school and the average cohort quality.

What is left is variation in exam grades within students between different courses: students generally have varying talents and different grades for different courses. The question is whether these differences are systematically related to the percentage of SEN students in a course. Nevertheless, there might also be differences in course characteristics: some courses may be more difficult than others or some courses may be more interesting for certain groups of students. Therefore, it is important to control for course and course*year fixed effects. In Fig. 1, it can be seen that there is indeed variation in the average number of SEN students between courses. This figure is for the lowest school track

[11] The results are virtually identical when letting course*year fixed effects vary by gender as in Lavy, Silva and Weinhardt (2012a).

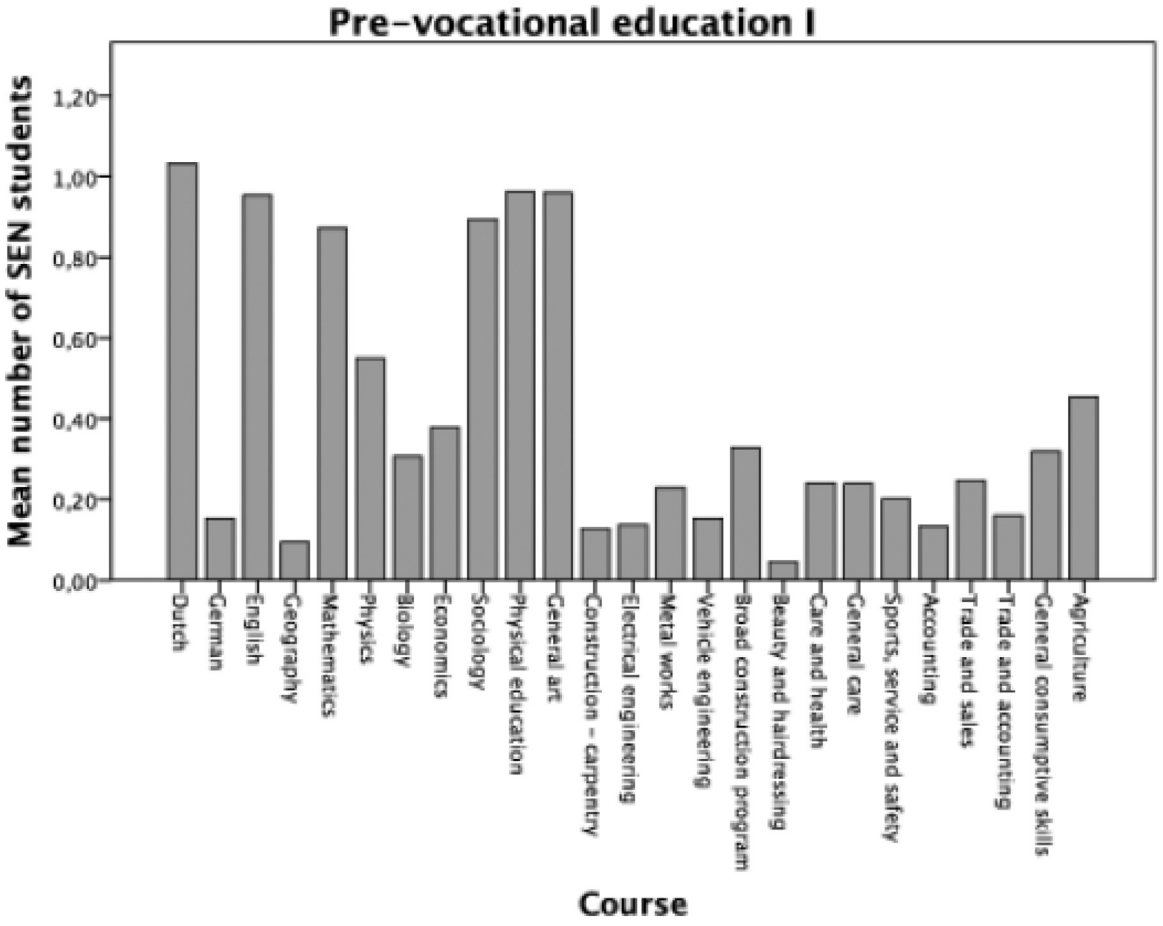

Fig. 1. Variation in the number of SEN students per course.
Note: Only courses that are taken by more than 1000 students are displayed in the figure.

(pre-vocational I) only, the figures for the other school tracks are similar and reported in Fig. A.1 of the Appendix.

An important assumption in this estimation strategy is that the presence of SEN students in a course is random within individuals: students should not select into courses because of (avoiding) certain peers. Given the importance of course choice for future education and employment possibilities, this is very likely. Even if some regular students are avoiding SEN students because they are more affected by negative externalities, this will bias the results in a predictable manner. Since the student fixed effect strategy exploits within student variation in exam grades, all students are exposed to SEN students in their obliged courses. This negatively affects the achievement in these courses for regular students avoiding SEN students. Their achievement in non-obliged courses will not be harmed, creating a larger difference in exam grades between courses with more or less SEN students. This would bias the results towards finding negative effects.[12]

Because some courses are obliged while others are not, and some courses are in general more popular than others, the number of students in a course varies within school cohorts. For the larger courses, cohorts are split into several classes. Therefore, not all regular students will actually be exposed to SEN students when they are present in a certain course. Since the probability of being educated with the SEN student(s) is larger when a course is smaller, course size is included as a cohort control. Robustness checks restricting the sample to courses with 30 or fewer students[13] and using the number of students instead of the percentage of SEN students yield similar results.

4.2. Empirical strategy 2: school fixed effects

The student fixed effects strategy can only be used for secondary education, since primary education students are educated in stable classes. Therefore, I also take a more conventional approach using school fixed effects. This strategy utilizes within school cohort-to-cohort variation in the percentage of SEN students using the following specification:

$$y_{ist} = X'_{ist}\beta_3 + P'_{st}\gamma_3 + \delta_3 SEN_{st} + \mu_{3,s} + \nu_{3,t} + \varepsilon_{3,ist} \quad (3)$$

Here, y_{ist} indicates the standardized citoscore or exam grade of student i in school s in year t. X'_{ist} is a vector of student covariates, such as gender and ethnicity. P'_{st} is a vector of peer characteristics in school s in year t, such as the percentage of students from a disadvantaged neighborhood. SEN_{st} indicates the percentage of students with Special Educational Needs in school s in year t, which makes δ_3 the parameter of interest. $\mu_{3,s}$ is the school fixed effect, which will pick up time invariant differences between schools. $\nu_{3,t}$ is a year fixed effect and $\varepsilon_{3,ist}$ is an individual specific

[12] An alternative approach is to restrict the analyses to obliged courses following Lavy et al. (2012a). Whereas both studies use peer presence measures at the grade level, this strategy is not feasible in this context. The reason is that SEN status is a student constant characteristic: there is no within-student variation in the percentage of SEN students in the obliged courses. Lavy et al. (2012a), on the other hand, investigate course-specific ability, which also varies within students.

[13] In practice, 30 students is often considered the maximum class size in secondary education.

Table 4
Balancing tests for the percentage of SEN students in the cohort.

	Primary education					
	All primary education students			Students with citoscore		
Boy	−0.015	0.000	0.002	−0.014	0.002	0.003
	(0.009)	(0.007)	(0.005)	(0.010)	(0.007)	(0.006)
Age	−0.010	−0.016**	−0.001	−0.013	−0.014*	−0.005
	(0.013)	(0.008)	(0.008)	(0.013)	(0.008)	(0.006)
Western non-Dutch	−0.091***	−0.014	−0.015	−0.099***	−0.015	−0.014
	(0.025)	(0.013)	(0.011)	(0.027)	(0.014)	(0.011)
Non-western non-Dutch	−0.409***	−0.005	−0.007	−0.416***	−0.000	−0.002
	(0.034)	(0.011)	(0.008)	(0.037)	(0.012)	(0.009)
Unknown ethnicity	−0.205**	−0.036	−0.009	−0.084	−0.058	−0.008
	(0.104)	(0.057)	(0.040)	(0.147)	(0.080)	(0.057)
0.30 funding weight	−0.121***	−0.001	−0.009	−0.089***	0.005	−0.002
	(0.028)	(0.013)	(0.011)	(0.031)	(0.014)	(0.011)
1.20 funding weight	−0.225***	0.014	0.006	−0.211***	0.007	−0.009
	(0.035)	(0.017)	(0.014)	(0.037)	(0.018)	(0.014)
Year fixed effects	√	√	√	√	√	√
School fixed effects		√	√		√	√
School specific time trend			√			√
Number of students	462,227	462,227	462,227	377,135	377,135	377,135
Number of schools	5958	5958	5958	5861	5861	5861
F-statistic	28.732	0.869	0.501	23.743	0.683	0.427
p-value	0.000	0.530	0.835	0.000	0.686	0.886
Df	(7,5957)	(7,5957)	(7,5957)	(7,5860)	(7,5860)	(7,5860)

Note: Each column represents a regression of the percentage of SEN students in the cohort on student background characteristics. The school specific time trend refers to a linear trend with the predicted values of the percentage of SEN students in a certain year. F-statistics, p-values and degrees of freedom at the bottom of the table refer to F-tests on the joint significance of gender, age, ethnicity and weighted student funding. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***p< 0.01 **p< 0.05 *p< 0.10.

error term, which is assumed to be exogenous apart from the school and year fixed effects.

The school fixed effects only pick up time invariant differences between schools. Some schools may have increasing or decreasing percentages of SEN students over time. It may be that there are unobserved factors that are also related to changes in the percentage of SEN students. Therefore, Eq. 4 includes a school specific linear time trend, including the predicted values of the percentage of SEN students in a school(track) in a certain year, estimated using a linear trend through the actual percentage of SEN students in the different years.

$$y_{ist} = X_{ist}^{'}\beta_4 + P_{st}^{'}\gamma_4 + \delta_4 SEN_{st} + \theta_4 PREDSEN_{st} + \mu_{4,s} + \nu_{4,t} + \varepsilon_{4,ist} \quad (4)$$

This strategy solves a number of potential selection problems. As described earlier, Dutch schools can decide to reject a student with SEN. If weaker schools are more likely to reject, stronger schools and stronger classes have a higher percentage of SEN students. By using the school fixed effects, I account for this type of systematic and time invariant differences between schools.

Second, within schools, the assignment of SEN students to classes may be nonrandom: teachers and principals may take the current class composition or teacher characteristics into account. For example, when one class is more easily distracted than another class within a grade, it can be attractive to place a SEN student with behavioral problems in the latter class. The school fixed effect strategy solves this by looking at the effect of inclusive education at the grade level instead of at the class level.

With respect to the overall cohort quality, it is assumed that the general cohort quality in a school is independent of the presence of SEN students. Teachers and principals should not take characteristics of the whole cohort into account in their placement decision. Tables 4 and 5 and Appendix Table A.3 show balancing tests for primary and secondary education. The tables show that within schools, cohort-to-cohort variation in the percentage of SEN students is not strongly associated to observable characteristics of the non-SEN students. The background characteristics are unrelated to the percentage of SEN students once controlling for school fixed effects and a school time trend. While some coefficients are statistically significant, their practical importance is small. For example, when looking at all school levels for secondary education, Turkish students have, compared to Dutch students, on average 0.012% fewer SEN students in their cohort.

Since the school fixed effects strategy exploits year to year variation in the percentage of SEN students, it is important that the number of SEN students differs between cohorts in the same school. Table 6 shows that the number of SEN students in 2009 and 2010 indeed varies within schools and school tracks. There are few SEN students in each cohort, in most cases, the variation comes from going from 0 to 1 SEN student. Table A.2 shows similar variation for the four different types of SEN.

In bigger schools, students are potentially not exposed to the SEN student when the SEN student is in another class. Robustness checks restricting the sample to include only small schools and using the number instead of the percentage of SEN students yield similar results.[14]

Next to the school fixed effects using student level data, the data is aggregated to the cohort level to investigate heterogeneous effects of the presence of SEN students on the achievement of high and low achieving regular students:

$$y_{st} = P_{st}^{'}\gamma_5 + \delta_5 SEN_{st} + \theta_5 PREDSEN_{st} + \mu_{5,s} + \nu_{5,t} + \varepsilon_{5,st} \quad (5)$$

[14] Further, it is assumed that without backpack funding, students with SEN are placed in special education. When SEN students would otherwise be present as 'problematic' students in regular schools, the quality of inclusive cohorts would be overestimated by leaving out such 'problematic' students. Table A1 shows that the number of SEN students is indeed positively related to cohort size. The fact that all coefficients are positive and close to 1 indicates that SEN students are additional to the regular cohort, instead of relabeling a 'problematic' student.

Table 5
Balancing tests for the percentage of SEN students in the cohort.

Secondary education (all school tracks)			
Boy	0.068***	−0.000	−0.000
	(0.012)	(0.004)	(0.003)
Age	−0.097***	0.002	0.004**
	(0.015)	(0.003)	(0.002)
Surinamese	−0.292***	0.005	0.003
	(0.048)	(0.011)	(0.008)
Arubean	−0.192***	−0.009	−0.000
	(0.040)	(0.016)	(0.012)
Turkish	−0.207***	−0.013	−0.012*
	(0.040)	(0.010)	(0.007)
Moroccan	−0.322***	−0.017*	−0.005
	(0.045)	(0.010)	(0.007)
Non-western	−0.120***	−0.014**	−0.010**
	(0.023)	(0.006)	(0.004)
Western	−0.032**	−0.009	−0.001
	(0.016)	(0.007)	(0.005)
Disadvantaged neighborhood	−0.106**	−0.021***	−0.009**
	(0.042)	(0.007)	(0.004)
Missing neighborhood information	0.087	0.013	0.018
	(0.054)	(0.022)	(0.016)
Number of courses	−0.090***	0.036***	−0.010*
	(0.008)	(0.010)	(0.006)
Additional support	0.572***	0.015	0.007
	(0.092)	(0.017)	(0.008)
Year fixed effects	√	√	√
School fixed effects		√	√
School specific time trend			√
Number of students	518,985	518,985	518,985
Number of schools	1036	1036	1036
F-statistic	28.047	2.515	1.755
p-value	0.000	0.003	0.051
Df	(12,1035)	(12,1035)	(12,1035)

Note: Each column represents a regression of the percentage of SEN students in the cohort on student background characteristics. The school specific time trend refers to a linear trend with the predicted values of the percentage of SEN students in a certain year. F-statistics, p-values and degrees of freedom at the bottom of the table refer to F-tests on the joint significance of gender, age, ethnicity, disadvantaged neighborhood, number of courses and additional support in pre-vocational education. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***p < 0.01 **p < 0.05 *p < 0.10.

Examples of the outcome variables in these regressions are the lowest and highest standardized mean exam grade and the standard deviation of the standardized exam grades in the cohort. To account for differences in school size, the regressions are weighted by the number of observations per school.

4.3. Empirical strategy 3: exploiting neighborhood variation

As described in the previous subsection, the school fixed effects strategy hinges on the assumption that the quality of cohorts within schools is independent of the presence of SEN students. While the balancing tests generally indicate that the observed background characteristics are unrelated to the percentage of SEN students once controlling for school fixed effects, the possibility that the presence of SEN students is related to unobserved aspects of within-school cohort quality cannot be excluded. More specific, it might be that SEN students are more easily referred to special education when the general quality of the school cohort is lower. In that case, we might find no effects of the presence of SEN students in the school fixed effects strategy, while the achievement of inclusive cohorts might have been better without the SEN students present.

The student fixed effect strategy yields credible estimates that do not depend on this assumption for secondary education. Given the educational context, this strategy is not feasible for primary education.[15] Instead, I utilize neighborhood variation in the percentage of SEN students in two ways: using an IV strategy and using neighborhood fixed effects. The idea behind using neighborhood information is that within neighborhoods, the presence of an additional SEN student is likely to be exogenous. It is unlikely that parents will move because of the presence of an additional SEN student in the neighborhood cohort. Also, schools cannot influence the percentage of SEN students in their neighborhood, while they could potentially influence the presence of SEN students in a school cohort. On the other hand, even though there is free school choice, most primary school students go to school in their own neighborhood. To be exact, 71% of the students go to a school in their own 4-digit post code area. As can be seen in Table 1, the average neighborhood cohort size is 50.1, while the average school cohort size is 26.8.

Neighborhood IV. In the instrumental variable strategy, the percentage of SEN students in a neighborhood cohort is used as an instrument for the percentage of SEN students in a school cohort. The idea is that schools cannot influence the presence of SEN students in neighborhoods, while it is a good predictor of the percentage of SEN students in school cohorts. In this strategy, we need to assume that the potential effects of the SEN students in the neighborhood operate via the schools. Again, we are interested in the effect of the percentage of SEN students on student achievement:

$$y_{ist} = X'_{ist}\beta_6 + P'_{st}\gamma_6 + \delta_6\widehat{SEN}_{st} + \mu_{6,s} + \nu_{6,t} + \varepsilon_{6,ist} \quad (6)$$

As before, y_{ist} indicates citoscore or cito participation of student i in school s in year t. X'_{ist}, P'_{st}, $\mu_{6,s}$, $\nu_{6,t}$ and $\varepsilon_{6,ist}$ indicate student covariates, peer characteristics, school fixed effects, year fixed effects and an individual specific error term. $\widehat{SEN}_{st}$ indicates the predicted values for the percentage of students with Special Educational Needs in school s in year t. The first stage predicted values are defined as:

$$\widehat{SEN}_{st} = X'_{ist}\beta_7 + P'_{st}\gamma_7 + \pi_7 SEN_{na} + \mu_{7,s} + \nu_{7,t} \quad (7)$$

Where SEN_{na} indicates the percentage of SEN students in neighborhood n in neighborhood cohort a. Cohort a is defined as all 11 year old students at October 1st of year t.

Neighborhood fixed effects. The neighborhood fixed effects strategy exploits neighborhood variation in a different way:

$$y_{ina} = X'_{ina}\beta_8 + P'_{na}\gamma_8 + \delta_8 SEN_{na} + \eta_{8,n} + \upsilon_{8,a} + \varepsilon_{8,ina} \quad (8)$$

Here, y_{ina} indicates citoscore or cito participation for student i in neighborhood n in neighborhood cohort a. X'_{ina} is a vector of student covariates, P'_{na} is a vector of peer characteristics. SEN_{na} indicates the percentage of students with Special Educational Needs in neighborhood n in cohort a, which makes δ_8 the parameter of interest. $\eta_{8,n}$ and $\upsilon_{8,a}$ are neighborhood and cohort fixed effects.

While this strategy is less direct than the IV strategy, it does not assume that there is no direct effect of SEN students in the neighborhood on student achievement. It investigates whether variation in the percentage of SEN students in a neighborhood affects the achievement of students in that neighborhood. If schools are more inclined to refer SEN students to special education in difficult or low quality cohorts, the percentage of SEN students in the school will be lower in such cohorts. This would bias the results. At the neighborhood level, however, the percentage of SEN students in a cohort is fixed. When results at the neighborhood level (including both backpack and special education students) are similar to the school fixed effects results, this provides additional evidence that schools are not selectively referring to special education.

[15] Reversely, the neighborhood strategies are not feasible for secondary education, since secondary school students are more mobile.

Table 6
Variation in the number of SEN students over time.

Number of SEN students 2010

Number of SEN students 2009

Primary education

	0	1	2	3	4	≥ 5
0	2782	896	210	59	13	5
1	763	392	124	52	9	5
2	179	108	62	19	6	2
3	38	25	18	6	2	2
4	8	12	5	3	1	2
≥ 5	2	5	4	3	0	2

Secondary education (all school tracks)

	0	1	2	3	4	≥ 5
0	1188	412	115	41	9	6
1	278	176	74	34	9	8
2	57	63	26	21	16	7
3	19	23	7	12	3	6
4	3	3	3	2	3	4
≥ 5	2	0	5	2	4	4

Secondary education (per school track)

Pre-voc. I

	0	1	2	3	4	≥ 5
0	158	55	25	8	3	0
1	35	27	16	5	3	3
2	9	6	5	5	1	3
3	3	6	1	4	0	2
4	1	0	0	1	3	0
≥ 5	1	0	0	1	2	0

Pre-voc. II

	0	1	2	3	4	≥ 5
0	173	56	13	5	2	0
1	41	36	12	8	0	0
2	8	17	6	5	2	2
3	4	0	1	1	0	1
4	1	1	1	0	0	0
≥ 5	1	0	2	0	0	0

Pre-voc. III

	0	1	2	3	4	≥ 5
0	167	25	5	1	0	0
1	22	6	2	0	0	0
2	1	2	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
≥ 5	0	0	1	0	0	0

Pre-voc. IV

	0	1	2	3	4	≥ 5
0	252	109	29	11	3	2
1	75	47	22	11	3	3
2	22	16	7	6	6	2
3	7	6	3	3	2	2
4	1	2	2	1	0	4
≥ 5	0	0	1	1	1	2

Senior gen.

	0	1	2	3	4	≥ 5
0	158	76	29	12	1	3
1	56	42	19	6	3	1
2	9	15	7	3	6	0
3	5	7	2	4	0	1
4	0	0	0	0	0	0
≥ 5	0	0	1	0	1	2

Pre-uni

	0	1	2	3	4	≥ 5
0	280	91	14	4	0	1
1	49	18	3	4	0	1
2	8	7	1	2	1	0
3	0	4	0	0	1	0
4	0	0	0	0	0	0
≥ 5	0	0	0	0	0	0

Note: This table shows variation in the number of SEN students over time by reporting counts of school(tracks) by the number of SEN students in 2009 and 2010. For secondary education, the table reports counts for each school track separately and the same numbers summed over all school tracks.

5. Results

5.1. Results for empirical strategy 1: student fixed effects

Results for the student fixed effect strategy are reported in Table 7. Each cell in Table 7 represents a separate regression of the standardized exam grades on the percentage of SEN students in the course. The columns represent 5 different specifications for each school track: column 1 are OLS estimates including year fixed effects, columns 2 and 3 add student and course fixed effects. In column 4, course fixed effects are replaced by course*year fixed effects. Column 5 adds cohort level controls.

In general, the coefficients are small and inconsistent in sign. The significant coefficients in column 2 contrast to considerably smaller and mainly insignificant coefficients in column 3. This difference indicates that course characteristics drive the association between the percentage of SEN students and exam grades in column 2. For pre-vocational I and IV, more SEN students are present in courses with higher mean exam grades, while for pre-vocational II, senior general secondary and pre-university education, more SEN students are present in courses with lower exam grades. When adding course*year fixed effects and cohort level controls, the coefficients remain similar to the coefficients in column 3.

The results in the last three columns of Table 7 generally indicate that the percentage of SEN students in the course is unrelated to a students' standardized exam grade. Although the point estimates are precise (the standard errors are small), the coefficients are generally insignificant and inconsistent in sign. When interpreting the coefficients, the practical relevance is low as well. For instance, for pre-vocational III, increasing the percentage of SEN students in the course with 1% is related to a 0.5% of a standard deviation increase in the exam grade for that course.[16,17] The lower bounds of the 95% confidence intervals for the estimates in column 5 range from −0.0043 to −0.0001. In terms of a 1 SD increase in the percentage of SEN students, the lower bound of these confidence intervals range from −0.0088 to −0.0005, which makes the lower bound similar in size to the point estimates found in Lavy et al. (2012b).

Table 8 makes a distinction between the inclusion of students with different types of special educational needs. The table only shows the results of the full models including student fixed effects,

[16] Remember that the average percentage of SEN students in the cohort ranges from 0.50% to 1.84%

[17] Investigating nonlinearities using dummy indicators on one, two and three or more SEN students, the results show a negative and significant coefficient for the two lowest pre-vocational tracks when having three or more SEN students in the course. Testing the joint significance of the indicators for one, two and three or more SEN students in the course, the null hypotheses that the coefficients are equal to zero cannot be rejected. For the other school tracks, the results on the dummy indicators are insignificant. Nonlinearities were further investigated by adding the square of the number of SEN students to student fixed effects regressions with the number of SEN students. Only for senior general secondary education, there was a (positive) significant coefficient on the square of the number of SEN students. For school fixed effects, non-linearities were also investigating using dummy indicators for one, two and three or more SEN students and using a squared term. The results for the school fixed effects analyses yield no evidence for non-linearities, for both primary and secondary education.

Table 7
Estimates of the effect of the percentage of SEN students on standardized central exam grades (student fixed effects).

	(1)	(2)	(3)	(4)	(5)	N observations	N students
All school tracks	0.002**	−0.002**	0.000	0.000	−0.000	3293,801	518,885
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		
Pre-voc. I	0.001	0.003**	0.002*	0.002*	0.002	271,376	55,957
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)		
Pre-voc. II	0.003	−0.005***	0.000	0.000	0.000	355,213	70,277
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)		
Pre-voc. III	0.009***	0.003	0.005**	0.005**	0.005*	93,314	14,960
	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)		
Pre-voc. IV	0.002	−0.002	0.002	0.001	0.002	780,815	125,018
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)		
Senior gen.	−0.001	−0.004	0.001	0.001	0.001	972,532	143,844
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)		
Pre-uni.	0.004	−0.005**	−0.001	−0.001	−0.001	820,551	108,829
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)		
Student fixed effects		√	√	√	√		
Course fixed effects			√				
Course*year fixed effects				√	√		
Cohort-level controls					√		

Note: Each coefficient represents a separate regression with the percentage of SEN students as independent variable. Cohort controls include (course) cohort size, percentage of students with additional support in pre-vocational education, percentage of boys, percentage of students from different ethnicities, percentage of students from disadvantaged neighborhoods, mean age and mean number of courses. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***p< 0.01 **p< 0.05 *p< 0.10.

Table 8
Estimates of the effect of the percentage of specific types of SEN students on standardized central exam grades (student fixed effects).

	All tracks	Pre-voc. I	Pre-voc. II	Pre-voc. III	Pre-voc. IV	Senior gen.	Pre-uni.
Visual problems	−0.006*	−0.003	0.007	0.042***	0.005	−0.010	−0.006
	(0.003)	(0.006)	(0.011)	(0.006)	(0.008)	(0.007)	(0.006)
Hearing problems	−0.002	0.005	−0.002	−0.005	−0.001	−0.007	−0.008
	(0.002)	(0.003)	(0.004)	(0.005)	(0.004)	(0.007)	(0.005)
Physical and intellectual disabilities	0.002	0.003	−0.002	0.010	0.003	0.003	0.004
	(0.002)	(0.003)	(0.004)	(0.007)	(0.003)	(0.003)	(0.004)
Behavioral problems	−0.000	0.001	0.001	0.004	0.001	0.001	−0.001
	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.003)
N observations	3293,801	271,376	355,213	93,314	780,815	972,532	820,551
N students	518,885	55,957	70,277	14,960	125,018	143,844	108,829

Note: Each column represents a separate regression with the percentage of specific SEN students as independent variables. All regressions include student fixed effects, course*year fixed effects and cohort controls. Cohort controls include (course) cohort size, percentage of students with additional support in pre-vocational education, percentage of boys, percentage of students from different ethnicities, percentage of students from disadvantaged neighborhoods, mean age and mean number of courses. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***p< 0.01 **p< 0.05 *p< 0.10.

course*year fixed effects and cohort-level controls. It turns out that there is no differential effect for the inclusion of students with different types of SEN: the coefficients are close to zero, precise and insignificant.[18]

Overall, the results of the student fixed effect strategy indicate that the presence of SEN students does not help or harm the achievement of regular students. When accounting for general differences between courses, the exam grades of regular students do not differ between courses with more or less SEN students.

5.2. Results for empirical strategy 2: school fixed effects

Table 9 shows the results for the school fixed effects strategy. Each cell in the table represents a separate regression of cito participation, citoscore or standardized mean exam grades on the percentage of SEN students in the school cohort. Column 1 shows OLS estimates with year fixed effects, column 2 includes school fixed effects. In columns 3 and 4, individual and cohort level controls are added. Column 5 includes a school specific time trend in the percentage of SEN students in the cohort.

Adding the school fixed effects reduces the magnitude of the coefficients, indicating that selection plays a significant role in the coefficients in column 1. In column 2 to column 5, the coefficients are small, precise and generally insignificant. The coefficients indicate that the presence of SEN students in the cohort does not affect the exam grades of regular students. For example, when the percentage of SEN students in the cohort increases with 1%% the mean exam grade for pre-university education students decreases by 0.6% of a standard deviation.

Table 10 shows that there are no differential effects in the inclusion of students with different types of special educational needs. The table only shows results for models with year fixed effects, school fixed effects, individual and cohort controls, and a school specific time trend in the percentage of SEN students. Again, the coefficients are close to zero, precise and insignificant.[19]

[18] Moreover, there might be differences in the effects of including male or female SEN students, as boys are more likely to exhibit externalizing behavior. Distinguishing between male and female SEN students does not change the results.

[19] Again, there might also be differences in the effects of including male or female SEN students, as boys are more likely to exhibit externalizing behavior. Distinguishing between male and female SEN students does not change the results.

Table 9
Estimates of the effect of the percentage of SEN students on student achievement (school fixed effects).

	(1)	(2)	(3)	(4)	(5)	N	Clusters
Cito participation	−0.001	−0.001	−0.001	−0.001	0.000	462,227	5958
(Primary education)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		
Standardized citoscore	0.006***	0.000	−0.000	−0.000	−0.000	377,135	5861
(Primary education)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		
All school tracks	0.005**	−0.003*	−0.005**	−0.004*	−0.001	518,985	1036
(Secondary education)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)		
Pre-voc. I	0.000	−0.001	−0.002	−0.001	−0.001	56,048	441
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)		
Pre-voc. II	0.006	−0.001	−0.001	−0.000	0.004	70,283	451
	(0.006)	(0.005)	(0.005)	(0.005)	(0.007)		
Pre-voc. III	0.020***	0.005	0.002	0.003	0.010	14,955	299
	(0.007)	(0.005)	(0.005)	(0.005)	(0.008)		
Pre-voc. IV	0.007**	−0.001	−0.002	−0.001	−0.000	125,023	741
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)		
Senior gen.	−0.003	−0.010*	−0.011**	−0.011**	−0.006	143,847	500
	(0.007)	(0.005)	(0.005)	(0.005)	(0.006)		
Pre-uni.	0.013	−0.003	−0.003	−0.003	−0.006	108,829	516
	(0.009)	(0.007)	(0.007)	(0.006)	(0.008)		
Year fixed effects	√	√	√	√	√		
School fixed effects		√	√	√	√		
Individual controls			√	√	√		
Cohort level controls				√	√		
School specific time trend					√		

Note: Each coefficient represents a separate regression with the percentage of SEN students as independent variable. Individual controls include gender, age, ethnicity and student weight for primary education, and additional support in pre-vocational education, gender, age, ethnicity, disadvantaged neighborhood and number of courses for secondary education. Cohort mean controls include cohort size and student individual controls averaged by students' school, track and year. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***p < 0.01 **p < 0.05 *p < 0.10.

Table 10
Estimates of the effect of the percentage of specific SEN students on student achievement (school fixed effects models).

	Primary education		Secondary education						
	Cito participation	Citoscore	All tracks	Pre-voc. I	Pre-voc. II	Pre-voc. III	Pre-voc. IV	Senior gen.	Pre-uni.
Visual problems	0.003	0.006	−0.000	0.019	−0.001	−0.092	−0.025	0.028	−0.010
	(0.006)	(0.008)	(0.016)	(0.041)	(0.077)	(0.107)	(0.023)	(0.031)	(0.024)
Hearing problems	−0.002	−0.002	−0.007	−0.011	−0.004	0.013	−0.001	−0.032	0.012
	(0.003)	(0.003)	(0.008)	(0.011)	(0.020)	(0.026)	(0.016)	(0.024)	(0.042)
Physical and intellectual disabilities	−0.002	−0.003	0.009	0.012	−0.011	0.026*	0.019*	−0.005	0.001
	(0.002)	(0.003)	(0.006)	(0.013)	(0.019)	(0.016)	(0.011)	(0.015)	(0.012)
Behavioral problems	0.001	0.000	−0.002	−0.003	0.008	0.004	−0.004	−0.005	−0.008
	(0.001)	(0.001)	(0.003)	(0.006)	(0.007)	(0.009)	(0.004)	(0.008)	(0.010)
N students	462,227	377,135	518,985	56,048	70,283	14,955	125,023	143,847	108,829
N schools	5958	5861	1036	441	451	299	741	500	516

Note: Each column represents a separate regression with the percentage of specific SEN students as independent variables. All regressions include year fixed effects, school fixed effects, individual and cohort controls and a school specific time trend in the percentage of SEN students. Individual controls include gender, age, ethnicity and student weight for primary education, and additional support in pre-vocational education, gender, age, ethnicity, disadvantaged neighborhood and number of courses for secondary education. Cohort mean controls include cohort size and student individual controls averaged by students' school, track and year. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***p < 0.01 **p < 0.05 *p < 0.10.

There might be differential effects of the inclusion of students with SEN on regular education students with different abilities. For example, since SEN students are likely to need more attention, teachers might expect more independency from the non-SEN students. This might harm the achievement of low-achieving students, while high-achieving students potentially benefit, driving the average effects to zero. To check for this type of differential effects, I aggregated the data to cohorts within schools and computed summary measures of the standardized exam grades.

The results in Table 11 show results for different summary measures, such as the mean, standard deviation and the 10th and 90th percentile of the standardized exam grades in cohorts within schools. Again, the coefficients are small and insignificant. From this table, there is no evidence for differential effects of inclusive education for high and low achieving regular students. Considering that the effects of inclusive education do not differ for the different school tracks either, it seems that the effects of inclusive education do not differ for high and low achieving students.

Overall, the results of the school fixed effect strategy are very similar to the results from the student fixed effect strategy. There is no evidence that the presence of SEN students helps or harms the achievement of the regular students in their cohort.

5.3. Results for empirical strategy 3: exploiting neighborhood variation

Neighborhood IV. Table 12 shows the results for the IV strategy. The percentage of SEN students in the neighborhood cohort turns out to be a good predictor of the percentage of SEN students in school cohorts. The first stage is always significant and the partial F-statistic is well above the rule of thumb of a minimum of 10. Consistent to the earlier results, the coefficients for the effect

Table 11
Estimates of the effect of the percentage of SEN students on student achievement at the cohort level.

	Primary education		Secondary education						
	Cito participation	Citoscore	All tracks	Pre-voc. I	Pre-voc. II	Pre-voc. III	Pre-voc.IV	Senior gen.	Pre-uni.
Mean	0.001	0.001	−0.001	−0.001	0.003	0.012	−0.002	−0.007	−0.006
	(0.001)	(0.001)	(0.002)	(0.005)	(0.007)	(0.008)	(0.003)	(0.006)	(0.007)
SD		−0.001	0.001	−0.004	−0.001	0.007	0.003	−0.002	−0.004
		(0.001)	(0.001)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
10th percentile		0.002	−0.002	0.000	0.004	0.008	−0.006	−0.002	−0.002
		(0.002)	(0.003)	(0.007)	(0.008)	(0.015)	(0.005)	(0.010)	(0.009)
25th percentile		0.001	−0.001	0.007	0.003	0.006	−0.003	−0.008	−0.004
		(0.002)	(0.003)	(0.006)	(0.008)	(0.011)	(0.004)	(0.007)	(0.007)
50th percentile		0.000	−0.000	−0.001	0.001	0.015*	0.001	−0.009	0.000
		(0.001)	(0.003)	(0.006)	(0.007)	(0.009)	(0.004)	(0.006)	(0.008)
75th percentile		0.000	−0.000	−0.005	0.001	0.022***	−0.000	−0.007	−0.005
		(0.001)	(0.003)	(0.006)	(0.008)	(0.009)	(0.004)	(0.007)	(0.010)
90th percentile		0.001	−0.001	−0.006	0.003	0.016*	−0.001	−0.009	−0.010
		(0.001)	(0.003)	(0.006)	(0.008)	(0.009)	(0.006)	(0.009)	(0.015)
N students	462,227	377,135	518,985	56,048	70,283	14,955	125,023	143,847	108,829
N schools	5958	5861	1036	441	451	299	741	500	516

Note: Each coefficient represents a separate regression with the percentage of SEN students as independent variable. All regressions include year fixed effects, school fixed effects, cohort controls and a school specific time trend in the percentage of SEN students. Cohort controls include cohort size, percentage of boys, mean age, percentage of students from different ethnicities and percentage of students with weighted student funding for primary education, and cohort size, percentage of students with additional support in pre-vocational education, percentage of boys, percentage of students from different ethnicities, percentage of students from disadvantaged neighborhoods, mean age and mean number of courses for secondary education. Regressions are weighted by the mean cohort size within schools. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***p< 0.01 **p< 0.05 * p< 0.10.

Table 12
IV estimates of the effect of the percentage of SEN students in primary education.

	(1)	(2)	(3)	(4)
Cito participation	0.003	0.005	0.005	0.004
	(0.004)	(0.007)	(0.007)	(0.007)
First stage coefficient	0.185***	0.132***	0.132***	0.133***
	(0.009)	(0.010)	(0.010)	(0.010)
Partial F statistic first stage	450.14	186.12	186.15	189.68
Standardized citoscore	−0.040***	−0.001	0.003	0.001
	(0.007)	(0.007)	(0.007)	(0.007)
First stage coefficient	0.184***	0.130***	0.130***	0.130***
	(0.009)	(0.011)	(0.011)	(0.011)
Partial F statistic first stage	388.88	144.63	144.65	144.71
Year fixed effects	√	√	√	√
School fixed effects		√	√	√
Individual controls			√	√
Cohort level controls				√
Cito participation		Standardized citoscore		
Number of students	460,823	Number of students		376,154
Number of schools	5957	Number of schools		5859

Note: Instrument: percentage of SEN students in the neighborhood. Each column represents two separate IV regressions, one for standardized citoscore, one for cito participation. Individual controls include gender, age, ethnicity and student weight. Cohort mean controls include cohort size and student individual controls averaged by students' school and year. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***p< 0.01 **p< 0.05 *p< 0.10.

Table 13
Effect of the percentage of SEN students in the post code area for primary education students.

	(1)	(2)	(3)	(4)	(5)
Cito participation	−0.001	0.000	0.000	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Standardized citoscore	−0.006***	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Year fixed effects	√	√	√	√	√
Post code area fixed effects		√	√	√	√
Individual controls			√	√	√
Cohort level controls				√	√
Post code area time trend					√
Cito participation		Standardized citoscore			
Number of students	522,095	Number of students			295,249
Number of post code areas	3917	Number of post code areas			3668

Note: Each coefficient represents a separate regression with the percentage of SEN students as independent variable. Individual controls include gender, age, ethnicity and student weight. Cohort level controls includes (post code area) cohort size and student individual controls averaged by students' post code area and year. Standard errors are reported in parentheses. Standard errors are robust and clustered at the level of the post code area. ***p< 0.01 **p< 0.05 * p< 0.10.

of SEN students on cito participation and citoscore are small and insignificant. At the 1% level, there is one significant coefficient for citoscore, when only taking into account year fixed effects. When exploiting within school variation using school fixed effects, this difference vanishes.

Neighborhood fixed effects. Table 13 shows results for the neighborhood fixed effect strategy. The coefficients are small, precise and insignificant, indicating that the percentage of SEN students in the neighborhood cohort does not affect student achievement. These results are similar to the results for the school fixed effects models, providing additional evidence that the zero results cannot be explained by more referral to special education in weaker school cohorts.

6. Conclusions

This paper investigates the effects of inclusive education on the academic achievement of regular students. The results show that the presence of students with special educational needs has no impact on the academic achievement of regular students. The coefficients are precisely estimated and the results are consistent between three different empirical strategies: student fixed effects, school fixed effects and exploiting neighborhood variation. The results further indicate that there are no heterogeneous effects of inclusive education on high and low achieving regular students.

Moreover, there are no differential effects of the inclusion of students with different types of special educational needs, such as visual or behavioral problems. These results seem remarkable given earlier research findings. Carrell and Hoekstra (2010), Figlio (2007) and Neidell and Waldfogel (2010) found that disruptive peers have a negative impact on student achievement. Their findings should, however, not be generalized to inclusive education, as they do not focus on students with diagnosed special educational needs. Students with diagnosed SEN generally have more severe problems, but at the same time, they receive additional resources and support.

Although this claim cannot be directly investigated with the data in this study, the additional resources attached to educating SEN students might explain the difference with the literature on behavioral difficulties. Inclusive education is highly subsidized in the Netherlands, the budget for a student with severe SEN is around double the budget of a regular student. It seems that the additional funding for SEN students under the backpack-policy is sufficient to avoid negative externalities of inclusion on the achievement of regular students. Interestingly, Friesen et al. (2010) find insignificant effects of inclusive education in the Canadian context as well, where schools also receive substantial additional funding for educating students with special educational needs. Moreover, Aizer (2008) found that students with undiagnosed ADD generate negative externalities in the classroom, but when students are diagnosed, no negative externalities occur. Further, she finds evidence that resources can help to overcome negative peer effects.

The pattern that emerges is that additional funding can offset negative peer effects associated to the presence of SEN students, which is consistent with the educational production model of Lazear (2001). In that sense, the findings from this study are also interesting in a broader education economics perspective, where the general evidence on the effectiveness of additional resources is mixed (e.g. Hanushek, 2006; Krueger, 2003).

From a policy perspective, it is important to stress that these findings are based on inclusive education under the Dutch backpack-policy. When the additional support for the inclusion of SEN students is increased or decreased, or when the population of included students changes, the impact on regular students might change. Nevertheless, this study adds an interesting nuance to the inclusive education debate: in a situation with substantial additional funding, inclusive education does not harm the achievement of regular students.

Appendix

Table A.1
Cohort size and the number of SEN students in the cohort.

	(1)	(2)	(3)	(4)	(5)	N	Clusters
Primary education	6.722***	1.144***	1.143***	1.165***	0.985***	462,227	5958
	(0.380)	(0.122)	(0.122)	(0.122)	(0.176)		
All tracks	8.831***	1.981***	1.961***	1.929***	1.411***	518,985	1036
	(0.761)	(0.280)	(0.278)	(0.276)	(0.387)		
Pre-voc. I	8.722***	2.078***	2.078***	2.127***	0.750	56,048	441
	(1.743)	(0.662)	(0.662)	(0.660)	(0.569)		
Pre-voc. II	9.557***	2.502***	2.502***	2.570***	1.904***	70,283	451
	(1.219)	(0.535)	(0.536)	(0.545)	(0.716)		
Pre-voc. III	19.537***	2.052**	2.030**	1.848*	1.518	14,955	299
	(2.516)	(1.004)	(1.002)	(1.021)	(1.671)		
Pre-voc. IV	7.354***	2.281***	2.280***	2.176***	1.690***	125,023	741
	(1.271)	(0.397)	(0.397)	(0.394)	(0.487)		
Senior gen.	8.627***	0.890	0.890	0.931	0.643	143,847	500
	(1.273)	(0.605)	(0.605)	(0.594)	(0.881)		
Pre-uni.	11.575***	3.366***	3.363***	3.230***	2.733**	108,829	516
	(3.110)	(1.129)	(1.130)	(1.099)	(1.120)		
Year fixed effects	√	√	√	√	√		
School fixed effects		√	√	√	√		
Individual controls			√	√	√		
Cohort level controls				√	√		
School specific time trend					√		

Note: Each coefficient represents a separate regression with the number of SEN students as independent variable and the total number of students in the cohort as dependent variable. Individual controls include gender, age, ethnicity and student weight for primary education, and additional support in pre-vocational education, gender, age, ethnicity, disadvantaged neighborhood and number of courses for secondary education. Cohort mean controls include student individual controls averaged by students' school, track and year. The school specific time trend refers to a linear trend with the predicted values of the number of SEN students in a certain year. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***$p < 0.01$ **$p < 0.05$ * $p < 0.10$.

Table A.2
Variation in the number of different types of SEN students over time.

	Number of SEN students 2010						
	Primary education						
Number of SEN students 2009	Visual problems						
	0	1	2	3	4	≥ 5	
0	5673	68	1	0	0	0	0
1	77	5	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
≥ 5	0	0	0	0	0	0	0
	Hearing problems						
	0	1	2	3	4	≥ 5	
0	5198	316	27	1	1	0	0
1	226	33	1	1	0	0	0
2	13	3	1	0	0	0	0
3	2	1	0	0	0	0	0
4	0	0	0	0	0	0	0
≥ 5	0	0	0	0	0	0	0
	Physical and intellectual disabilities						
	0	1	2	3	4	≥ 5	
0	4867	435	33	3	0	0	0
1	358	66	13	1	0	0	0
2	30	8	1	0	0	0	0
3	6	0	0	0	0	1	0
4	0	1	0	0	0	0	0
≥ 5	1	0	0	0	0	0	0
	Behavioral problems						
	0	1	2	3	4	≥ 5	
0	3623	726	143	34	4	1	0
1	656	246	64	20	8	2	0
2	134	61	28	7	1	0	0
3	20	14	6	1	2	2	0
4	4	7	0	1	0	0	0
≥ 5	2	4	2	0	0	1	0
	Secondary education (all school tracks)						
	Visual problems						
	0	1	2	3	4	≥ 5	
0	2513	69	2	0	0	0	0
1	57	2	0	0	0	0	0
2	1	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
≥ 5	0	0	0	0	0	0	0
	Hearing problems						
	0	1	2	3	4	≥ 5	
0	2391	103	14	1	1	0	0
1	99	18	3	1	0	0	0
2	9	1	1	1	0	0	0
3	0	1	0	0	0	0	0
4	0	0	0	0	0	0	0
≥ 5	0	0	0	0	0	0	0
	Physical and intellectual disabilities						
	0	1	2	3	4	≥ 5	
0	2162	230	23	0	0	0	0
1	167	43	2	0	0	0	0
2	8	4	3	0	0	0	0
3	1	0	0	0	0	0	0
4	0	0	0	0	0	0	0
≥ 5	0	0	0	0	0	1	0
	Behavioral problems						
	0	1	2	3	4	≥ 5	
0	1533	375	94	20	5	4	0
1	238	117	55	14	9	2	0
2	49	29	22	13	8	3	0
3	10	10	2	5	4	3	0
4	1	2	4	2	0	3	0
≥ 5	1	1	1	1	2	2	0

Note: This table shows variation in the number of specific SEN students over time by reporting counts of school(tracks) by the number of different types of SEN students in 2009 and 2010. For secondary education, the table does not distinguish between the different school tracks. When a school offers multiple school tracks, each track is counted as a separate observation.

Table A.3
Balancing tests for the percentage of SEN students in the cohort.

	Pre-voc. I			Pre-voc. II		
Additional support	0.217***	0.002	0.004	0.226***	0.022	0.018**
	(0.065)	(0.020)	(0.013)	(0.061)	(0.014)	(0.008)
Boy	0.045	0.015	0.005	0.089***	0.004	−0.001
	(0.042)	(0.014)	(0.010)	(0.033)	(0.013)	(0.008)
Age	0.015	0.019*	0.016**	0.033	−0.002	−0.002
	(0.032)	(0.011)	(0.007)	(0.027)	(0.011)	(0.005)
Surinamese	−0.600***	−0.005	−0.006	−0.464***	−0.003	0.028
	(0.095)	(0.033)	(0.019)	(0.073)	(0.027)	(0.017)
Arubean	−0.409***	−0.023	−0.021	−0.329***	−0.022	0.017
	(0.104)	(0.039)	(0.028)	(0.078)	(0.040)	(0.030)
Turkish	−0.396***	−0.005	−0.002	−0.128	−0.038*	0.003
	(0.082)	(0.024)	(0.017)	(0.081)	(0.020)	(0.013)
Moroccan	−0.586***	−0.054**	−0.007	−0.289***	−0.019	0.003
	(0.091)	(0.025)	(0.015)	(0.083)	(0.027)	(0.014)
Non-Western	−0.344***	−0.038	−0.020	−0.231***	−0.004	0.005
	(0.075)	(0.025)	(0.017)	(0.049)	(0.020)	(0.012)
Western	−0.105*	−0.014	−0.015	−0.084**	0.000	0.009
	(0.062)	(0.029)	(0.020)	(0.041)	(0.021)	(0.013)
Disadvantaged neighborhood	−0.397***	−0.028*	−0.015	−0.222***	−0.014	−0.000
	(0.106)	(0.017)	(0.011)	(0.069)	(0.018)	(0.012)
Missing neighborhood information	0.183	0.110	0.145	0.368*	0.127	0.086
	(0.180)	(0.128)	(0.094)	(0.204)	(0.084)	(0.061)
Number of courses	0.007	0.006	0.003	−0.140	−0.028	0.012
	(0.025)	(0.007)	(0.005)	(0.105)	(0.040)	(0.026)

(*continued on next page*)

Table A.3 (*continued*)

	Pre-voc. I			Pre-voc. II		
Year fixed effects	√	√	√	√	√	√
School fixed effects		√	√		√	√
School specific time trend			√			√
Number of students	56,048	56,048	56,048	70,283	70,283	70,283
Number of schools	441	441	441	451	451	451
F-statistic	7.277	1.406	0.950	6.475	0.875	1.049
p-value	0.000	0.160	0.497	0.000	0.573	0.402
Df	(12,440)	(12,440)	(12,440)	(12,450)	(12,450)	(12,450)
	Pre-voc. III			Pre-voc. IV		
Additional support	0.038	−0.042	−0.052	2.280***	0.012	−0.009
	(0.165)	(0.064)	(0.081)	(0.572)	(0.099)	(0.039)
Boy	0.121	0.061	0.014	0.067**	−0.020**	−0.010
	(0.074)	(0.039)	(0.029)	(0.027)	(0.009)	(0.006)
Age	0.121**	0.040	0.032	0.115***	0.004	0.012**
	(0.052)	(0.028)	(0.024)	(0.041)	(0.008)	(0.005)
Surinamese	−0.353*	−0.112	0.009	−0.237**	0.039	0.021
	(0.184)	(0.119)	(0.061)	(0.100)	(0.025)	(0.018)
Arubean	−0.510**	0.005	0.249**	−0.223***	−0.023	−0.007
	(0.214)	(0.132)	(0.107)	(0.077)	(0.044)	(0.035)
Turkish	−0.269	−0.128	−0.004	−0.439***	0.004	−0.017
	(0.203)	(0.083)	(0.055)	(0.076)	(0.020)	(0.013)
Moroccan	−0.425*	−0.185*	−0.061	−0.449***	0.008	−0.011
	(0.224)	(0.105)	(0.099)	(0.092)	(0.020)	(0.015)
Non-Western	−0.257	−0.051	0.010	−0.300***	−0.014	−0.005
	(0.161)	(0.093)	(0.068)	(0.064)	(0.016)	(0.012)
Western	−0.107	−0.035	0.060	−0.092**	−0.016	−0.003
	(0.093)	(0.071)	(0.050)	(0.038)	(0.020)	(0.014)
Disadvantaged neighborhood	−0.160	0.036	0.034	−0.068	−0.058***	−0.022
	(0.203)	(0.072)	(0.059)	(0.085)	(0.022)	(0.014)
Missing neighborhood information	0.040	0.148	0.240	−0.063	−0.060	−0.037
	(0.333)	(0.219)	(0.151)	(0.108)	(0.049)	(0.038)
Number of courses	0.062	0.061	0.023	−0.045	0.034	0.008
	(0.089)	(0.062)	(0.036)	(0.039)	(0.022)	(0.013)
Year fixed effects	√	√	√	√	√	√
School fixed effects		√	√		√	√
School specific time trend			√			√
Number of students	14,955	14,955	14,955	125,023	125,023	125,023
Number of schools	299	299	299	741	741	741
F-statistic	1.847	1.187	1.263	4.608	1.580	1.496
p-value	0.041	0.292	0.240	0.000	0.092	0.120
Df	(12,298)	(12,298)	(12,298)	(12,740)	(12,740)	(12,740)
	Senior gen.			Pre-uni.		
Boy	0.008	0.001	0.002	0.009	0.003	0.005
	(0.007)	(0.004)	(0.003)	(0.007)	(0.004)	(0.003)
Age	−0.002	−0.000	0.000	−0.005	−0.003	−0.003
	(0.010)	(0.004)	(0.002)	(0.008)	(0.005)	(0.003)
Surinamese	−0.210***	−0.017	−0.018*	−0.091**	0.007	−0.020
	(0.053)	(0.014)	(0.010)	(0.036)	(0.017)	(0.012)
Arubean	−0.035	−0.009	−0.006	−0.007	0.032	0.006
	(0.047)	(0.025)	(0.017)	(0.035)	(0.023)	(0.016)
Turkish	−0.128***	−0.008	−0.028***	−0.058	−0.019	−0.014
	(0.048)	(0.016)	(0.010)	(0.044)	(0.019)	(0.015)
Moroccan	−0.166***	0.019	0.015	−0.165***	−0.048**	−0.012
	(0.058)	(0.017)	(0.013)	(0.043)	(0.022)	(0.014)
Non-Western	−0.067***	−0.013	−0.019***	−0.019	−0.008	−0.011*
	(0.025)	(0.010)	(0.007)	(0.018)	(0.009)	(0.007)
Western	−0.004	−0.001	0.001	−0.041***	−0.010	−0.004
	(0.020)	(0.010)	(0.007)	(0.015)	(0.007)	(0.005)
Disadvantaged neighborhood	0.030	−0.013	−0.012**	−0.024	0.011	0.004
	(0.059)	(0.009)	(0.006)	(0.040)	(0.008)	(0.006)
Missing neighborhood information	0.016	−0.027	−0.033*	0.120*	0.039	0.036*
	(0.075)	(0.028)	(0.019)	(0.061)	(0.032)	(0.020)
Number of courses	0.011	0.026	0.015	−0.012	−0.010	−0.021**
	(0.048)	(0.018)	(0.010)	(0.022)	(0.017)	(0.009)
Year fixed effects	√	√	√	√	√	√
School fixed effects		√	√		√	√
School specific time trend			√			√
Number of students	143,847	143,847	143,847	108,829	108,829	108,829
Number of schools	500	500	500	516	516	516
F-statistic	2.147	1.094	3.048	2.545	1.278	1.459
p-value	0.016	0.364	0.001	0.004	0.233	0.143
Df	(11,499)	(11,499)	(11,499)	(11,515)	(11,515)	(11,515)

Note: Each column represents a regression of the percentage of SEN students in the cohort on student background characteristics. The school specific time trend refers to a linear trend with the predicted values of the percentage of SEN students in a certain year. F-statistics, p-values and degrees of freedom at the bottom of the table refer to F-tests on the joint significance of additional support in pre-vocational education, gender, age, ethnicity, disadvantaged neighborhood and number of courses. Standard errors are reported in parentheses. Standard errors are robust and clustered at the school level. ***$p < 0.01$ **$p < 0.05$ *$p < 0.10$.

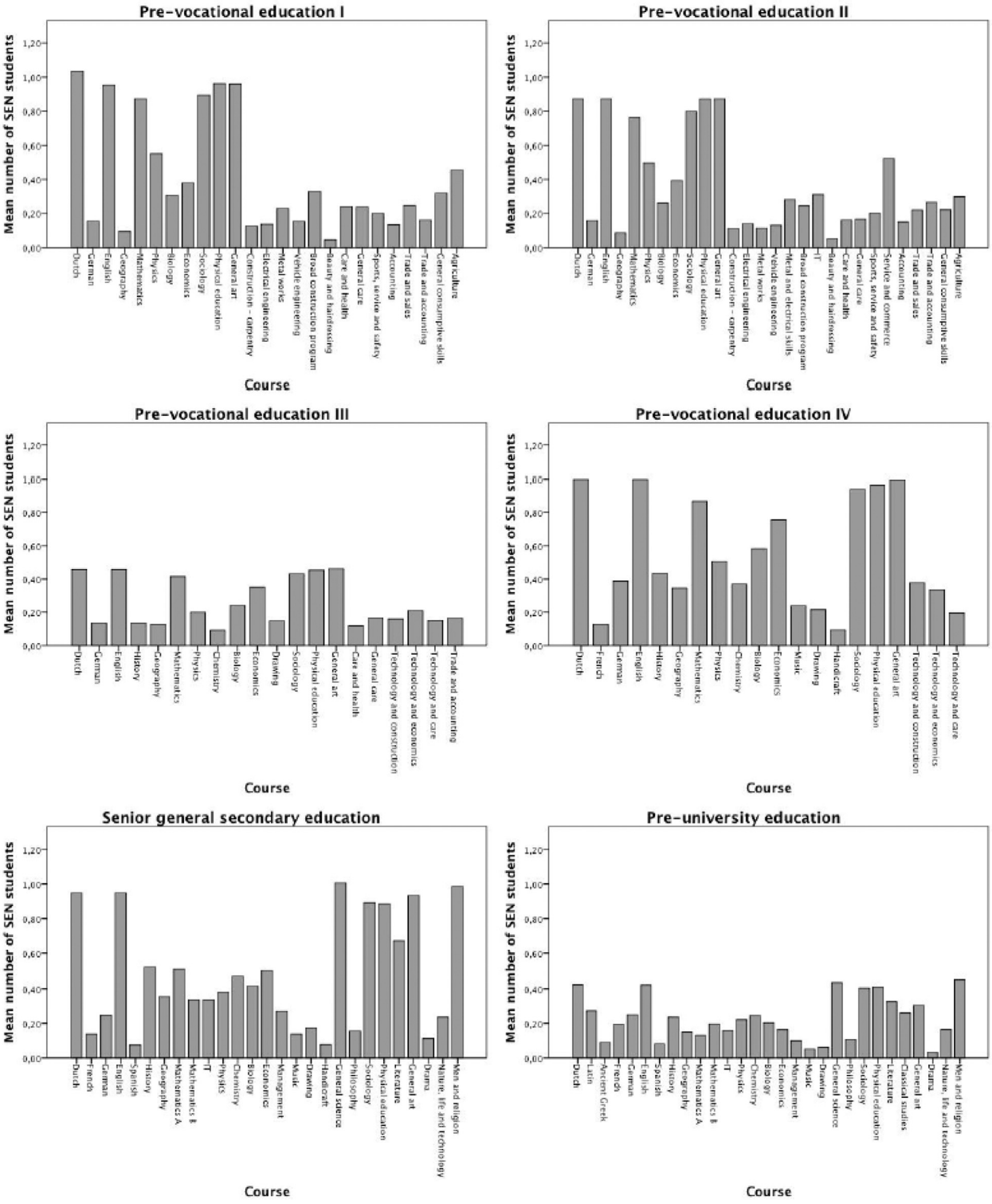

Fig. A.1. Variation in the number of SEN students per cohort.
Note: Only courses that are taken by more than 1000 students are displayed in the figure.

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