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A regression discontinuity design

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Inhoud

Beleidssamenvatting

Het voorzien van gelijke onderwijskansen voor elke leerling is een van de prioriteiten in de meeste onderwijssystemen. Leerlingen uit kansarme milieus ondervinden vaak nadelen omwille van een culturele, financiële of sociale achterstand. Om deze achterstand te beperken en om te buigen is er wereldwijd een grote variatie aan interventies ontwikkeld. Uit een review van internationale literatuur die de oorzakelijke impact van de interventies kwantificeert, blijkt dat dergelijke interventies veelal ofwel zeer kleine, ofwel niet-significante, ofwel tegenstrijdige effecten genereren. Het is echter niet mogelijk om specifieke interventies te identificeren die resulteren in een eenduidig positieve (of negatieve) impact.

Door middel van bijkomende financieringsmiddelen en specifieke doelstellingen poogt men ook in de Vlaamse Gemeenschap de impact van de socio-economische achterstand te verkleinen. Het Gelijke Onderwijskansen (GOK)-programma voorziet sinds 2002 bijkomende uren-leraar voor scholen met een minimum aandeel aan kansarme leerlingen. Deze uren kunnen ingezet worden volgens een van de zes daarvoor voorziene thema's, die elk op een eigen manier de ongelijke kansen proberen te bestrijden. In dit rapport onderzoeken we het oorzakelijke effect van deze bijkomende middelen op problematische afwezigheid, schoolse vertraging en verdere studies van leerlingen in scholen die deze middelen ontvangen.

Om dit effect te meten maken we gebruik van bestaande administratieve databanken (Vlaams Ministerie van Onderwijs en Vorming) betreffende het secundair onderwijs. De gegevens zijn beschikbaar op leerling- en schoolniveau. Naast de data met betrekking tot de GOK-indicatoren en de uitkomstvariabelen, beschikken we ook over informatie over de onderwijscarrière en enkele kenmerken van leerlingen (zoals geslacht en thuistaal).

Uit descriptief onderzoek van deze data blijkt dat de GOK-indicatoren sterk gecorreleerd zijn met de bestudeerde uitkomstvariabelen. Scholen met meer kansarme leerlingen scoren gemiddeld significant lager op alle bestudeerde uitkomstvariabelen. Het beleid is dus gericht op de juiste doelgroep om de ongelijke onderwijskansen aan te pakken.

Om de impact van het toekennen van bijkomende GOK-uren te kwantificeren en om de determinanten die een positieve of negatieve bijdrage kunnen leveren te identificeren, is het van belang om de meest geschikte methodologie te gebruiken, gegeven het specifieke Vlaamse systeem van de GOK-uren. Vanuit methodologisch oogpunt is het van primordiaal belang om causale relaties te meten: een correlatie of toevallige samenhang impliceert immers niet noodzakelijk een causaal of oorzakelijk verband. De constructie van het Vlaamse systeem van de GOK-uren laat ons toe om een causale identificatie- en schattingsprocedure te ontwikkelen. Om aanspraak te maken op de GOK-uren dient een school een minimum percentage leerlingen te hebben die voldoen aan de GOK-criteria. Dit gaat over 10% GOK-leerlingen in de eerste graad van het secundair onderwijs en 25% in de hogere cycli. In scholen boven deze drempel, genereert elke leerling op basis van de kenmerken waaraan hij/zij voldoet bijkomende middelen voor de school. Om de middelen effectief te verwerven moeten er evenwel minimaal 6 uren gegenereerd zijn. Deze drempelwaarden laten toe om modellen te ontwikkelen die causale verbanden schatten: we kunnen immers scholen net onder en net boven deze drempel vergelijken. Aangezien de drempelwaarde exogeen is, zullen scholen net boven en net onder de drempel vergelijkbare geobserveerde en niet-geobserveerde kenmerken bezitten. De gebruikte

methode (regression discontinuity design (RDD)) is een quasi-experimentele techniek waarbij twee groepen (scholen en leerlingen in scholen) vergeleken worden: (1) scholen die zich net boven de drempel van 10% of 25% bevinden ontvangen immers bijkomende GOK-uren (op voorwaarde dat ze minstens 6 uren genereren) en (2) scholen die zich net onder de drempel bevinden ontvangen geen bijkomende middelen en worden beschouwd als 'controlegroep'. Deze setting laat toe om na te gaan of er, onmiddellijk rond de drempelwaarden, statistisch significante discontinuïteiten zijn in de relatie tussen het aandeel GOK-leerlingen in een school en de bestudeerde uitkomstvariabelen. Zo kunnen we oorzakelijk nagaan wat het verschil is in de uitkomsten tussen scholen die GOK-uren ontvangen en deze van scholen met gelijkaardige kenmerken die geen bijkomende GOK-uren ontvangen. Het vinden van een discontinuïteit bij de drempelwaarde wijst dan op een causale impact van de bijkomende middelen. We analyseren resultaten op zowel school- als op leerlingenniveau.

Om zeker te zijn dat scholen onder en boven de drempelwaarde niet cruciaal verschillen van elkaar, en dus wel degelijk als vergelijkbare interventiegroep en controlegroep gebruikt kunnen worden, kan deze methode slechts toegepast worden binnen een beperkte bandbreedte rond de drempelwaarde. In deze paper wordt standaard een bandbreedte van 8% onder en boven de drempels gehanteerd (bijkomende analyses die onder andere dienen om de robuustheid van de modellen te checken, gebruiken ook bandbreedtes van 4,7% en 10% rond de drempels). Hoewel scholen onder de drempel geen bijkomende GOK-uren ontvangen (en scholen boven de drempel wel bijkomende GOK-uren ontvangen), is het mogelijk dat leerlingen, na het veranderen van school (bv. van lager naar secundair) of bij overgang van de eerste naar de tweede graad terecht komen in een school die zich aan de andere kant van de drempel bevindt dan hun vorige school. Zo zou een leerling wiens vorige school GOK-uren ontving en zijn huidige school geen GOK-middelen ontvangt de controlegroep kunnen contamineren omdat hij via zijn eerdere school in het verleden in contact gekomen is met GOK-uren.

Kenmerkend voor dit soort van analyses is dat de resultaten slechts valide zijn binnen de gehanteerde bandbreedtes. Het is niet mogelijk om gefundeerde en betrouwbare uitspraken te doen buiten deze bandbreedte. Deze beperking is inherent aan de gebuikte techniek: de interne validiteit is hoog (d.w.z. dat de gevonden resultaten binnen de bandbreedte betrouwbaar zijn), maar de externe validiteit is laag (d.w.z. dat de resultaten niet generaliseerbaar zijn buiten de bandbreedte). Gelet op het feit dat er geen controlegroep bestaat voor de scholen met veel GOK-leerlingen, is gebruik maken van de drempels de enig bruikbare manier om een causaal verband methodologisch correct te meten.

De schattingen laten, zowel in de eerste graad als in de tweede en derde graad, nauwelijks tot geen effecten zien van de GOK-uren op schoolse vertraging, problematische afwezigheid, doorstroom naar het hoger onderwijs en behalen van diploma in het hoger onderwijs. Wat betreft de hogere cycli zijn er, ook bij aparte schattingen opgesplitst per onderwijsvorm, eveneens geen waarneembare verschillen. Noch worden er significante effecten van de middelen gemeten binnen subgroepen opgesplitst volgens schoolgrootte, onderwijsnet en GOK-indicator. Onze resultaten zijn in lijn met verschillende internationale studies die veelal zeer kleine, niet-significante of tegenstrijdige effecten vinden.

Deze bevindingen moeten wel in het juiste perspectief gezien worden. Ten eerste zijn deze resultaten gebaseerd op schattingen binnen een bandbreedte van 8% onder en boven de drempelwaarden van 10% en 25%. Ze zijn niet extrapoleerbaar naar scholen (ver) buiten dit schattingsinterval. Gegeven de setting van het systeem van de GOK-uren dat werkt met een drempel van 10% of 25% en gegeven de beschikbare data, kunnen we geen uitspraken doen over een mogelijke impact in scholen met bv. 35% of meer GOK-leerlingen.

Ten tweede zijn de gebruikte uitkomstvariabelen ruw van aard en niet volledig consistent overheen de tijd en onderwijsvormen. We beschikken echter niet over andere mogelijk relevante gegevens, zoals bijvoorbeeld testscores of welbevinden van leerlingen. Hoewel de verscheidenheid aan gebruikte uitkomsten een duidelijke indicatie geeft van het beperkte resultaat van de middelen, zijn analyses van verschillende subgroepen, hoewel consistent met de algehele conclusie, niet volledig vergelijkbaar. Bovenop de imperfecte vergelijkbaarheid over de subgroepen heen, beslaan de uitkomstvariabelen ook slechts een deel van de uitkomsten die beïnvloed konden worden door het GOK-programma. Daar we niet over andere uitkomsten beschikken, zijn alle oorzakelijke effecten dan ook enkel relevant voor de gemeten uitkomsten. Verder onderzoek naar een mogelijke impact op cognitieve, financiële, psychologische of andere uitkomsten, zou dan ook nuttig zijn en mogelijk andere effecten reveleren.

Het niet vinden van een consistent effect is echter ook in overeenkomst met de bevindingen van een review van internationale literatuur over specifieke interventies gericht op het bevorderen van gelijke onderwijskansen (De Witte, Smet & Van Assche, 2017). Uit deze review blijkt immers dat een groot aantal interventies nauwelijks of geen aantoonbare impact hebben. Indien toch een effect gemeten wordt, is het dikwijls tegenstrijdig en sterk afhankelijk van de specifieke context. In het algemeen is er in ontwikkelingslanden een positiever resultaat dan in meer ontwikkelde landen en kan aangetoond worden dat hogere lonen (of een loon gebaseerd op prestaties) doorgaans leidt tot minder verloop van leerkrachten (vooral in kansarme scholen). Het gebrek aan positieve effecten (vooral in ontwikkelde landen) zou kunnen betekenen dat scholen, gegeven de huidige technologie) opereren in de buurt van de top van de onderwijsproductiefunctie. Een tweede hypothese is dat onderwijs alleen niet in staat is om alle problemen gerelateerd tot gelijke kansen op te lossen. Een lage SES (en de gevolgen ervan) is immers multidimensioneel en vereist waarschijnlijk een aanhoudende betrokkenheid van ook andere actoren, gespecialiseerd in bv. huisvesting, arbeidsmarkt, welzijn, gezondheidszorg, taal, … (De Witte, Smet & Van Assche, 2017).

In een recent rapport dat ook binnen het Steunpunt SONO werd uitgewerkt, worden een aantal mogelijke oorzaken gesuggereerd voor het feit dat de evidentie voor impact van de gelijke onderwijskansenprogramma's in Vlaanderen beperkt is (Franck, Nicaise, & Lavrijsen, 2016). Zij identificeren een aantal mogelijke verklaringen voor de zwakke leerwinsteffecten: zoals (1) een onduidelijke afbakening van de doelgroep; (2) de spreiding van de bijkomende middelen over alle leeftijdsgroepen; (3) de ongelijke draagkracht binnen de groep van GOK-scholen en de toenemende segregatie; (4) het gebrek aan duidelijke doelstellingen en de gebrekkige implementatie binnen scholen en (5) de ondoelmatige aanwending van de SES-werkingsmiddelen.

Een bijkomende oorzaak die zou kunnen verklaren waarom we in deze studie nauwelijks impact vinden, is de relatief lage drempelwaarde. In de eerste graad ontvangen scholen met tussen 10% en 18% GOK-leerlingen gemiddeld 4,9 bijkomende uren. In de tweede en derde graad ontvangen scholen met tussen 25% en 33% GOK-leerlingen gemiddeld 10,3 bijkomende uren. Voor beide groepen is dit ongeveer 1% van het volledige pakket uren-leraar. De bijkomende FTE die hiermee aangeworven kunnen worden, zijn misschien te weinig om een efficiënt beleid, gericht op het bevorderen van gelijke onderwijskansen, uit te werken en te implementeren. Het is mogelijk dat scholen met een hoger aandeel GOK-leerlingen wel een kritische massa aan bijkomende uren genereren om een gericht beleid (mét impact) te voeren. Aangezien de gehanteerde drempels echter relatief laag zijn en er geen voldoende gedetailleerde datareeksen beschikbaar zijn vóór en na de implementatie van het GOK-decreet, is het niet mogelijk om oorzakelijke uitspraken te doen over scholen met een relatief hoog aandeel aan GOK-leerlingen.

Onze resultaten suggereren dat, binnen de bandbreedte van 8% rond de GOK-drempels van 10% en 25%, zowel in de eerste graad als de hogere graden er geen oorzakelijke effecten zijn op de

onderzochte variabelen. Gegeven de aantoonbaar negatieve invloed van de socio-economische status op deelname en succes in het hoger onderwijs, schoolse vertraging en problematische afwezigheid, lijkt bijkomende aandacht voor leerlingen uit lage SES-groepen evenwel van blijvend belang.

Gelet op het feit dat de uitkomstenvariabelen die gebruikt dienden te worden voor dit onderzoek relatief ruw zijn en dus waarschijnlijk niet de best mogelijke variabelen zijn om de impact van het gelijke onderwijskansenbeleid te kwantificeren, bevelen we aan dat beleidsmakers reeds bij de voorbereiding van een nieuwe maatregel (dus vóór de implementatie ervan) zouden moeten nadenken over de evaluatie ervan. Het is van belang om steeds duidelijke doelstellingen te formuleren en aan te geven wanneer en hoe de maatregel geëvalueerd zal worden. Het belang van duidelijke en transparante doelstellingen voor scholen kan nauwelijks overschat worden: indien scholen weten hoe ze geëvalueerd zullen worden, zullen ze hun beleid kunnen afstemmen op de doelstellingen die op een hoger niveau werden vastgelegd. Duidelijke doelstellingen zullen ook het evaluatieproces zelf ten goede komen. Ten slotte dienen ook de indicatoren die gebruikt zullen worden voor de evaluatie geïdentificeerd (of gecreëerd) te worden en dient er een nulmeting uitgevoerd te worden.

The impact of additional funds for schools with disadvantaged pupils: A regression discontinuity design[1]

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Abstract:

This paper evaluates the impact of additional funding for disadvantaged secondary school pupils on educational outcomes. We exploit the discontinuous nature of the equal educational opportunities program which provides funding for additional staff if the school passes an exogenous number of disadvantaged students. We evaluate the effect of the additional funding on problematic absenteeism, later educational outcomes and grade retention. The results suggest that there is no significant effect of the additional funding on either of the observed outcomes. This is the case for both lower and higher secondary education.

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1. Introduction

Socio-economic status (SES) has been widely recognized to have a significant effect on educational outcomes (Dahl & Lochner, 2012; Haveman & Wolfe, 1995). To mitigate the influence of SES on education outcomes, a wide variety of programs and policies have been implemented. They include voucher programs (Hsieh & Urquiola, 2006), class size reduction (Hoxby, 2000) and additional funding for schools with a large proportion of disadvantaged students (Kendall et al., 2004). This paper focusses on the latter intervention, for which there is a wide heterogeneity in its implementation and empirical evaluation. While many evaluations lack a credible counterfactual for a causal evaluation (e.g., Bénabou, Kramarz, & Prost, 2009; Kendall et al., 2004), others make use of regression discontinuity designs (e.g., Leuven et al., 2007; Ooghe, 2011). The observed effects vary between favorable (e.g., Henry, Fortner, & Thompson, 2010; Ooghe, 2011), unfavorable (e.g., Leuven et al., 2007; Van Der Klaauw, 2008) and insignificant (e.g., Bénabou, Kramarz, & Prost, 2009; Van Der Klaauw, 2008). This wide variety of observed effects can be partly explained by the difference in implementation, characteristics and conditions of the programs.

Equal educational opportunities have been an area of significant interest since the Coleman report (Coleman, 1968). In a later publication, Coleman notes that the term 'equality of educational opportunity' has led to confusion since it may imply equality of school inputs as well as equality of educational output. Moreover, he argues that the notion of equal educational inputs is inappropriate and that equal educational outcomes are unrealistic. With respect to the effects of schooling, Coleman suggests that education should lead towards more equal adult opportunities and that education serves as a means to this end. Rather than discussing equal educational inputs or outputs, he considers it as a duty of the education system to reduce the effect of different environments on adult life (Coleman, 1975).

This paper focusses on the equal educational opportunities (EEO) program of the Flemish Community of Belgium. The Flemish Ministry of Education awarded additional funding for schools with a significant proportion of disadvantaged students. The schools could freely allocate the funding to hire additional teachers or teacher support. Interestingly, the additional resources are assigned to schools based on an exogenously defined cut-off. In particular, schools were only eligible for the intervention if they have more than 25% disadvantaged students in the second and third stage of secondary education and 10% in the first stage of secondary education. The exogenous cut-off allows us to examine the causal effect of the intervention in a regression discontinuity design. This method permits a causal evaluation of the program as long as the cutoff is exogenously defined, there is no manipulation of the forcing variable around the cutoff and there is a clear discontinuity of the treatment probability around this cutoff. As some eligible schools did not apply for the funding, we rely in a next step on a fuzzy regression discontinuity design where we use the position of the school relative to the cutoff as an instrument for receiving treatment. The exogenously defined cutoff is by definition correlated with the probability of treatment and only influences any other outcome through its effect on the treatment.

This paper contributes to the literature in several ways. First, we exploit a detailed administrative dataset that includes panel data information on all students in secondary education in the Flemish Community of Belgium in 2002, 2006 and from 2007 to 2015. Thanks to the detailed nature of the data, we avoid endogeneity issues due to unobserved heterogeneity in the data. Second, the large dataset of over 4 million observations allows us to focus on a small bandwidth around the discontinuity, guaranteeing a high internal validity of the results. The small bandwidth increases the similarity of schools on both sides of the cutoff, thus allowing us to make causal claims about the effects of the program on educational outcomes. Third, as regression discontinuity designs, by definition, have a low external validity, this paper researches the effect of additional funding on schools

with a relatively low percentage of disadvantaged students. The effect of additional funding on the students in these schools is not necessarily comparable to that of schools with a higher percentage of disadvantaged students, but, to our best knowledge, has not been researched until now.

The Flemish Community of Belgium offers an interesting setting for equal educational opportunities (EEO) research. According to the OECD PISA survey, the region scores well on mathematics, reading and science. Despite a below average percentage of low achieving students in math, the disparities between strong and weak students are largely explained by their socio-economic background (OECD, 2013). As inequality is one of the main problems in the Flemish educational system, several programs aimed at reducing this inequality received substantial funding over the past decade. Both the number of students and the level of the funds involved with the EEO-program are exceptional compared to other studied EEO programs (Dahl & Lochner, 2012; De Haan, 2014).

This paper unfolds as follows. In section 2, we briefly review the related literature. We focus on literature that makes use of causal identification strategies. Both reasons for positive and negative effects are considered and discussed. In section 3, we summarize the EEO-program, its conditions and characteristics. A brief introduction to the Flemish educational system is also included in this section. Section 4 explains the data and presents descriptive statistics. Section 5 discusses the use of a regression discontinuity design and checks the validity of this approach. In section 6 the results are presented, followed by a discussion and a conclusion in section 7 and 8.

2. Literature Review

Evidence from existing literature is mixed. On the one hand, a number of studies observes positive effects on student outcomes. Henry, Fortner & Thompson (2010) evaluate additional funding for students in educationally disadvantaged districts in North Carolina. Using a regression discontinuity design, they observe a significantly positive effect on students' test scores and especially on the scores of disadvantaged students. Ooghe (2011) examined the effect of additional funding for disadvantaged students in primary schools in the Flemish Community of Belgium. Exploiting the exogenous cut-off in a regression discontinuity design, he finds significantly positive effects for spelling, while there is no effect on mathematics test scores. Exploring the heterogeneity in the treatment effects, the results suggest that the effects are larger for disadvantaged students, but lower for low initial performers. The "Excellence in Cities" program, a program that aims to raise standards in English urban schools and to meet the needs of all students, provided target schools with additional funding. Mainly focusing on underachievement of gifted and talented pupils, using treatment and comparison groups, the program had a small but significantly positive effect on the attainment of gifted students and a strong reduction in their absences (Kendall et al., 2004; Machin et al., 2004). Using a nonparametric bounds analysis De Haan (2014) analyzed the effect of a comparable program aimed at Dutch low ability students. She finds that additional funds have a significantly positive effect on both math and language test scores and decreases the likelihood of a student failing the exam.

On the other hand, some studies find negative or insignificant effects of additional resources for disadvantaged students. Leuven et al. (2007) review a Dutch program that provides extra funding for staff and information technologies (IT) to primary schools with at least 70% of the students from a disadvantaged group. They conclude, based on a regression discontinuity design, that neither subsidy had a positive effect on the disadvantaged student's educational achievements and even find a small negative effect of the additional funds for IT. Title I of the Elementary and Secondary Education Act of 1965 led to several compensatory education programs in New York City. Using a regression-

discontinuity design, Van Der Klaauw (2008) estimates that the program did not result in better educational outcomes. For the early years of the program he finds a significantly negative effect. Although the negative effect is absent in the later data, there is no positive effect either. This non-effect of additional funds is also witnessed by Bénabou, Kramarz & Prost (2009) in their evaluation of the French educational priority zones. This program invested additional funds into schools in disadvantaged neighborhoods. Despite of the large investment, Bénabou et al. (2009) find no impact on student outcomes, when applying their OLS-regression using fixed effects at the school and year level.

The inconsistency of these programs' results may be due to the fact that the amount invested, the way in which schools can spend the money, whether the funding is earmarked or not were different for the policy interventions investigated in these studies. The studies also depend on different sets of assumptions and especially the regression discontinuity results only estimate local average treatment effects (De Haan, 2014). As such, additional research of this type of policy measures is needed to address the key success points of each intervention.

3. The setting and the program

Education is compulsory in Flanders from the age of 6 until the age of 18. Compulsory education comprises primary (6-12 years old) and secondary (12-18 years old) education. Parents are free to choose any primary or secondary school for their children (i.e., there are no catchment areas). Secondary education distinguishes four ability tracks. General secondary education prepares students for higher education. Artistic secondary education provides general education with an emphasis on arts. While technical secondary education takes a more technical approach, intended to provide students with the necessary skills to start a professional career, it also provides them with sufficient knowledge to enroll in higher education. This is in contrast with the vocational secondary education track that explicitly trains students for a specific occupation. While choice between these tracks is, in theory, up to the students' ability and ambitions, general education is generally perceived as the most prestigious of the tracks and vocational education is perceived as the least prestigious. In the absence of standardized exams, this creates segregation in schools (an elaborate discussion is provided in De Witte and Hindriks, 2017). The segregation can be observed in the significant differences in the average SES levels between schools.

This paper focusses on an equal educational opportunities program, which was implemented in the Flemish Community of Belgium in 2001. The program aimed to support low SES pupils in schools, and provide them with better educational outcomes. While all secondary schools with a minimum percentage of disadvantaged students were eligible for additional funding, schools need to apply for this funding. Although there was sufficient leeway in the exact use of the funding, it could only be used for hiring additional teachers and teacher support. For the first stage of secondary education, the cutoff was exogenously set at a minimum of 10% disadvantaged students relative to all students in the school. For the second and third stage of secondary education, the cutoff level was increased to 25% of disadvantaged students relative to all students in the school. The total amount of additional funding for a school is decided upon every three years and is based on the amount and type of the disadvantaged students per school in the year before the start of the 3-year cycle.

The eligibility criteria for 'disadvantaged students' shifted slightly throughout the years. Before 2008, the focus was mainly on the educational outcomes of students as a disadvantaged student was defined as a student who satisfies at least one of the following indicators. (i) The student has two or more years of grade retention; (ii) The student was part of a program for non-Dutch speaking newcomers; (iii)

Students in vocational or technical education who received a school advise to repeat the year or to change their field of study. After 2008, the focus shifted to the socio-economic status of students. In particular, the following indicators are used to define disadvantaged students: (i) The student receives an educational grant (weighted by 0.4); (ii) The student's mother does not have a secondary education degree (weighted by 0.6); (iii) The student lives outside of family (weighted by 0.8); (iv) The student is part of the travelling population (weighted by 0.8). In addition to these four indicators an extra weight of 0.2 is added for students who do not speak Dutch (i.e., the native language) at home. This additional weight is only assigned to students in combination with one of the four other indicators. Using these weights, a weighted sum is calculated for each student, with a maximum of 1.2. Both schools with a significant concentration of disadvantaged students (i.e., more than 80% (before 2011) or more than 55% (after 2011) weighed disadvantaged students) and schools in the Brussels Region receive a 1.5 weight coefficient to counter to the specific needs of these schools. As these coefficients are cumulative, a school in the Brussels region can receive a maximum coefficient of 2.25. The total budget for the program is then allocated to schools that meet the earlier defined eligibility criteria, proportional to the sum of weighted students per school.

To avoid the fragmentation of funds, however, there is also a minimum threshold defined. Eligible schools only receive the equal educational opportunities funding if the number of additional teaching hours is at least six teaching hours. For example, a school that generates five additional teaching hours, despite passing the threshold for the percentage of disadvantaged students, will not receive the additional funding.

4. Identification strategy

Sharp regression discontinuity design

To examine the causal effect of equal educational opportunities funding, we exploit the discontinuous nature of the funding in a regression discontinuity design (RDD). In particular, schools are only eligible if they have more than 25% (10%) disadvantaged students in the second and third stage of secondary education (first stage of secondary education, respectively). Given that the percentage of disadvantaged students in the total school population is exogenous to the schools (i.e., Flemish schools cannot by law and in practice select or refuse students), we can assume that schools at both sides of the threshold share similar observed and unobserved characteristics. Schools close to, but below, the threshold are considered as a good control group for schools close to, but above, the threshold. As in the absence of a treatment, both groups of schools would have similar education outcomes, the schools close to, but below, the threshold constitute a credible counterfactual for the schools close to, but above the threshold.

First consider a sharp RDD where we use a nonparametric local linear regression method. The advantage of using a nonparametric method, is that we only use data close to the cutoff (within a bandwidth *h*) excluding less relevant observations. In particular, we estimate the following model specification:

$$Y_{it} = \alpha + \tau D_{it} + \beta\,(R_{it} - c) + \mu X_{it} + \partial_s + \gamma_t + \varepsilon_{it} \qquad (1)$$

Where Y_{it} denotes the outcome variable of student *i* at time *t.* As discussed in the next section, we use three different outcome variables: grade retention, problematic absenteeism from school, participation in a professional bachelor program and participation in academic education. As in a sharp RDD all students on one side of the cutoff have the same treatment value that is opposite of those on the other side of the cutoff (i.e. 0 left and 1 right of the cutoff), the binary variable D_{it} indicates both

on what side of the cutoff student *i* at time *t* is positioned and whether or not this received any treatment. The coefficient τ serves as the parameter of interest. The treatment cutoff is denoted by *c* and represents the value for the forcing variable at which the treatment value changes (in our application 10% or 25%). R_{it} is the forcing or running variable, as its value essentially forces the treatment on student *i* at time *t*. In the analyses to follow, the forcing value will be the percentage of disadvantaged students in a school. The only values of R_{it} used in the analysis are the values between c-h and c+h, thus excluding observations too far from the cutoff. The selection of the bandwidth is an essential part of an RDD as a smaller bandwidth makes for a better control group, while reducing the number of observations available. We use the ideal CCT bandwidth for our sharp RDDs, calculated with

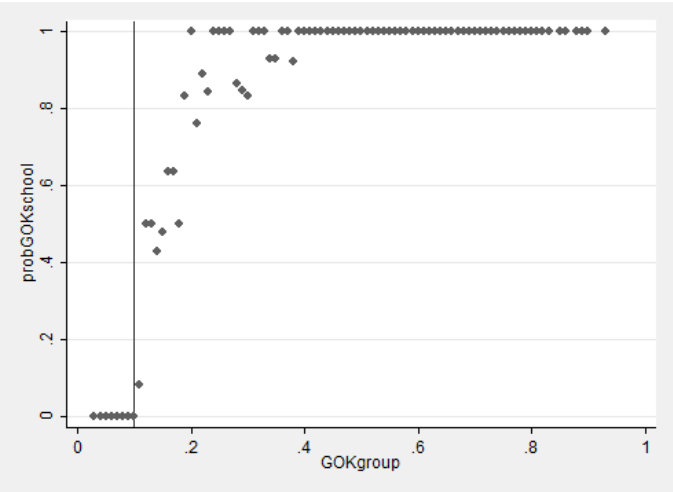

Figure 1: Probability of treatment in the first stage of secondary education, where 10% disadvantaged students serves as the cutoff. Data for 2011.

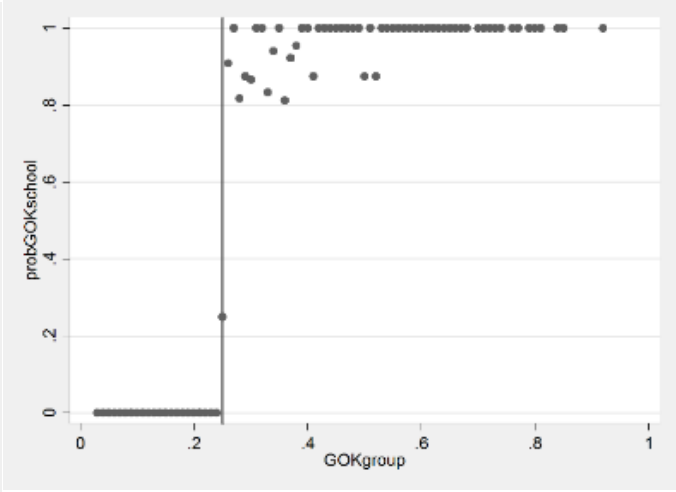

Figure 2: Probability of treatment in the second and third stage of secondary education, where 25% disadvantaged students serves as the cutoff. Data for 2011.

the 'rdrobust package' in Stata (Calonico, Cattaneo, & Titiunik, 2014). This package implements local-polynomial regression-discontinuity point estimators with robust confidence intervals. Next, we include a vector X of individual and time specific control variables to capture time varying heterogeneity, and a constant α. Finally, we include school fixed effects ∂_s and time fixed effects γ_t to capture time invariant heterogeneity at the school and cohort level.[3] To capture the within school effects arising from, for example, peer effects, we cluster the standard errors at the school level. ε_{it} denotes an i.i.d. error term.

To obtain the unbiased local average treatment effect, the following conditions need to be met. First, as explained by Jacob, Zhu, Somers & Bloom (2012), there must be a clear discontinuity in the probability of receiving treatment at the cutoff. Figures 1 and 2, which present the probability of additional funding relatively to the percentage of disadvantaged students in the school for the first stage of secondary and for the second and third stage of secondary education, verify this assumption. Schools below the threshold of 10% (25%) have a zero probability of additional funding, while schools above the threshold have a high (up to 1.0) probability of additional funding. For the first stage of secondary education, the discontinuity is less clear just above the cutoff as the second condition for funding (i.e. a minimum number of 6 teaching hours) is more binding given the lower cutoff.

As a second condition, the cutoff point and the forcing variable for the observations should be determined independently. Lee & Lemieux (2010) argue that, when there is imprecise control over the

[3] We also ran the regression for the school years in a separate model specification. This delivers robust results.

observations' ratings, random variation is the only factor determining at which side of the cutoff the observations fall. In our setting, the cutoff was exogenously predefined at 10% (25%) of disadvantaged students, independent of the observations' actual ratings. By definition, the first half of the condition has been satisfied. On the other hand, as schools observe the cutoff and their position relatively to the cutoff, schools might engage in strategic behavior. Schools barely below the cutoff could have possibly influenced the percentage of disadvantaged students in order to receive treatment. In the evaluation of the program in primary schools Ooghe (2011) discovered this was actually the case. In our setting, however, densities for different years seem to be randomly distributed around the cutoff. We use a manipulation test to see if there was any manipulation of the forcing variable around the cutoff. More precisely, we use the local polynomial density estimators as proposed in Cattaneo, Jansson, & Ma (2017) and apply these to look for a discontinuity in density, as applied by McCrary (2008). For the second and third stage of secondary education, we find no sign of manipulation between 2009 and 2013, with p-values ranging between 0.43 and 0.99. For 2014, we observe indications of manipulation, but in the opposite direction. As manipulation in the opposite direction is unlikely, we can conclude that this variation is random and not manipulated. For the first stage of secondary education, we find no sign of manipulation in any given year. Results per year are visualized for the second and third stage in figure 3 and can be found in the Appendix A.

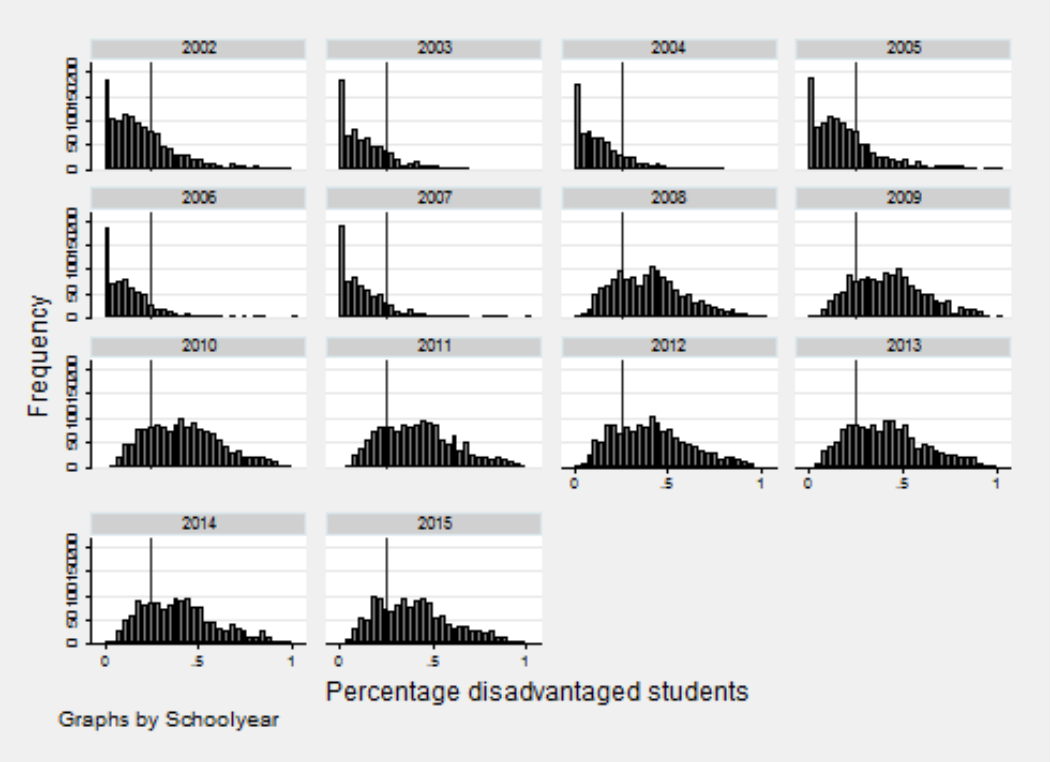

Figure 3: Probability of treatment in the second and third stage of secondary education, where 25% disadvantaged students serves as the cutoff. Data for 2011.

As a third condition, we do not observe any visible kind of sorting around the cutoff for observed characteristics as share of boys in the school, education form, age of the students, etc. This is important as it excludes an endogenous variable influencing these variables as a cause of possible differences in the outcomes around the cutoff. Given that the three conditions are met, we can conclude that a regression discontinuity design is valid identification strategy for the setting at hand.

Fuzzy regression discontinuity design

As the additional resources are assigned in cycles of three years, some schools receive funding while they are no longer eligible, or vice versa, schools do not receive funding while they are eligible in this particular year. This issue biases a sharp regression discontinuity design, and requires a fuzzy regression discontinuity identification strategy. A fuzzy RDD is a two stage method in which *"we interpret the ratio of the jump in the regression of the outcome on the covariate to the jump in the regression of the treatment indicator on the covariate as an average causal effect of treatment."* (Imbens & Lemieux, 2008, p. 619).

In the first stage, we predict for observation *i* at time *t* the probability of treatment T_{it} based on the dummy indicator for the side of the cutoff (D_{it}), the forcing variable (i.e., percentage of disadvantaged students in the school (R_{it}), a vector of covariates (X_{it}), school fixed effects ∂_s and time fixed effects γ_t to capture time invariant heterogeneity at the school and cohort level.

$$T_{it} = \alpha + \tau D_{it} + \beta R_{it} + \mu X_{it} + \partial_s + \gamma_t + \varepsilon_{it} \quad (2)$$

In this setting, (D_{it}) serves as an instrument in a two-stage least squares approach to predict the treatment value. If the cutoff dummy has a significant effect on the value of the treatment, we can use the predicted value of the treatment as a regressor to the outcome (T_{it}) in the second stage. This corrects for the fact that not all observations on one side of the cutoff have the treatment value that would be expected in a sharp discontinuity. The second stage is then estimated as follows:

$$Y_{it} = \alpha + \beta \widehat{T_{it}} + f(R_{it}) + \mu X_{it} + \partial_s + \gamma_t + \varepsilon_{it} \quad (3)$$

For a fuzzy RDD to be valid all the requirements for a sharp RDD have to be met in addition to the cutoff being a good instrument for the treatment value. We examine the latter by using first stage tests in section 6.

5. Data

We examine the effect of the equal educational opportunities program by using a rich administrative dataset at school and pupil level. The data are obtained from the Flemish Ministry of Education. We observe the entire population of pupils and schools in the time period 2002-2015. This avoids endogeneity issues arising from selection effects. At school level the data include information on the percentage of disadvantaged students (the forcing variable), school location, type of schooling (general, technical, vocational or artistic education), school size and the extra funding received. At the student level the data set contains information on the disadvantaged student indicators, student characteristics, field of study, higher educational outcomes, problematic absenteeism and grade retention.

Recall that students are considered as disadvantaged if they meet certain criteria. Table 1 and Table 2 present the share of the students for each of these 5 criteria in 2011 for the first stage and for the second and third stage of secondary education.[4] The first column presents all schools in the sample, while the second (third) column indicates the students who meet the criteria and who are below (above) the threshold of 10% (or 25%) disadvantaged students, considering a bandwidth of 8% below

[4] Table 1 and Table 2 demonstrate the data for 2011, but, except for home language, similar results are observed for other years. These can be found in the Appendix B.

and above the threshold. The bandwidth of 8% used in the tables in this section corresponds to the 'ideal' bandwidth for RDD, which was calculated using the rdrobust package in Stata (Calonico et al., 2014). Table 1 and Table 2 suggest that two EEO-indicators dominate the allocation of additional funds for disadvantaged students: pupils receiving an educational grant and the educational level of the mother. When comparing the EEO indicators for schools just below and above the cutoffs, we observe significant differences in the SES-composition of the control and treatment group. This is intuitive, as the EEO-indicators are directly correlated with the percentage of disadvantaged students. We need to account for this selection effect in the regression analyses and as such we will include the separate EEO-indicators as covariates.

Table 1: Distribution on the Equal Educational Opportunity indicators - Students are considered as disadvantaged if they meet one of these five criteria. Data for 2011 – First stage of secondary education.

EEO-indicators	All schools	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	28.00%	9.29%	14.97%	0.000
Traveling population	0.19%	0.00%	0.002%	0.000
Homeless	0.75%	0.00%	0.13%	0.000
Education mother	26.79%	4.1%	8.74%	0.000
Home language	15.00%	7.68%	5.00%	0.000

Table 2: Distribution on the Equal Educational Opportunity indicators - Students are considered as disadvantaged if they meet one of these five criteria. Data for 2011 – Second and third stage of secondary education.

EEO-indicators	All schools	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	25.3%	19.5%	24.3%	0.000
Traveling population	0.06%	0.01%	0.05%	0.000
Homeless	0.30%	0.08%	0.26%	0.000
Education mother	23.7%	14.0%	21.6%	0.000
Home language	9.6%	5.6%	7.0%	0.000

Table 3 and Table 4 provide some descriptive statistics of the data for the year 2011 (other years in Appendix C). Most variables differ significantly below and above the threshold. For the first stage of secondary education, we observe differences for all indicators, except for school size which does not significantly differ. The average additional teaching hours, 14.11, is higher here than in the second and third stage of secondary education. The maximum is over 150 additional teaching hours for one school. Considering the smaller school size, this is a clear indicator that the first stage of secondary education receives more additional hours per student on average.

Table 3: Descriptive statistics of the student characteristics for all schools (column 1), for schools below the threshold (column 2) and above the threshold (column 3). Data for 2011 – First stage of secondary education

Student characteristics (student level)	All schools	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Belgian Nationality	91.81%	97.69%	96.36%	0.004
Special needs primary education	3.74%	0.09%	0.37%	0.000
Age (in January)	13.79	13.5	13.55	0.000
Male	50.92%	51.55%	46.42%	0.000
Integration coaching disabled students	43.71%	17.57%	31.89%	0.000
School size	239 (14-669)*	273	280	0.064
Additional EEO teaching hours	14.11 (0-156)*	0	4.90	0.000

* Minimum and maximum value in brackets

Table 4: Descriptive statistics of the student characteristics for all schools (column 1), for schools below the threshold (column 2) and above the threshold (column 3). Data for 2011 – Second and third stage of secondary education

Student characteristics (student level)	All schools	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Belgian Nationality	94.87%	96.57%	96.30%	0.0335
General education	39.47%	57.02%	21.48%	0.000
Technical education	25.69%	28.17%	45.56%	0.000
Vocational education	30.51%	9.29%	25.46%	0.000
Artistic education	2.17%	5.52%	4.81%	0.000
Special needs primary education	3.33%	1.27%	3.52%	0.000
Age (in January)	16.25	15.75	16.35	0.000
Male	49.93%	45.87%	51.99%	0.000
Integration coaching disabled students	49.2%	41.33%	58.25%	0.000
School size	533 (12-1599)*	470	556	0.000
Additional EEO teaching hours	10.2 (0-95)*	0	10.3	0.000

* Minimum and maximum value in brackets

For the second and third stage of secondary education, this difference is mainly explained by the set of education forms on either side. As the percentage of students in general education on the left side of the cutoff is three times as high as on the right side, there is a clear difference between both subgroups. With respect to the students' nationality we do not observe a strong difference between schools in the treatment and control group. Nevertheless, the overall average suggests that there are more foreign[5] students in schools with more disadvantaged students. We observe a higher percentage of students with a special needs background above the cutoff than below the cutoff. This difference can also be explained by the education form differences. Schools above the cutoff are slightly larger than those below. Most likely this is because larger schools are often located in cities that also have

[5] This indicator describes nationality rather than ethnicity. Second and third generation immigrants often have the Belgian nationality and are as such not foreign.

lower SES-scores on average. The average school on the right side of the cutoff, receives 10.3 additional EEO teaching hours. This is slightly less than half of a FTE in the Flemish educational system. With a maximum of 95, the additional EEO teaching hours fund a substantial part of the teaching force in multiple schools.

Table 5 and Table 6 present descriptive statistics for the outcome variables used in the analysis. There are 4 relevant outcome variables. First, consider grade retention. We define grade retention by comparing a student's grade in year T to the grade in year T+1 and deduct 1 from this difference. This way grade retention is 0 when the student does not have to repeat any grades. If this difference is smaller than zero, we assume the student failed the year. This value can be smaller than -1, when a student switches tracks and as such is essentially going back one grade. Positive values are present when students skip one or more years.

Second, a student is considered as problematically absent from when he/she is absent for more than 30 half school days. In general, (problematic) absenteeism increases exponentially with the percentage of disadvantaged students. Around the cutoff, however, we can assume the distribution to be continuous. As is clear from the total maximum of over 30%, absenteeism is an important issue in many schools with a lot of disadvantaged students. There is significantly more problematic absenteeism in schools above the cutoff, which can, again, be explained by the difference in school composition.

Third, we consider the outcomes in higher education. For higher educational outcomes we look at the level of higher education they enroll in directly after secondary education and at the first degree they attain. We make a distinction between academic bachelors and professional bachelors. Starting a bachelor is highly dependent on the education form and on the specific study field, with students in general education being much more likely to enroll in academic bachelors than any other students from other education forms and students in vocational education being less likely to start a bachelor. There is a bias towards the later years, for the outcome of achieving a degree. Students enrolling in higher education after 2012, could not have attained a degree yet, while students that enrolled in 2010 for example, would have had 5 years to finish their bachelor. The same is true for starting a degree for analysis for the first cycle of secondary education, for this reason we use 2009 data in Table 5. Most of this difference can however be explained by additional cohorts entering higher education. The variable as such is not stable over time, but the relation of students entering academic and professional bachelors remains similar. As in all the descriptive tables, we use the 2011 data in the document. Additional information can be found in appendix D. For grade retention we include minimum and maximum values between brackets.

Table 5: Descriptive statistics of the outcomes at student level. Data for 2009 – First stage of secondary education

Outcomes (student level)	All students	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Grade retention	-0.033 (-2; 1)*	-0.018 (-1; 1)*	-0.015 (-1; 1)*	0.0464
Problematic absenteeism	0.75%	0.0%	0.02%	0.0849
Professional bachelor start	27.9%	22.47%	32.07%	0.000
Academic Bachelor start	25.04%	58.03%	46.05%	0.000

* Minimum and maximum value in brackets

Table 6: Descriptive statistics of the outcomes at student level. Data for 2011– Second and third stage of secondary education

Outcomes (student level)	All students	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Grade retention	-0.08 (-2; 3)*	-0.068 (-2; 1)*	-0.08 (-2; 1)*	0.000
Problematic absenteeism	1.51%	0.31%	0.76%	0.000
Professional bachelor start	33.09%	40.75%	41.32%	0.0831
Graduate from professional bachelor	6.47%	9.04%	7.91%	0.000
Academic bachelor start	26.06%	35.81%	16.81%	0.000
Graduate from academic bachelor	6.47%	6.12%	2.25%	0.000

* Minimum and maximum value in brackets

6. Results

Sharp regression discontinuity design

First consider the results of the sharp regression discontinuity design (RDD) to evaluate the effect of additional funding. The estimated coefficients of the sharp RDD are lower bounds of the effect of additional funding on the outcomes, as using a sharp RDD - rather than a fuzzy RDD - leads to an underestimation of the actual effect of the treatment, since it is averaged over several schools that do not receive treatment as well. In a first set of regressions, we focus on the school level as this is the unit of analysis which receives the funding. As the school level might suffer from a regression to the mean (i.e., positive and negative effects can balance each other), we analyze in a second set of regressions the effects at the student level (while controlling for school fixed effects and clustered standard errors at the school level).

Table 7 and Table 8 present the sharp RDD results at the school level for the effect of additional funding on grade retention, problematic absenteeism and higher education outcomes such as starting and finishing an academic or professional bachelor. In these regressions we include the percentage of male students, the percentage of students with the Belgian nationality, the percentage of students who went to special needs education in primary school, the number of students in the school and the average birth year of the students. We also correct for the percentage of disadvantaged students, the percentage of disadvantaged students per indicator and the squared percentage of disadvantaged students. For the outcome variables related to higher education, we additionally control for the percentage of students in a school starting this type of bachelor. The 'ideal' bandwidth corresponds to 8% on either side of the cutoff. This bandwidth is the ideal CCT bandwidth for this sharp RDD and was calculated with the rdrobust package in Stata (Calonico et al., 2014). Table 7 presents the results for first stage of secondary education while Table 8 shows the second and third stage of secondary education's results.

The estimated coefficients of D_{it} in Table 7 and Table 8 suggest that there is no causal effect of the EEO-program on the various outcome variables. The only exception is a slightly significant positive effect on the variable grade retention (i.e. actual grade retention is reduced) in first stage of secondary education. The estimated coefficients of $(R_{it} - c)$ and $(R_{it} - c)^2$ allow to calculate the slope of the forcing variable (i.e. the share of disadvantaged students in a school) at and near the cutoff point. Since

we estimate a quadratic form, the slope is not necessarily constant (unless the quadratic term is not significant). We only discuss the coefficients which are significantly different from 0. For the first stage of secondary education, we do not observe a significant relationship between the share of disadvantaged students in the school and grade retention or starting an academic bachelor. We do observe a positive relationship with starting in a professional bachelor. For the first stage of secondary education we do not include attaining a bachelor as an outcome, as they are too young at the time of this research. For the second and third stage of secondary education, the results indicate that the more disadvantaged students in the school, the higher the value of the grade retention variable. This however is only true on the right side of the cutoff as the quadratic term is the only significant one (left of the cutoff, we observe a negative relationship). More disadvantaged students also indicate more students that start a professional bachelor, although a small decline is observed at the high end of the cutoff because of the quadratic term. Schools with more disadvantaged students show less students that start an academic bachelor, less that graduate from a professional bachelor and the less graduate from an academic bachelor. Although for these last two the quadratic term inverts this relationship for the schools that are over 4% removed from the cutoff. The weaker relationship with disadvantaged students in the first stage of secondary education may be explained both by the lower percentage of disadvantaged students around the cutoff and by the smaller jump of treatment around the cutoff. Overall these results seem to indicate that there is no significant effect of additional funding on educational outcomes.

Table 7: Analysis at school level of the effect of the EEO-program on outcomes in the first stage of secondary education through sharp RDD

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB
D_{it}	0.00412*	-0.000239	-0.00267	0.00173
	(0.00221)	(0.000212)	(0.00551)	(0.00720)
$(R_{it} - c)$	-0.000128	0.00276	0.198**	-0.148
	(0.0355)	(0.00339)	(0.0881)	(0.115)
$(R_{it} - c)^2$	-0.147	-0.0647*	0.0864	0.191
	(0.399)	(0.0377)	(0.980)	(1.282)
N	850	1,041	1,041	1,041
R^2	0.122	0.088	0.855	0.912

Note: Robust standard errors in parentheses. D_{it} indicates both on what side of the cutoff student *i* at time *t* is positioned; R_{it} is the forcing or running variable percentage of disadvantaged students, c represents the cutoff; N denotes the number of observations. Additional covariates used: percentage of male students, percentage of students with the Belgian nationality, the percentage of students who went to special needs education in primary school, the number of students in the school, the average birth year of the students, percentage of disadvantaged students per indicator. The bandwidth around the cutoff is 8%. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Analysis at school level of the effect of the EEO-program on outcomes in the second and third stage of secondary education through sharp RDD

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
D_{it}	0.00454	0.000461	0.0103	-0.0136	0.00206	-0.000817
	(0.00500)	(0.000953)	(0.0108)	(0.0132)	(0.00380)	(0.00350)
$(R_{it} - c)$	0.0431	0.00160	0.778***	-1.091***	-0.109*	-0.167***
	(0.0764)	(0.0144)	(0.163)	(0.199)	(0.0579)	(0.0528)
$(R_{it} - c)^2$	1.825***	-0.0102	-5.445***	1.126	1.228**	0.918**
	(0.644)	(0.123)	(1.391)	(1.697)	(0.492)	(0.449)
N	1,067	1,291	1,291	1,291	1,291	1,291
R^2	0.283	0.138	0.676	0.608	0.867	0.558

Note: Robust standard errors in parentheses. D_{it} indicates both on what side of the cutoff student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: percentage of male students, percentage of students with the Belgian nationality, the percentage of students who went to special needs education in primary school, the number of students in the school, the average birth year of the students, percentage of disadvantaged students per indicator. The bandwidth around the cutoff is 8%. *** p<0.01, ** p<0.05, * p<0.1

To avoid a regression to the mean and to increase the power of the analysis, we repeat the analysis at student level. In Table 9 and Table 10 we present the sharp RDD results at the student level for the effect of additional funding on grade retention, problematic absenteeism and higher education outcomes such as starting and finishing an academic or professional bachelor. We include the same control variables as at the school level, but at the individual level, rather than averaged over all students in a specific school. We also correct for the effect of percentage of disadvantaged students and the effect of the squared percentage of disadvantaged students. For finishing the professional or academic bachelor we again control for starting this type of bachelor. At the student level, the optimal bandwidth is determined at 4.7% on either side of the cutoff. Table 9 presents the results for the first stage of secondary education, while Table 10 shows those for the second and third stage of secondary education.

In the first stage of secondary education, the results in Table 9 provide evidence that the program had no effect on any of the outcomes in this stage. For the second and third stage of secondary education, the results in Table 10 suggest that there is no significant impact of the EEO-program on any of the observed outcomes either. Nevertheless, it should be noted that the explained variation (R^2) is rather low for all regressions regarding grade retention and problematic absenteeism. This indicates a majority of the variation for these outcomes is not explained by our model specification, but instead depends on unobserved variables.

Table 9: Analysis at student level of the effect of the EEO-program on outcomes in the first stage of secondary education through sharp RDD

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB
D_{it}	0.00322	-0.000243	0.00420	0.00701
	(0.00283)	(0.000322)	(0.00644)	(0.00759)
$(R_{it} - c)$	-0.0295	0.00471	0.146	-0.528***
	(0.0565)	(0.00538)	(0.123)	(0.136)
$(R_{it} - c)^2$	-1.431	-0.0636	-0.619	1.948
	(1.208)	(0.102)	(2.720)	(3.195)
N	124,705	150,573	150,573	150,573
R^2	0.007	0.005	0.184	0.363

Note: Clustered standard errors at the school level in parentheses. D_{it} indicates both on what side of the cutoff student i at time t is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Analysis at student level of the effect of the EEO-program on outcomes in the second and third stage of secondary education through sharp RDD

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
D_{it}	-0.00247	0.000660	-0.00686	-0.0285	-0.00245	-0.00262
	(0.00830)	(0.00102)	(0.0135)	(0.0241)	(0.00429)	(0.00325)
$(R_{it} - c)$	0.0514	0.0183	0.335	-1.028***	-0.0837	-0.00797
	(0.128)	(0.0187)	(0.308)	(0.394)	(0.0858)	(0.0561)
$(R_{it} - c)^2$	5.427**	-0.381	-3.699	-5.304	1.925	1.639
	(2.743)	(0.433)	(7.143)	(9.956)	(1.810)	(1.225)
N	183,236	298,468	298,468	298,468	298,468	298,468
R^2	0.023	0.006	0.111	0.081	0.180	0.128

Note: Clustered standard errors at the school level in parentheses. D_{it} indicates both on what side of the cutoff student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Since the differences between the three main tracks in the second and third stage of secondary education are significant, as shown in Table 4, we run the sharp regression discontinuity again for each education form. In Table 11, Table 12 and Table 13 we show the results for general, technical and vocational education. For secondary art education the power of the analysis is too low to draw any meaningful conclusions. In neither type of education, the additional funding seems to have a significant effect on any of the outcomes. For vocational education we leave out the academic bachelor outcomes as these are not relevant for this type of education. In vocational education the insignificance could be because of the small amount of observations in this group. The consistency over the three main tracks however, seems to indicate the effects are overall rather limited.

Table 11: Analysis at student level of the effect of the EEO-program –Restricted sample to students in general education

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Finish PB	(6) Finish AB
D_{it}	-0.000236	0.000952	0.00702	-0.0183	-0.00336	-0.00465
	(0.00686)	(0.000628)	(0.0143)	(0.0147)	(0.00512)	(0.00517)
$(R_{it} - c)$	-0.0946	-0.0126	0.147	-0.0782	-0.0726	0.0300
	(0.126)	(0.0125)	(0.276)	(0.286)	(0.111)	(0.0847)
$(R_{it} - c)^2$	-0.293	-0.146	2.119	-7.044	-0.344	1.661
	(2.891)	(0.269)	(7.017)	(7.133)	(2.445)	(2.136)
N	77,265	117,342	117,342	117,342	117,342	117,342
R^2	0.024	0.005	0.100	0.154	0.221	0.123

Note: Clustered standard errors at the school level in parentheses. D_{it} indicates both on what side of the cutoff student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Table 12: Analysis at student level of the effect of the EEO-program –Restricted sample to students in technical education

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Finish PB	(6) Finish AB
D_{it}	-0.00443	-0.000709	-0.00626	0.00476	0.00727	0.000427
	(0.0123)	(0.00112)	(0.0163)	(0.00958)	(0.00702)	(0.000877)
$(R_{it} - c)$	0.179	0.0156	-0.189	0.00337	-0.117	-0.000957
	(0.195)	(0.0189)	(0.356)	(0.143)	(0.121)	(0.0162)
$(R_{it} - c)^2$	12.08**	-0.205	0.725	-5.875***	6.833**	0.710*
	(3.795)	(0.366)	(7.496)	(3.043)	(2.892)	(0.372)
N	68,179	112,824	112,824	112,824	112,824	112,824
R^2	0.028	0.004	0.228	0.022	0.183	0.050

Note: Clustered standard errors at the school level in parentheses. D_{it} indicates both on what side of the cutoff student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Table 13: Analysis at student level of the effect of the EEO-program –Restricted sample to students in vocational education

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Finish PB
D_{it}	-0.0140	0.00249	-0.00196	-0.000444
	(0.0101)	(0.00390)	(0.0168)	(0.00157)
$(R_{it} - c)$	0.278	0.0187	-0.196	0.00782
	(0.234)	(0.0658)	(0.242)	(0.0383)
$(R_{it} - c)^2$	1.973	-2.156	-2.385	-0.518
	(4.740)	(1.701)	(6.228)	(1.093)
N	30,789	53,277	53,277	53,277
R^2	0.017	0.006	0.099	0.088

Note: Clustered standard errors at the school level in parentheses. D_{it} indicates both on what side of the cutoff student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Fuzzy regression discontinuity design

The sharp RDD only yields a less accurate lower bound for the true effect of the EEO-program. First consider the 25% cutoff. The first stage regression of this instrumental variable approach shows that

we can use the cutoff as a valid instrument for receiving additional funding. In Table 14 we show the first stage results regarding the cutoff and the percentage of disadvantaged students. The full first stage results can be found in Appendix E. The instrument D_{it} has a significant positive effect on receiving additional funding and the Sanderson Windmeijer multivariate F test of excluded instruments yields a significantly high value (F statistic of 17.20). This implies that the fuzzy RDD is valid approach. Second, consider the 10% cutoff. In this application, the Sanderson Windmeijer test provides us with small F-values (0.12). As such, the weak first stage suggests that a fuzzy RDD is not an appropriate technique for lower secondary education. One possible reason for the weak instrument is the existence of a second condition for schools to receive additional funding. As mentioned before, a school needs to generate a minimum of 6 additional hours in order to actually receive the funding. If schools only start generating the required percentage of hours at a percentage higher than 10%, this could (at least partly) explain the weakness of the instrument. Nevertheless, also using a second instrument does not provide meaningful first stage outcomes.

Table 14: First stage regression results for higher secondary education

Additional funding$_{it}$	Coef.	Std. Error
D_{it}	.4330692***	.104414
R_{it}	7.816772***	2.543706

Additional covariates used: percentage of male students, percentage of students with the Belgian nationality, the percentage of students who went to special needs education in primary school, the number of students in the school, the average birth year of the students, percentage of disadvantaged students per indicator.*** p<0.01, ** p<0.05, * p<0.1

Table 15 and Table 16 present the fuzzy RD results at the school level for the effect of additional funding on grade retention, problematic absenteeism and higher education outcomes such as starting and finishing an academic or professional bachelor. In these regressions we again include the percentage of male students, the percentage of students with the Belgian nationality, the percentage of students who went to special needs education in primary schooling, the number of students in the school and the average birth year of the students. We also correct for the effect of percentage of disadvantaged students and the effect of percentage of disadvantaged students per indicator. For finishing the professional or academic bachelor we also control for starting this type of bachelor. Here we use the optimal bandwidth for the sharp RDD of 8% (Table 15) and as a robustness check we include the 10% (Table 16) bandwidth. Since for a fuzzy RDD the optimal bandwidth is often a bit larger (Calonico et al., 2014). For the fuzzy RDD we do not use a quadratic term as the added value of an additional covariate is zero.

The results in Table 15 suggest that there are no significant effects of the EEO-program on grade retention, problematic absenteeism, starting an academic and finishing a professional bachelor. In Table 16 we observe for starting a professional bachelor and finishing an academic bachelor slightly significant results at the 10% bandwidth. This difference in finding can be attributed to the increased power of the larger bandwidth, or because of an endogenous difference between both groups. One possible source of endogeneity is coming from the education form. As schools below the cutoff are predominantly general education schools, while above the cutoff there are more frequently technical and vocational schools, these differences should be taken into account. When looking at the student level we will include the effect of additional funding on each education form separately.

Table 15: Second stage analysis at school level of the effect of the EEO-program on outcomes in the second and third stage of secondary education through a fuzzy RDD

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
T_{it}	0.0115	0.00140	0.0384	-0.0423	0.00461	0.00518
	(0.0169)	(0.00284)	(0.0328)	(0.0394)	(0.0113)	(0.00643)
$(R_{it} - c)$	0.00740	-0.00433	0.577**	-0.906***	-0.117	0.0457
	(0.136)	(0.0236)	(0.272)	(0.327)	(0.0949)	(0.0527)
N	1,067	1,291	1,291	1,291	1,291	1,291
R^2	0.266	0.140	0.665	0.606	0.866	0.833

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations Additional covariates used: percentage of male students, percentage of students with the Belgian nationality, the percentage of students who went to special needs education in primary school, the number of students in the school, the average birth year of the students, percentage of disadvantaged students per indicator. The bandwidth around the cutoff is 8%. *** p<0.01, ** p<0.05, * p<0.1

Table 16: Robustness test of the second stage analysis at school level of the effect of the EEO-program on outcomes in the second and third stage of secondary education through a fuzzy RDD (bandwidth equals 10%)

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
T_{it}	0.0183	0.00159	0.0394*	-0.0332	-0.000639	0.0110**
	(0.0116)	(0.00198)	(0.0234)	(0.0285)	(0.00813)	(0.00501)
$(R_{it} - c)$	-0.0129	-0.00864	0.516***	-1.025***	-0.0391	0.0251
	(0.0824)	(0.0148)	(0.175)	(0.213)	(0.0608)	(0.0371)
N	1,416	1,694	1,694	1,694	1,694	1,694
R^2	0.276	0.183	0.658	0.639	0.865	0.841

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: percentage of male students, percentage of students with the Belgian nationality, the percentage of students who went to special needs education in primary school, the number of students in the school, the average birth year of the students, percentage of disadvantaged students per indicator. The bandwidth around the cutoff is 10%. *** p<0.01, ** p<0.05, * p<0.1

Table 17 presents the fuzzy RD results at the student level for the effect of additional funding on grade retention, problematic absenteeism and higher education outcomes such as starting and finishing an academic or professional bachelor. Covariates included in these regressions are gender, a dummy for native language (Dutch vs non-Dutch), each of the four disadvantage indicators, a dummy for the Belgian nationality, a dummy if the student went to special needs education in primary schooling and the number of students in the school. We also correct for the effect of percentage of disadvantaged students in the school and for the track the student is in (general, technical, arts or vocational education (general education serves as the baseline). Furthermore, we cluster the standard errors at the school level. For finishing the professional or academic bachelor we also control for starting this type of bachelor. Here we use the optimal bandwidth for the sharp RDD of 4.7%.

Table 17: Robustness test 2 of the second stage analysis at student level of the effect of the EEO-program on outcomes in the second and third stage of secondary education through a fuzzy RDD

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
T_{it}	-0.0226	0.00319	0.00132	-0.0615	-0.00333	-0.0114
	(0.0437)	(0.00441)	(0.0414)	(0.0542)	(0.0177)	(0.0138)
$(R_{it} - c)$	0.261	-0.0249	0.0298	0.618	0.0437	0.129
	(0.462)	(0.0505)	(0.497)	(0.594)	(0.207)	(0.161)
Vocational edu	-0.00337	0.0130***	-0.0961***	-0.369***	-0.0378***	-0.00970***
	(0.00518)	(0.00162)	(0.0112)	(0.0124)	(0.00354)	(0.00173)
Technical edu	-0.0312***	0.00127**	0.240***	-0.323***	-0.0115***	-0.0164***
	(0.00584)	(0.000606)	(0.0120)	(0.0115)	(0.00306)	(0.00170)
Arts education	-0.0850***	0.0142***	0.0158	-0.0772***	-0.0299***	-0.0126***
	(0.0153)	(0.00291)	(0.0155)	(0.0169)	(0.00537)	(0.00303)
N	183,236	298,468	298,468	298,468	298,468	298,468
R^2	0.0162	0.009	0.178	0.223	0.180	0.129

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators and schoolyear. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

We find no significant effect of additional funding or even percentage of disadvantaged students for any of the measured outcomes. The insignificance of the percentage of disadvantaged students may be explained by the small bandwidth and the fact that covariates for all the disadvantaged student indicators on the individual level were included. For both grade retention and problematic absenteeism, we observe low values for R-squared, concluding that these outcomes are largely influenced by unobserved characteristics.

We also use the same fuzzy RDD to look at the effect on several subgroups of schools and students and find no significant effects on any of these subgroups (Disadvantaged students, educational grant receiving students, students with lowly educated mothers, small schools, large schools). These results can be found in Appendix F.

We also show the rather high and significant effects of the track the students are in on every measured outcome. Both technical and arts education show significantly more grade retention than general education schools. When looking at problematic absenteeism there is a higher rate of absenteeism in all three non-general education tracks. The large differences on the choice of a bachelor and the probability of attaining a degree lead us to run the fuzzy RDD for general, technical and vocational education separately to look for track-specific effects of the additional funding (Table 18). For the arts track, we do however not have a sufficient amount of observations around the cutoff.

Table 18: Robustness test 3 of the second stage analysis at student level of the effect of the EEO-program on outcomes in the second and third stage of secondary education through a fuzzy RDD

General Education VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Finish PB	(6) Finish AB
T_{it}	0.00410	0.00384	0.0309	-0.113*	-0.0214	-0.0188
	(0.0327)	(0.00347)	(0.0622)	(0.0660)	(0.0248)	(0.0251)
$(R_{it} - c)$	-0.120	-0.0315	0.0671	0.839	0.119	0.138
	(0.288)	(0.0316)	(0.604)	(0.604)	(0.239)	(0.225)
N	77,265	117,342	117,342	117,342	117,342	117,342
R^2	0.017	0.001	0.087	0.099	0.203	0.122

Vocational Education VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB
T_{it}	-0.0793	0.0140	0.00826	0.000898
	(0.0659)	(0.0179)	(0.0663)	(0.00692)
$(R_{it} - c)$	1.047	-0.142	-0.316	-0.0117
	(0.814)	(0.229)	(0.817)	(0.100)
N	30,789	53,277	53,277	53,277
R^2	0.011	0.007	0.066	0.087

Technical Education VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Finish PB	(6) Finish AB
T_{it}	-0.0577	-0.00478	-0.0385	0.0294	0.0238	0.00102
	(0.111)	(0.00695)	(0.100)	(0.0542)	(0.0455)	(0.00464)
$(R_{it} - c)$	0.829	0.0666	0.303	-0.305	-0.258	-0.00477
	(1.310)	(0.0869)	(1.278)	(0.662)	(0.570)	(0.0598)
N	68,179	112,824	112,824	112,824	112,824	112,824
R^2	0.009	0.002	0.170	0.014	0.174	0.050

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

For neither of the three evaluated tracks we find any significant effects on a single outcome. We again notice small values for R squared for grade retention and problematic absenteeism. The fuzzy RD results, both at student and school level, seem to indicate the additional funding had little to no effect on the schools within the 4.7% to 10% bandwidth that received these funds.

7. Discussion

It should be stressed that the results reported in this paper are based on estimations within the bandwidth considered (i.e. 8% below and above the cutoff of 10% for the first stage of secondary education and 8% below and above the cutoff of 25% for the second and third stage of secondary education for most of the estimates). Given the nature of a regression discontinuity design it is not possible to make credible claims (far) outside this interval. Reliable causal estimates can only be made within a reasonable distance from the threshold.

Although schools below the cutoff do not receive additional teacher hours (and schools above the cutoff do receive additional funds), pupils that changed schools (e.g. from primary to secondary) or move from the first stage to the second stage of secondary education, may have been enrolled in a school on the other side of the cutoff than their current school. Pupils who received EEO treatment in their previous school might thus contaminate the actual control group (i.e. schools below the cutoff).

Within the bandwidth considered, we do not find any consistent significant effects of the additional funding on grade retention, problematic absenteeism and higher education outcomes such as starting and finishing an academic or professional bachelor. Several robustness checks (e.g. estimates at school level vs. estimates at individual level, sharp RDD vs. fuzzy RDD, altering the bandwidth, etc.) and separate estimates on various subgroup of schools and individuals (e.g. small vs. large schools, disadvantaged students in general and those that indicate low educational level mother or educational grants) did not lead to different conclusions. These results are in line with the international empirical literature on the causal impact of interventions to foster equal education opportunities: these analyses often show either small, insignificant or conflicting results.

Not finding consistent significant effects, is consistent with the international literature focusing on interventions to foster equal educational opportunities, however. A recent review of specific interventions in equity funding by De Witte, Smet & Van Assche (2017) concludes that many policy interventions have limited or mixed effects, depending on the specific setting and context. In general, programs in developing countries outperform their counterparts in developed countries and performance pay and higher teacher wages seem to reduce teacher turnover, especially in disadvantaged schools. The lack of consistent positive results of interventions (especially in developed countries) might indicate that many developed countries are, given the current technology, operating at (or near) the top of the educational production function. A second hypothesis is that we may expect too much from schools regarding equal opportunities: low SES (and its implications) is multidimensional and should be tackled not only by education, but may also require persistent attention and involvement of other policy areas, e.g. housing, labour market, welfare, health, language, … (De Witte, Smet & Van Assche, 2017).

Several other explanations for the small educational gains can be found in a recent study on the Flemish EEO-program (Franck, Nicaise, & Lavrijsen, 2016). They address five key effects that limit the effectiveness of this part of the program. First, there is no uniform and consistent definition of the target population. As the decree stipulates that the additional hours should benefit all students, while aiming at problems for disadvantaged students, it is not entirely clear which students should be addressed and how. Second, the additional funding is spread over several age groups. The literature suggests that interventions at a younger age have a larger chance of succeeding. In secondary education, the results are less likely to have a significant effect on further educational outcomes as the accumulated effects of the first 12 years may heavily outweigh the effects that can still be mitigated. Third, not every school that is entitled to additional funding faces the same type of disadvantaged population. The program is aimed to mitigate effects with regards to language, home situation, financial and cultural luggage. As such not every school has the same initial capacity to make use of the additional hours, which in turn might limit the effectiveness. Fourth, they suggest that the EEO-program does not have clear goals. This makes it hard to implement the program and to find consistent significant effects across all schools. The program may very well have had a positive impact on one or two measured outcomes in several schools. As there is no common objective, however, these positive effects may go unnoticed when looking at the entire population. A fifth reason may be the inadequate use of additional EEO operating expenses.

Another cause of the lack of results could be the position of the cutoff. As both 10% and 25% are rather low, the effect of additional funding on schools within the bandwidth may be rather limited: in the first stage of secondary education, schools just right of the threshold of 10% received on average 4.9 additional teacher hours, while in the second and third stage of secondary education, schools just right of the threshold of 25% received on average 10.3 additional teacher hours; equaling approximately 0.25 FTE and 0.5 FTE, respectively (i.e. approximately 1% of their total amount of teacher-hours). This additional amount of teacher staff that can be hired may be too small for schools to develop and implement an efficient policy to foster equal education opportunities and thus to generate a significant impact. It could be possible that the additional funding does have an impact in schools with higher concentrations of disadvantaged students, since they would generate more additional hours, allowing them to hire an amount of FTE that would enable them to effectively pursue a school policy to mitigate the impact of problems related to a high concentration of disadvantaged pupils. However, since there is no exogenously defined threshold (except for the current and relatively low thresholds of 10% and 25%) for these schools, nor is detailed data available before and after implementation of the EEO-program, which would allow to use quasi-experimental techniques to credibly estimate causal relationships, it is not possible to draw any causal conclusions on these other schools.

8. Conclusion

Using sharp and fuzzy regression discontinuity designs we evaluated the effect of additional funds for disadvantaged students. We used state-of-the-art methodologies, both for evaluating the effects of additional funding and for calculating the appropriate corresponding bandwidths. Our conclusions are robust for the sharp and fuzzy RDD's, both at the school and student level. We observe little to no effects of the additional funding on problematic absenteeism, grade retention and higher education outcomes (starting and finishing a professional or academic bachelor).

As we cannot observe any RDD results on the first stage of secondary education and except for the significance level the coefficients, the fuzzy and sharp results seem consistent, it is highly unlikely there is any significant effect of the additional funding on the measured outcomes within the bandwidth considered. This result is also found with respect to the second and third stage of secondary education. Neither while using the sharp or fuzzy regression discontinuity design we find any significant effects on the outcomes.

The lack of consistent causal evidence indicates that the program does not improve the measured outcomes for disadvantaged students. At the same time, however, the indicators used to distribute the additional funds seem to have significant negative effects on the educational outcomes of the students. Furthermore, the lack of causal evidence does not exclude (positive) effects on other, unmeasured aspects of school life. The current restrictions with regard to the use of the funding, however, do not seem to provide additional positive effects on the intended educational outcomes. This is suggested with regards to the schools considered in this paper, with relatively low percentages of disadvantaged students and EEO-funding.

A generic recommendation is that policy makers should already think about the evaluation of a policy or intervention before the actual implementation of a new policy measure. It is important to set clear goals of the policy measure and to define when and how the policy should be evaluated. Setting clear and transparent goals is important for schools: knowing in advance how they will be evaluated allows

them to set goals at the micro level that are aligned with the goals formulated at the macro level and will help to avoid fuzziness and frustration. In addition, well defined goals will facilitate the evaluation process. In addition, relevant indicators for the evaluation should be identified or created and a baseline measurement should be performed.

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Appendix A: Manipulation tests

A.1: Manipulation tests second and third stage of secondary education

	2009	2010	2011	2012	2013	2014
T	-0.0025	0.0811	-0.0059	0.7850	.5788	-1.6580
P>|T|	0.9980	0.9353	0.9953	0.4325	.5627	.0973
N	677	698	695	695	691	686

Note: We use a manipulation test to see if there was any manipulation of the forcing variable around the cutoff. More precisely, we use the local polynomial density estimators as proposed in Cattaneo, Jansson, & Ma (2017) and apply these to look for a discontinuity in density, as applied by McCrary (2008). For the second and third stage of secondary education, we find no sign of manipulation between 2009 and 2013, with p-values ranging between 0.43 and 0.99. For 2014, we observe indications of manipulation, but in the opposite direction. As manipulation in the opposite direction is unlikely, we can conclude that this variation is random and not manipulated.

A.2: Manipulation tests first stage of secondary education

	2009	2010	2011	2012	2013	2014
T	1.4340	-0.2045	0.1506	0.1754	1.2721	-0.3035
P>|T|	0.1516	0.8380	0.8803	0.8608	0.2033	0.7615
N	670	731	729	730	724	720

Note: We use a manipulation test to see if there was any manipulation of the forcing variable around the cutoff. More precisely, we use the local polynomial density estimators as proposed in Cattaneo, Jansson, & Ma (2017) and apply these to look for a discontinuity in density, as applied by McCrary (2008). For the first stage of secondary education, we find no sign of manipulation in any given year.

Appendix B: Descriptive statistics indicator variables

Appendix B.1: Indicator variables second and third stage of secondary education

2009

EEO-indicators	All schools	Below threshold17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	27.84%	20.15%	25.3%	0.000
Traveling population	0.1%	0.01%	0.07%	0.000
Homeless	0.26%	0.07%	0.25%	0.000
Education mother	26.72%	14.14%	21.54%	0.000
Home language	10.78%	7.53%	6.83%	0.000

2010

EEO-indicators	All schools	Below threshold17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	27.7%	20.45%	25.43%	0.000
Traveling population	0.08%	0.003%	0.026%	0.000
Homeless	0.30%	0.07%	0.26%	0.000
Education mother	26.18%	13.95%	21.25%	0.000
Home language	11.17%	6.84%	7.39%	0.000

2011

EEO-indicators	All schools	Below threshold17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	25.3%	19.5%	24.3%	0.000
Traveling population	0.06%	0.01%	0.05%	0.000
Homeless	0.30%	0.08%	0.26%	0.000
Education mother	23.7%	14.0%	21.6%	0.000
Home language	9.6%	5.6%	7.0%	0.000

2012

EEO-indicators	All schools	Below threshold17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	27.92%	20.60%	25.30%	0.000
Traveling population	00.10%	00.015%	00.05%	0.000
Homeless	00.38%	00.15%	00.30%	0.000
Education mother	25.70%	14.36%	21.49%	0.000
Home language	12.38%	06.77%	06.91%	0.000

2013

EEO-indicators	All schools	Below threshold17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	27.08%	20.01%	24.11%	0.000
Traveling population	00.11%	00.02%	00.05%	0.000
Homeless	00.45%	00.19%	00.31%	0.000
Education mother	25.43%	14.07%	21.39%	0.000
Home language	13.09%	07.15%	08.21%	0.000

2014

EEO-indicators	All schools	Below threshold17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	27.99%	20.97%	25.62%	0.000
Traveling population	00.13%	00.01%	00.04%	0.000
Homeless	00.44%	00.17%	00.33%	0.000
Education mother	13.87%	08.60%	07.91%	0.000
Home language	25.22%	14.74%	21.59%	0.000

Appendix B.2: Indicator variables first stage of secondary education

2009

EEO-indicators	All schools	Below threshold2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	30.31%	09.74%	15.58%	0.000
Traveling population	00.22%	00.01%	00.002%	0.000
Homeless	00.55%	00.01%	00.05%	0.000
Home language	13.85%	06.82%	06.27%	0.000
Education mother	28.24%	03.98%	09.18%	0.000

2010

EEO-indicators	All schools	Below threshold2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	29.19%	09.57%	15.71%	0.000
Traveling population	00.17%	0%	00.01%	0.000
Homeless	00.51%	0%	00.04%	0.000
Home language	14.03%	06.88%	05.77%	0.000
Education mother	27.13%	04.15%	08.95%	0.000

2011

EEO-indicators	All schools	Below threshold2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	28.00%	9.29%	14.97%	0.000
Traveling population	0.19%	0.00%	0.002%	0.000
Homeless	0.75%	0.00%	0.13%	0.000
Home language	15.00%	7.68%	5.00%	0.000
Education mother	26.79%	4.1%	8.74%	0.000

2012

EEO-indicators	All schools	Below threshold2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	28.50%	09.38%	15.18%	0.000
Traveling population	00.26%	0%	00.04%	0.000
Homeless	00.69%	0%	00.10%	0.000
Home language	15.62%	07.77%	05.72%	0.000
Education mother	26.31%	04.05%	08.74%	0.000

2013

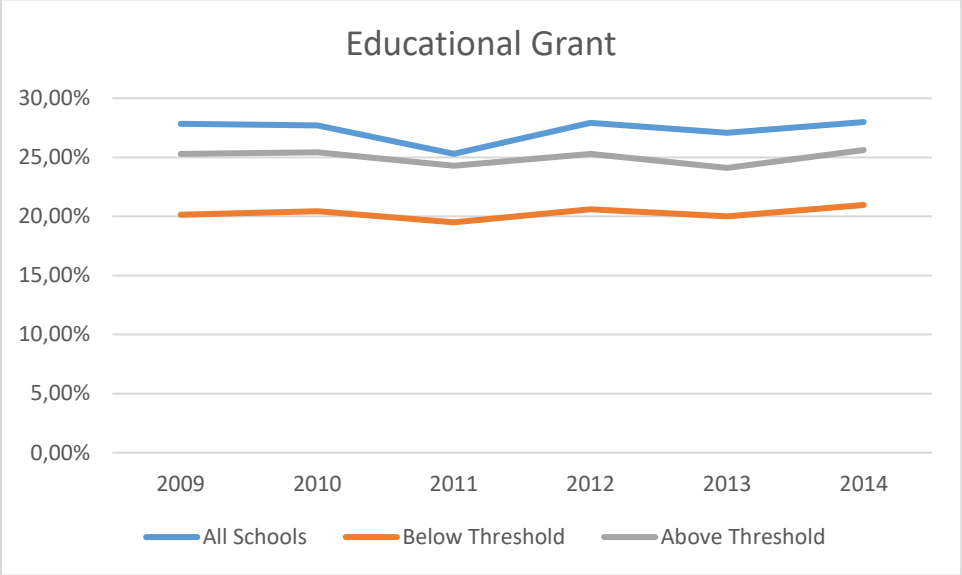
EEO-indicators	All schools	Below threshold2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	27.25%	09.24%	14.61%	0.000
Traveling population	00.27%	0%	00.03%	0.000
Homeless	00.59%	00.01%	00.11%	0.000
Home language	16.78%	08.28%	07.94%	0.000
Education mother	26.17%	04.49%	08.58%	0.000

2014

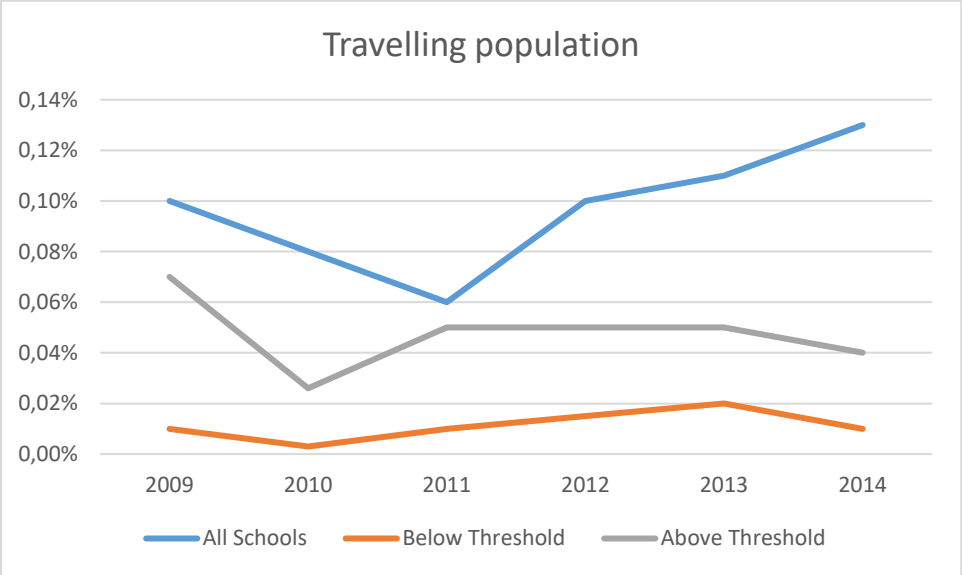
EEO-indicators	All schools	Below threshold2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Pupil receives educational grant	28.21%	08.92%	14.94%	0.000
Traveling population	00.26%	0,0%	00.03%	0.000
Homeless	00.63%	00.03%	00.10%	0.000
Home language	17.80%	08.08%	08.17%	0.000
Education mother	25.97%	04.43%	09.20%	0.000

Appendix B.3: Graphs indicator per year second and third stage of secondary education

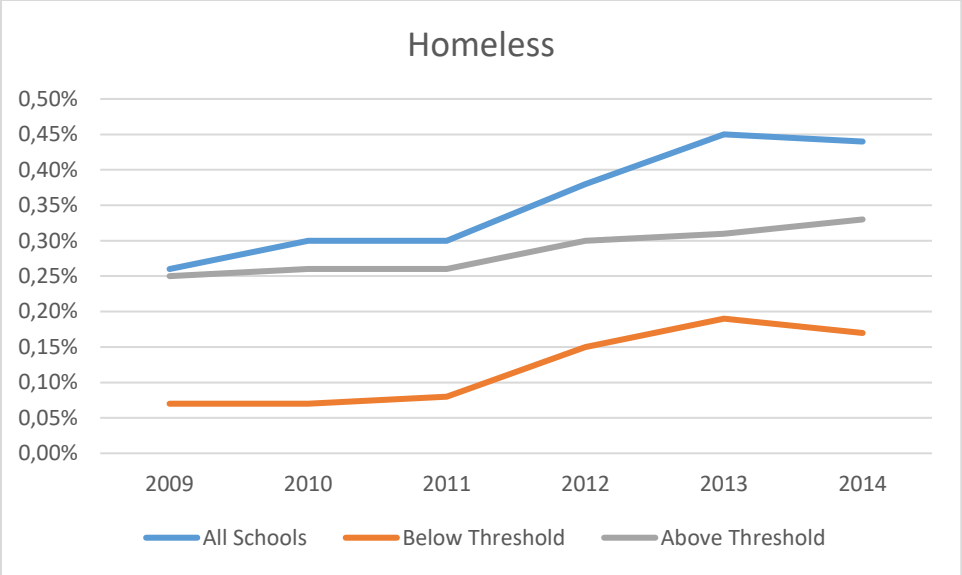
Appendix B.3.1: Educational Grant second and third stage of secondary education



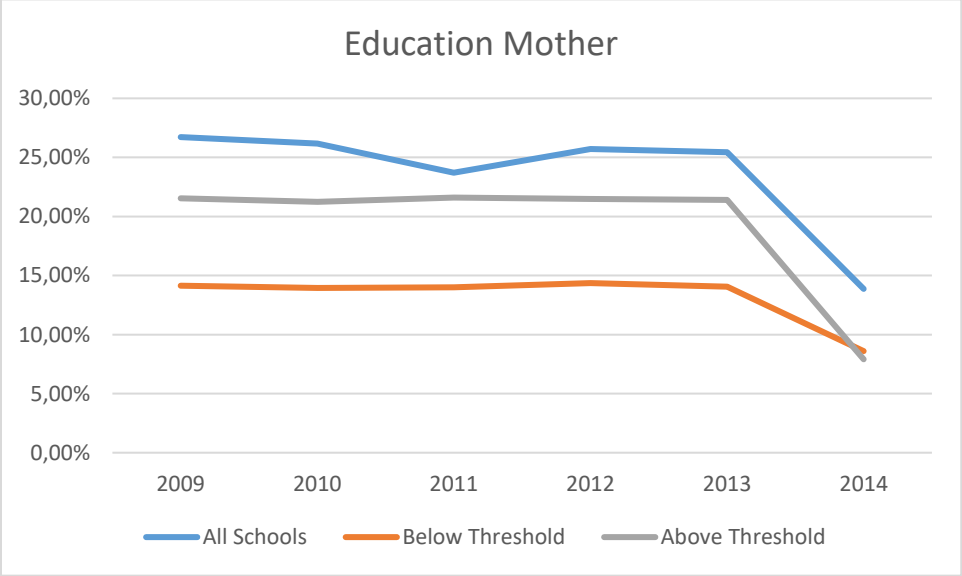
Appendix B.3.2: Travelling population second and third stage of secondary education



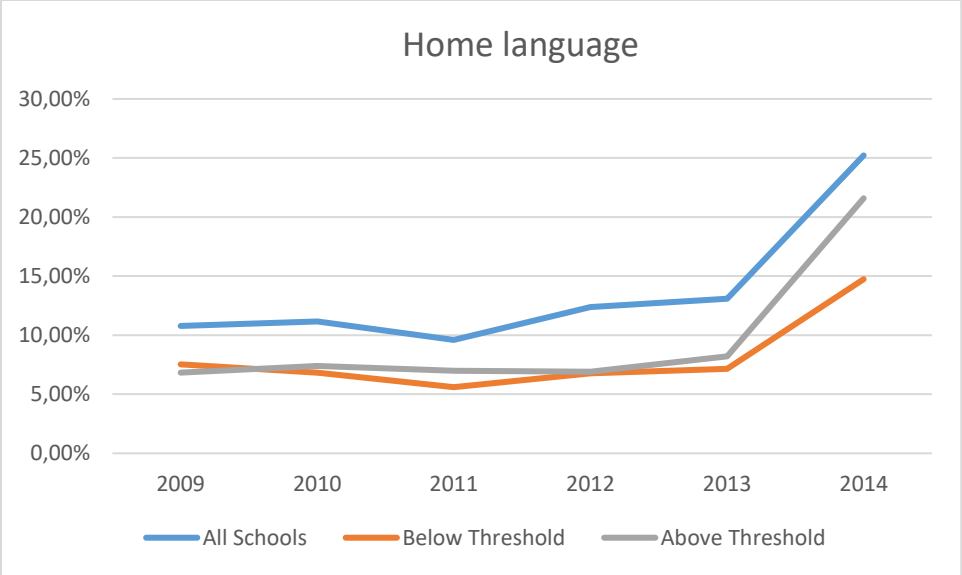
Appendix B.3.3: Homeless second and third stage of secondary education



Appendix B.3.4: Home Language second and third stage of secondary education mother

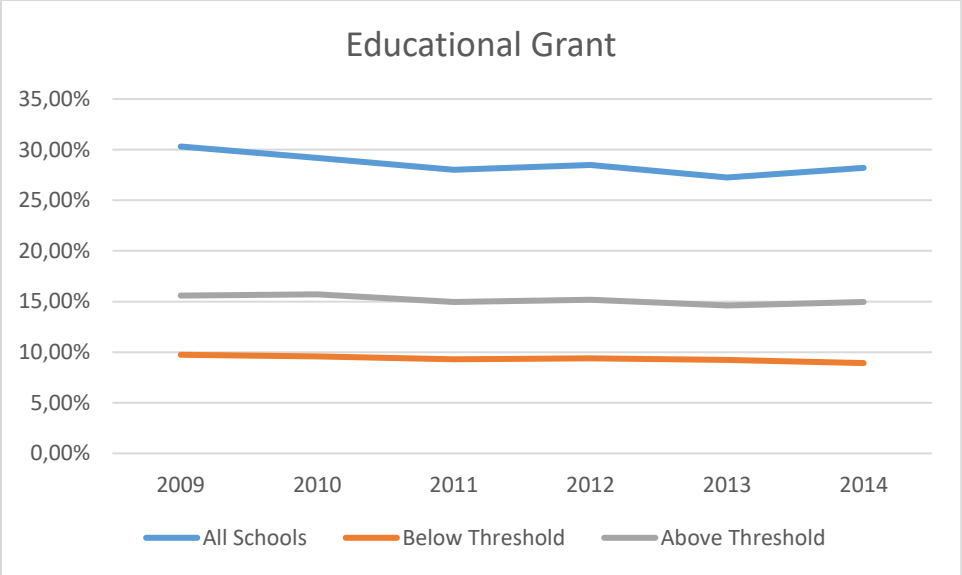


Appendix B.3.5: Education mother second and third stage of secondary education

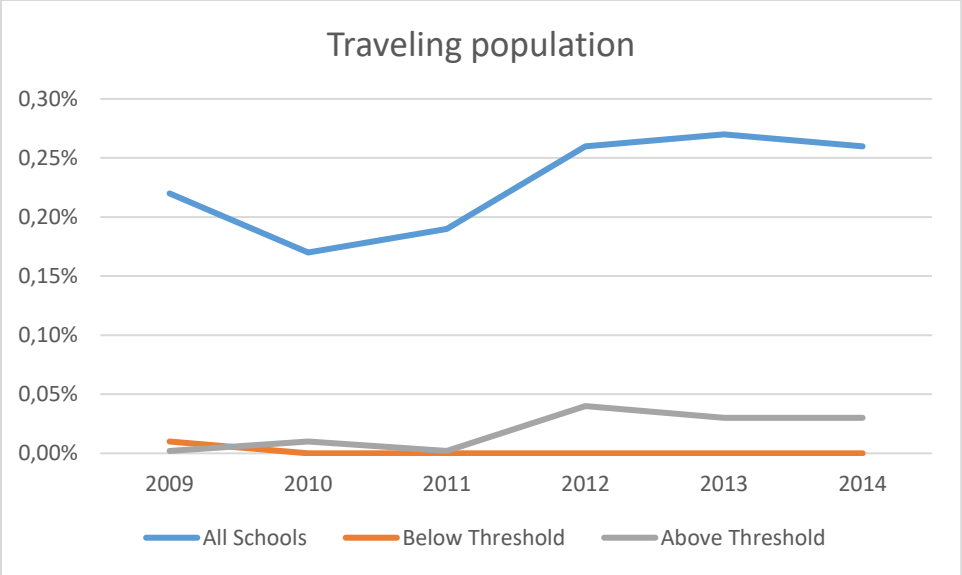


Appendix B.4: Graphs indicator per year first stage of secondary education

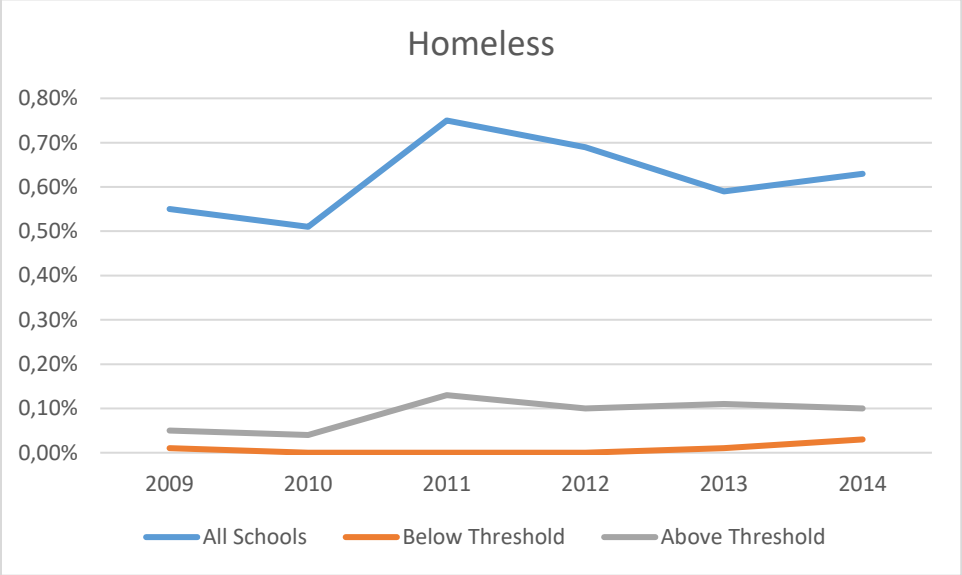
Appendix B.4.1: Educational Grant first stage of secondary education



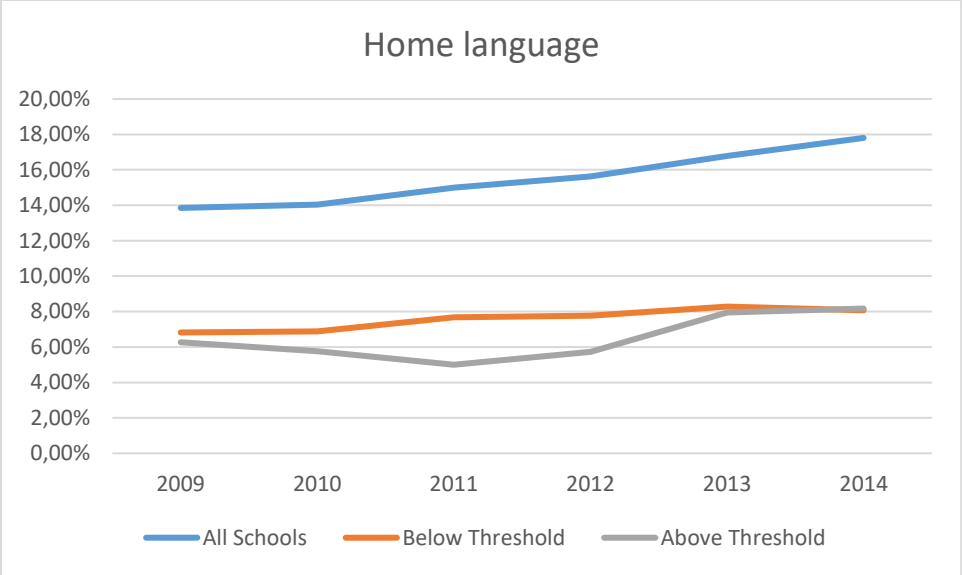
Appendix B.4.2: Travelling population first stage of secondary education



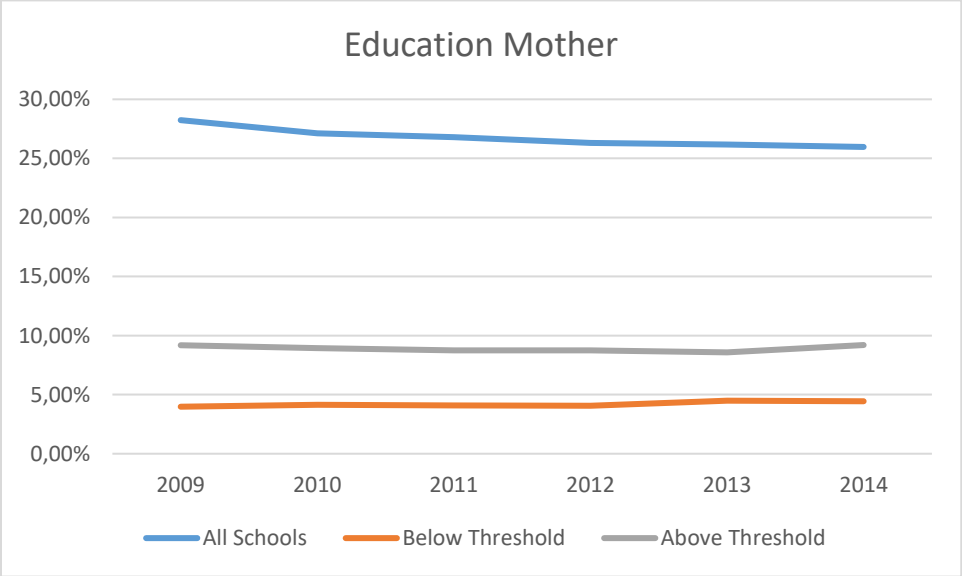
Appendix B.4.3: Homeless first stage of education



Appendix B.4.4: Home Language first stage of education



Appendix B.4.5: Education mother first stage of education



Appendix C: Descriptive statistics covariates

Appendix C.1: Covariates second and third stage of secondary education

2009

Student characteristics (student level)	All schools	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Belgian Nationality	95.65%	97.22%	96.51%	0.001
General education	38.37%	64.36%	24.48%	0.000
Technical education	31.61%	24.37%	44.17%	0.000
Vocational education	26.01%	6.92%	24.69%	0.000
Artistic education	2.16%	4.33%	4.88%	0.000
Special needs primary education	3.18%	0.94%	3.02%	0.000
Birth year	1993	1993	1993	0.000
Male	50.04%	45.40%	52.08%	0.000
Integration coaching disabled students	48.84%	44.74%	47.17%	0.000
School size	534 (15-1340)	474	537	0.000
Additional EEO teaching hours	13.65 (0-119)	1.7	11.9	0.000

2010

Student characteristics (student level)	All schools	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Belgian Nationality	95.20%	96.57%	96.69%	0.0284
General education	39.17%	64.15%	23.18%	0.000
Technical education	30.92%	23.13%	45.76%	0.000
Vocational education	25.78%	6.60%	25.44%	0.000
Artistic education	2.13%	6.11%	4.22%	0.000
Special needs primary education	3.26%	0.91%	3.52%	0.000
Birth year	1994	1994	1994	0.000
Male	50.16%	45.13%	53.62%	0.000
Integration coaching disabled students	49.14%	40.33%	56.45%	0.000
School size	535(16-1385)	455	547	0.000
Additional EEO teaching hours	13.5(0-119)	2.4	12.0	0.000

2011

Student characteristics (student level)	All schools	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Belgian Nationality	94.87%	96.57%	96.30%	0.0335
General education	39.47%	57.02%	21.48%	0.000
Technical education	25.69%	28.17%	45.56%	0.000
Vocational education	30.51%	9.29%	25.46%	0.000
Artistic education	2.17%	5.52%	4.81%	0.000
Special needs primary education	3.33%	1.27%	3.52%	0.000
Birth year	1995	1995	1995	0.000
Male	49.93%	45.87%	51.99%	0.000
Integration coaching disabled students	49.2%	41.33%	58.25%	0.000
School size	533 (12-1599)	470	556	0.000
Additional EEO teaching hours	10.2 (0-95)	0	10.3	0.000

2012

Student characteristics (student level)	All schools	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Belgian Nationality	94.69%	96.28%	95.93%	0.0215
General education	39.45%	56.60%	18.47%	0.000
Technical education	30.53%	29.57%	44.79%	0.000
Vocational education	25.49%	9.07%	28.37%	0.000
Artistic education	2.17%	4.74%	4.80%	0.0035
Special needs primary education	3.3%	1.32%	3.82%	0.000
Birth year	1996	1996	1996	0.000
Male	49.94%	47.50%	51.06%	0.000
Integration coaching disabled students	49.35%	43.24%	61.46%	0.000
School size	533 (12-1599)	473	590	0.000
Additional EEO teaching hours	10.54 (0-95)	.9	11.5	0.000

2013

Student characteristics (student level)	All schools	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Belgian Nationality	94.24%	95.74%	95.82%	0.0965
General education	39.19%	57.01%	16.89%	0.000
Technical education	30.70%	29.87%	45.96%	0.000
Vocational education	25.41%	8.50%	29.82%	0.000
Artistic education	2.15%	4.61%	3.81%	0.000
Special needs primary education	3.53%	1.16%	4.30%	0.000
Birth year	1997	1997	1997	0.000
Male	49.81%	46.43%	57.00%	0.000
Integration coaching disabled students	49.37%	46.47%	61.40%	0.000
School size	537 (8-1620)	489	584	0.000
Additional EEO teaching hours	10.6 (0-95)	.4	11.7	0.000

2014

Student characteristics (student level)	All schools	Below threshold 17%-25%	Above threshold 25%-33%	Diff. below and above threshold p-value t-test
Belgian Nationality	93.54%	96.06%	95.27%	0.001
General education	39.08%	54.99%	15.03%	0.000
Technical education	30.72%	29.31%	48.90%	0.000
Vocational education	25.52%	10.25%	30.47%	0.000
Artistic education	2.12%	4.78%	3.03%	0.000
Special needs primary education	3.66%	1.58%	4.25%	0.000
Birth year	1998	1998	1998	0.000
Male	49.77%	46.94%	58.69%	0.000
Integration coaching disabled students	49.08%	48.23%	60.63%	0.000
School size	540 (14-1746)	502	571	0.000
Additional EEO teaching hours	10.1 (0-105)	0	10.2	0.000

Appendix C.2: Covariates first stage of secondary education

2009

Student characteristics (student level)	All schools	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Belgian Nationality	93.03%	98.43%	97.49%	0.000
Special needs primary education	3.79%	0.11%	0.17%	0.000
Birth year	1996	1996	1996	0.000
Male	50.79%	52.14%	46.47%	0.000
Integration coaching disabled students	45.08%	14.64%	28.60%	0.000
School size	239 (7-687)	295	277	0.064
Additional EEO teaching hours	13.97 (0-99)	.11	5.34	0.000

2010

Student characteristics (student level)	All schools	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Belgian Nationality	92.41%	97.02%	97.01%	0.084
Special needs primary education	3.71%	0.09%	0.39%	0.000
Birth year	1997	1997	1997	0.000
Male	50.85%	52.50%	47.09%	0.000
Integration coaching disabled students	43.54%	13.74%	36.18%	0.000
School size	240(15-680)	274	271	0.064
Additional EEO teaching hours	13.48 (0-99)	0.4	5.5	0.000

2011

Student characteristics (student level)	All schools	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Belgian Nationality	91.81%	97.69%	96.36%	0.004
Special needs primary education	3.74%	0.09%	0.37%	0.000
Birth year	1998	1998	1998	0.000
Male	50.92%	51.55%	46.42%	0.000
Integration coaching disabled students	43.71%	17.57%	31.89%	0.000
School size	239 (14-669)	273	280	0.064
Additional EEO teaching hours	14.11 (0-156)	0	4.90	0.000

2012

Student characteristics (student level)	All schools	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Belgian Nationality	91.71%	97.71%	96.44%	0.000
Special needs primary education	3.85%	0.08%	0.36%	0.000
Birth year	1999	1999	1999	0.000
Male	50.71%	51.31%	45.56%	0.000
Integration coaching disabled students	43.67%	20.25%	32.28%	0.000
School size	238 (9-676)	273	277	0.064
Additional EEO teaching hours	14.23 (0-156)	0	5.53	0.000

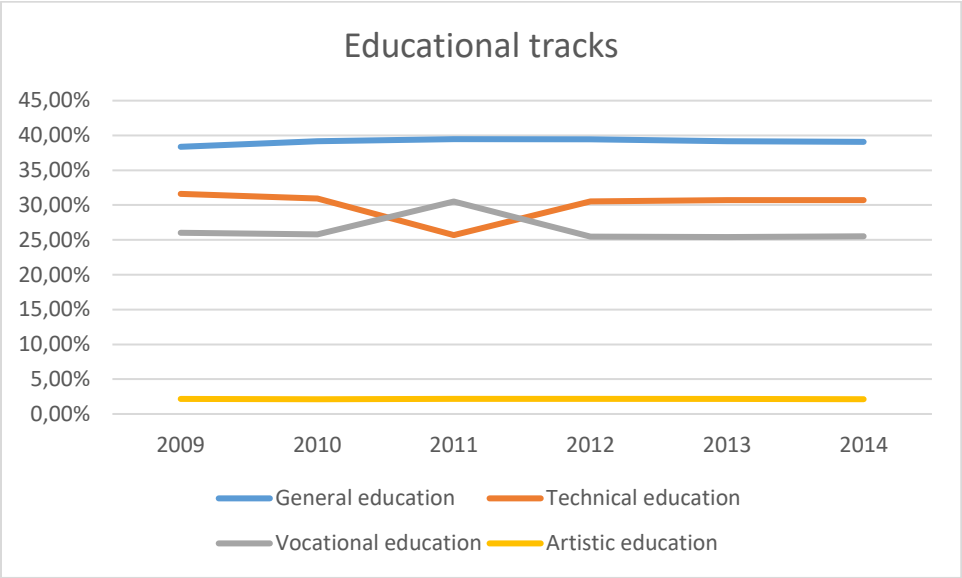
2013

Student characteristics (student level)	All schools	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Belgian Nationality	91.49%	97.70%	95.95%	0.000
Special needs primary education	4.10%	0.07%	0.23%	0.000
Birth year	2000	2000	2000	0.000
Male	50.72%	51.01%	44.94%	0.000
Integration coaching disabled students	43.75%	20.00%	32.26%	0.000
School size	237 (19-671)	278	278	0.064
Additional EEO teaching hours	14.50 (0-156)	.08	5.90	0.000

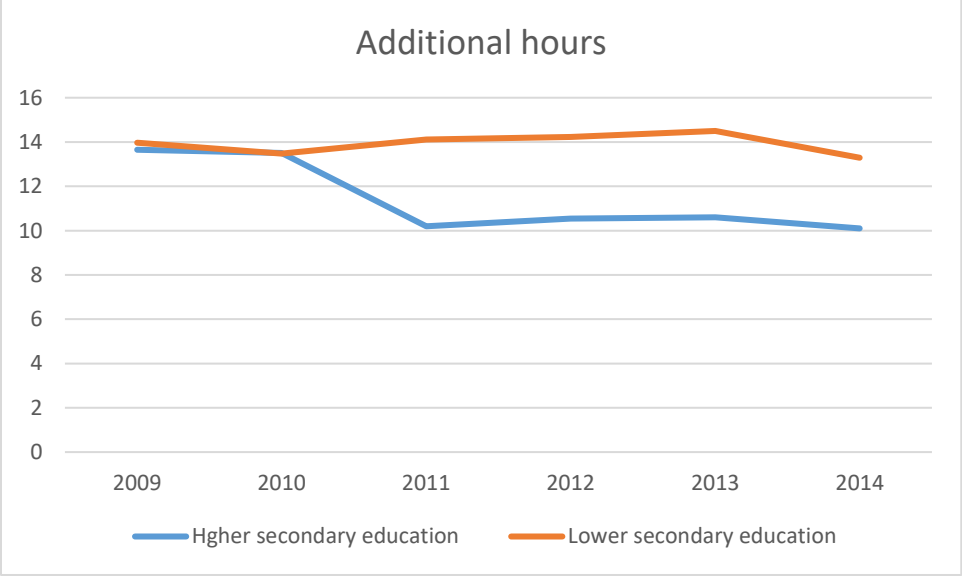
2014

Student characteristics (student level)	All schools	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Belgian Nationality	90.96%	96.97%	96.06%	0.000
Special needs primary education	4.24%	0.07%	0.58%	0.000
Birth year	2001	2001	2001	0.000
Male	50.87%	50.45%	46.56%	0.000
Integration coaching disabled students	43.86%	21.01%	32.28%	0.000
School size	238 (15-663)	271	274	0.064
Additional EEO teaching hours	13.29 (0-174)	0	5.49	0.000

Appendix C.3: Graphs Educational tracks



Appendix C.4: Graph Additional EEO teaching-hours



Appendix D: Descriptive statistics outcome variables

Appendix D.1: Outcome variables first stage of secondary education

2009

Outcomes (student level)	All students	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Grade retention	-0.033 (-2; 1)	-0.018 (-1; 1)	-0.015 (-1; 1)	0.0929
Problematic absenteeism	0.75%	0.0%	0.02%	0.1698
Professional bachelor start	27.9%	22.47%	32.07%	0.000
Academic Bachelor start	25.04%	58.03%	46.05%	0.000

2010

Outcomes (student level)	All students	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Grade retention	-0.030 (-2; 1)	-0.017 (-1; 1)	-0.017 (-1; 1)	0.9478
Problematic absenteeism	0.72%	0.02%	0.07%	0.1404

2011

Outcomes (student level)	All students	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Grade retention	-0.026 (-2; 1)	-0.012 (-1; 1)	-0.013 (-1; 1)	0.5550
Problematic absenteeism	0.68%	0.02%	0.04%	0.1696

2012

Outcomes (student level)	All students	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Grade retention	-0.025 (-2; 1)	-0.012 (-1; 1)	-0.013 (-1; 1)	0.3134
Problematic absenteeism	0.74%	0.02%	0.06%	0.0730

2013

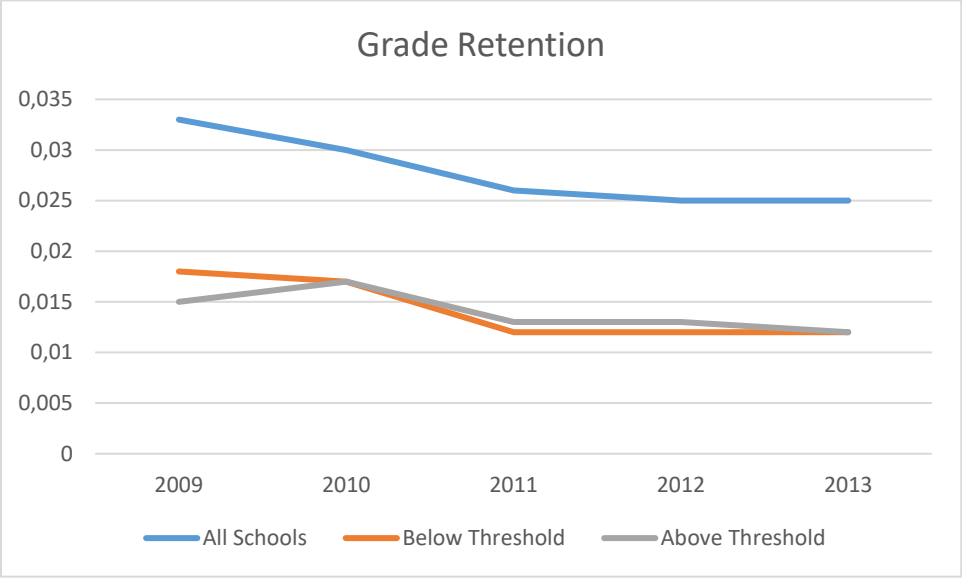
Outcomes (student level)	All students	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Grade retention	-0.025 (-2; 1)	-0.012 (-1; 1)	-0.012 (-1; 1)	0.7875
Problematic absenteeism	0.75%	0.05%	0.07%	0.4283

2014

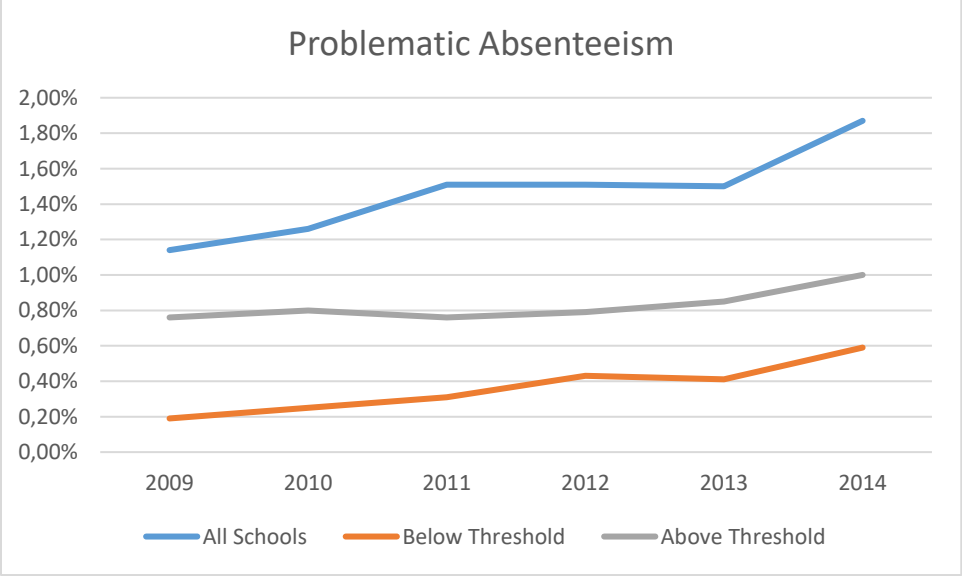
Outcomes (student level)	All students	Below threshold 2%-10%	Above threshold 10%-18%	Diff. below and above threshold p-value t-test
Grade retention	-NA	-NA	NA	
Problematic absenteeism	0.91%	0.08%	0.07%	0.6362

Appendix D.2: Graphs first stage of secondary education outcome variables

Appendix D.2.1: Grade Retention



Appendix D.4.2: Problematic absenteeism



Appendix D.3: Outcome variables second and third stage of secondary education

2009

Outcomes (student level)	All students	Below threshold 17%-25%	Above threshold 25%-33%
Grade retention	-0.09 (-2,3)	-0.07 (-3,1)	-0.09 (-3,1)
Problematic absenteeism	1.14%	0.19%	0.76%
Professional bachelor start	36.54%	43.22%	45.00%
Graduate from professional bachelor	16.87%	23.74%	19.16%
Academic bachelor start	27.37%	39.86%	19.00%
Graduate from academic bachelor	7.26%	10.19%	4.00%

2010

Outcomes (student level)	All students	Below threshold 17%-25%	Above threshold 25%-33%
Grade retention	-0.08 (-3,3)	-0.076 (-3,2)	-0.091 (-3,1)
Problematic absenteeism	1.26%	0.25%	0.80%
Professional bachelor start	36.18%	42.45%	44.54%
Graduate from professional bachelor	11.89%	16.31%	13.51%
Academic bachelor start	27.51%	39.095%	18.04%
Graduate from academic bachelor	6.45%	9.13%	3.30%

2011

Outcomes (student level)	All students	Below threshold 17%-25%	Above threshold 25%-33%
Grade retention	-0.08 (-2,3)	-0.068 (-2,1)	-0.08 (-2,1)
Problematic absenteeism	1.51%	0.31%	0.76%
Professional bachelor start	33.09%	40.75%	41.32%
Graduate from professional bachelor	6.47%	9.04%	7.91%
Academic bachelor start	26.06%	35.81%	16.81%
Graduate from academic bachelor	6.47%	6.12%	2.25%

2012

Outcomes (student level)	All students	Below threshold 17%-25%	Above threshold 25%-33%
Grade retention	-0.08 (-2,3)	-0.072 (-2,1)	-0.09 (-3,1)
Problematic absenteeism	1.51%	0.43%	0.79%
Professional bachelor start	33.09%	29.4975%	31.33%
Graduate from professional bachelor	6.47%	3.18%	3.21%
Academic bachelor start	26.06%	26.70%	11.61%
Graduate from academic bachelor	2.19%	2.43%	0.09%

2013

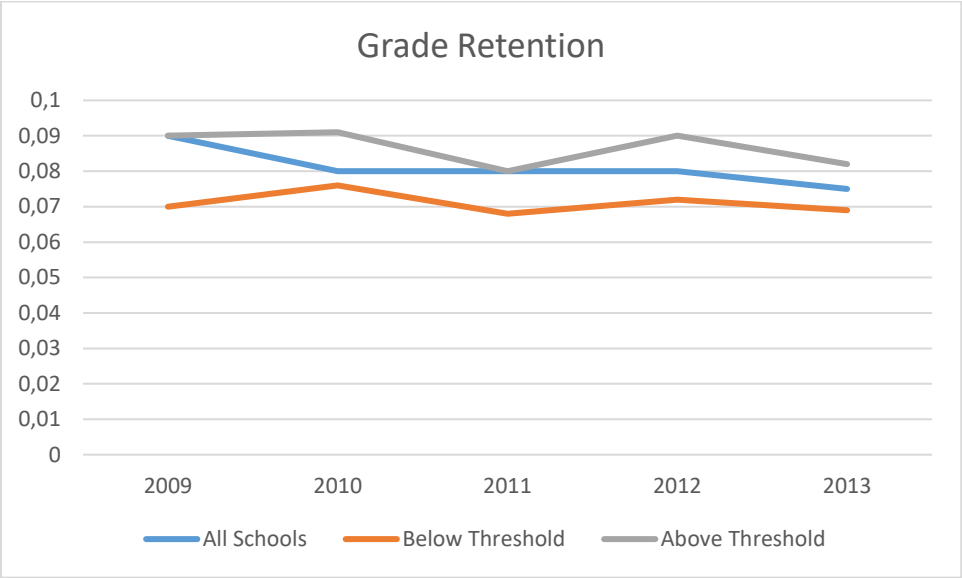
Outcomes (student level)	All students	Below threshold 17%-25%	Above threshold 25%-33%
Grade retention	-0.075 (-2,3)	-0.069 (-2,1)	-0.082 (-2,1)
Problematic absenteeism	1.50%	0.41%	0.85%
Professional bachelor start	17.30%	19.29%	20.77%
Graduate from professional bachelor	NA	NA	NA
Academic bachelor start	13.35%	18.02%	7.41%
Graduate from academic bachelor	NA	NA	NA

2014

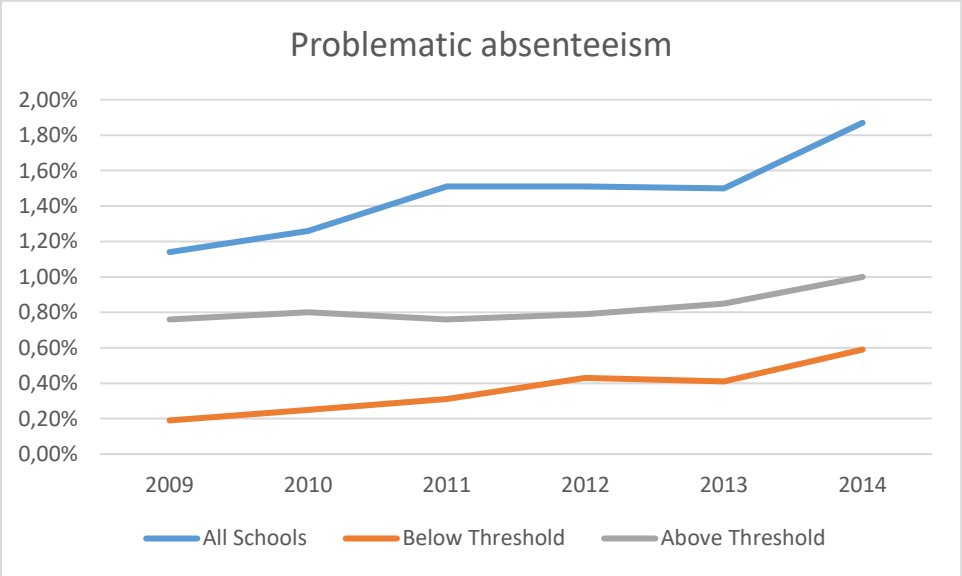
Outcomes (student level)	All students	Below threshold 17%-25%	Above threshold 25%-33%
Grade retention	NA	NA	NA
Problematic absenteeism	1.87%	0.59%	1.0%
Professional bachelor start	9.06%	9.78%	11.15%
Graduate from professional bachelor	NA	NA	NA
Academic bachelor start	6.73%	8.86%	3.56%
Graduate from academic bachelor	NA	NA	NA

Appendix D.4: Graphs second and third stage of secondary education outcome variables

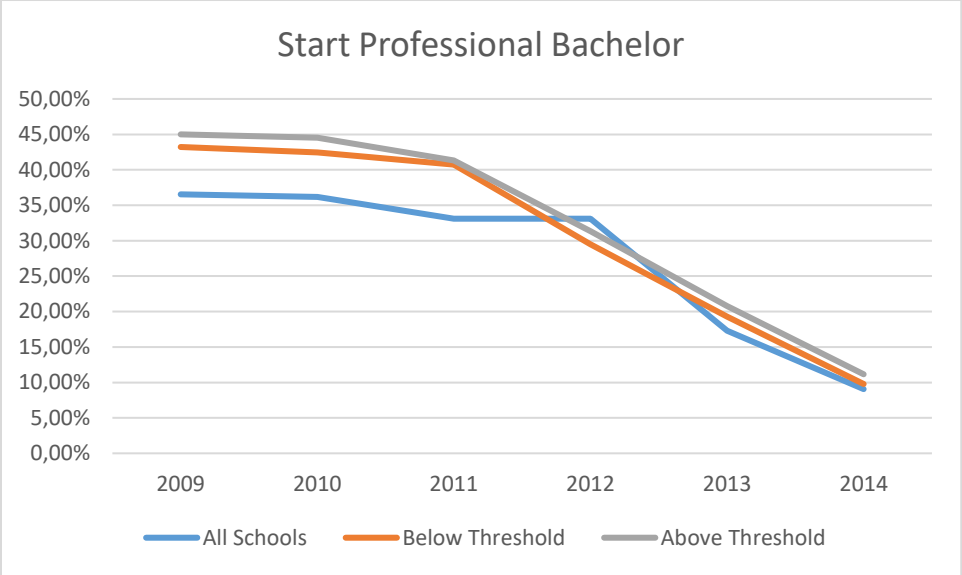
Appendix D.4.1: Grade Retention



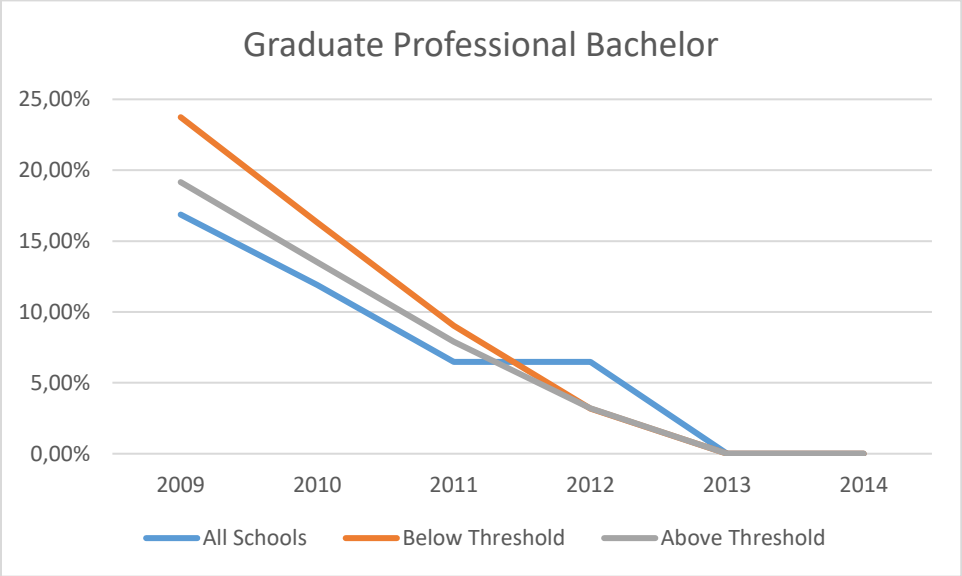
Appendix D.4.2: Problematic absenteeism



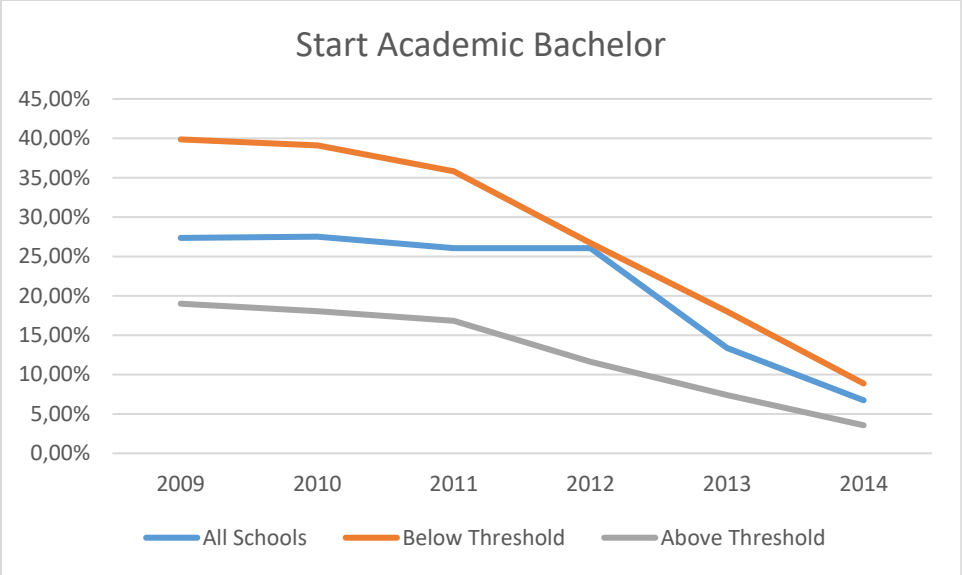
Appendix D.4.3: Professional bachelor start



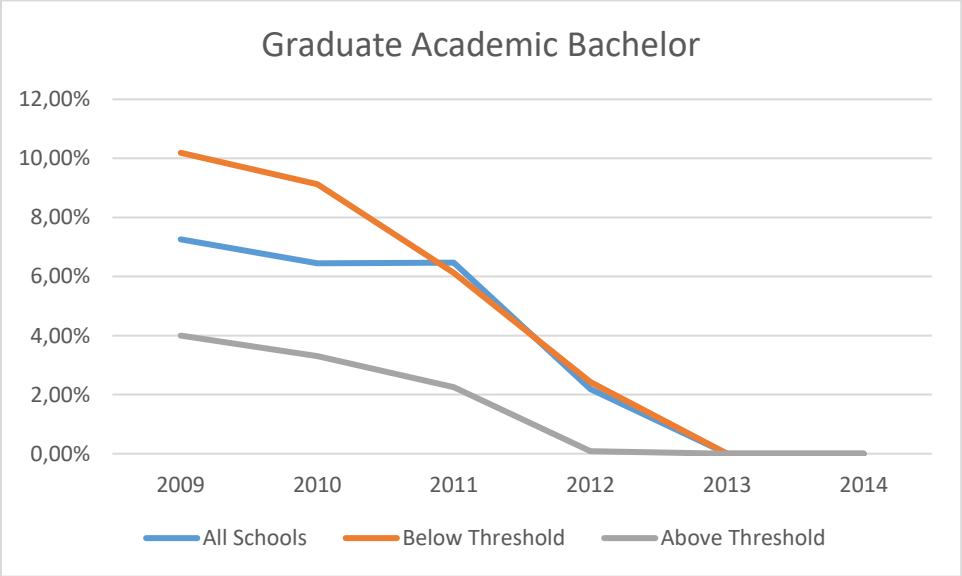
Appendix D.4.4: Professional bachelor graduate



Appendix D.4.5: Academic bachelor start



Appendix D.4.6: Academic bachelor graduate



Appendix E: first stage regression results fuzzy RDD

Additional funding$_{it}$	Coef.	Std. Err.
D_{it}	.4330692***	.104414
R_{it}	7.816772***	2.543706
Vocational education	-.0009977	.4131328
Technical education	.0214104	.1341778
Arts education	-.0462888	.1507416
Traveling population	-105.2744	94.45885
Homeless	12.95359	9.408422
Pupil receives educational grant	-1.303686	1.048867
Education mother	-2.058599	1.450308
Home language	.6824605	.4930175
Special needs primary education	1.307973	2.140618
Male	-.0425696	.180082
Integration coaching disabled students	.0859196	.0606079
Native Belgian	-.6047284	.842734
School size	.0001764	.000175
Constant	-.7664689	.9089052
N	298,468	
R^2	.6375	

Note: Clustered standard errors at the school level in parentheses. D_{it} indicates both on what side of the cutoff student *i* at time *t* is positioned; R_{it} is the forcing or running variable; N denotes the number of observations. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Appendix F: Regression results fuzzy RDD subgroups

Appendix F.1: Regression results fuzzy RDD disadvantaged students

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
T_{it}	-0.0374	0.00260	-0.0109	-0.0503	-0.0109	-0.00724
	(0.0527)	(0.00828)	(0.0454)	(0.0462)	(0.0230)	(0.0114)
$(R_{it} - c)$	0.461	-0.0200	0.208	0.387	0.108	0.118
	(0.576)	(0.0946)	(0.542)	(0.519)	(0.273)	(0.133)
Vocational edu	0.00963	0.0173***	-0.136***	-0.319***	-0.0421***	-0.0109***
	(0.00696)	(0.00227)	(0.0120)	(0.0122)	(0.00419)	(0.00146)
Technical edu	-0.0195***	0.00177*	0.184***	-0.276***	-0.0175***	-0.0154***
	(0.00720)	(0.00104)	(0.0129)	(0.0120)	(0.00429)	(0.00155)
Arts education	-0.0878***	0.0205***	-0.0281*	-0.0443**	-0.0338***	-0.0139***
	(0.0219)	(0.00399)	(0.0152)	(0.0184)	(0.00484)	(0.00376)
N	60,901	99,202	99,202	99,202	99,202	99,202
R^2	0.012	0.011	0.179	0.198	0.165	0.106

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators and schoolyear. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Appendix F.2: Regression results fuzzy RDD students with educational grant

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
T_{it}	-0.0104	0.000630	0.0343	-0.0582	-0.00953	-0.0155
	(0.0473)	(0.00820)	(0.0502)	(0.0495)	(0.0233)	(0.0133)
$(R_{it} - c)$	0.144	0.00843	-0.271	0.469	0.147	0.203
	(0.507)	(0.0936)	(0.592)	(0.558)	(0.271)	(0.155)
Vocational edu	0.00765	0.0158***	-0.133***	-0.330***	-0.0396***	-0.0110***
	(0.00766)	(0.00233)	(0.0123)	(0.0116)	(0.00418)	(0.00193)
Technical edu	-0.0213***	0.00174*	0.195***	-0.285***	-0.0152***	-0.0159***
	(0.00790)	(0.000958)	(0.0129)	(0.0111)	(0.00450)	(0.00191)
Arts education	-0.0906***	0.0180***	-0.0345**	-0.0517***	-0.0296***	-0.00945**
	(0.0220)	(0.00328)	(0.0135)	(0.0193)	(0.00504)	(0.00467)
N	41,369	66,715	66,715	66,715	66,715	66,715
R^2	0.014	0.009	0.177	0.200	0.163	0.107

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators and schoolyear. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Appendix F.3: Regression results fuzzy RDD students with lowly educated mothers

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
T_{it}	-0.109	0.00874	-0.0479	-0.0743	-0.0192	-0.00171
	(0.0949)	(0.0129)	(0.0595)	(0.0520)	(0.0269)	(0.00984)
$(R_{it} - c)$	1.261	-0.0907	0.569	0.649	0.123	0.0637
	(1.034)	(0.149)	(0.709)	(0.591)	(0.321)	(0.118)
Vocational edu	0.0188*	0.0211***	-0.150***	-0.291***	-0.0437***	-0.00904***
	(0.0102)	(0.00296)	(0.0134)	(0.0141)	(0.00511)	(0.00131)
Technical edu	-0.0105	0.00238	0.161***	-0.249***	-0.0204***	-0.0120***
	(0.0100)	(0.00173)	(0.0146)	(0.0140)	(0.00572)	(0.00157)
Arts education	-0.0837***	0.0242***	-0.0252	-0.0390*	-0.0425***	-0.0118***
	(0.0254)	(0.00599)	(0.0202)	(0.0209)	(0.00669)	(0.00382)
N	32,328	53,135	53,135	53,135	53,135	53,135
R^2	-0.007	0.011	0.179	0.181	0.160	0.091

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators and school year. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Appendix F.4: Regression results fuzzy RDD small schools (less than 500 students)

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
T_{it}	0.0745	0.0130	0.0327	-0.0505	0.0245	-0.00366
	(0.0731)	(0.0116)	(0.102)	(0.103)	(0.0423)	(0.0260)
$(R_{it} - c)$	-0.653	-0.130	-0.153	0.270	-0.246	0.0562
	(0.728)	(0.122)	(1.107)	(1.102)	(0.452)	(0.281)
Vocational edu	-0.00166	0.0129***	-0.129***	-0.369***	-0.0405***	-0.00750***
	(0.00980)	(0.00258)	(0.0154)	(0.0147)	(0.00607)	(0.00267)
Technical edu	-0.0265***	-4.55e-05	0.224***	-0.313***	-0.0141***	-0.0138***
	(0.00950)	(0.00140)	(0.0181)	(0.0144)	(0.00523)	(0.00261)
Arts education	-0.114***	0.0134**	0.0104	-0.0885***	-0.0386***	-0.0121*
	(0.0199)	(0.00547)	(0.0263)	(0.0250)	(0.0106)	(0.00624)
N	98,887	152,722	152,722	152,722	152,722	152,722
R^2	0.008	0.006	0.162	0.211	0.178	0.125

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators and schoolyear. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1

Appendix F.5: Regression results fuzzy RDD large schools (more than 500 students)

VARIABLES	(1) Grade Retention	(2) Absenteeism	(3) Start PB	(4) Start AB	(5) Graduate PB	(6) Graduate AB
T_{it}	-0.0625	-0.00168	-0.0107	-0.0601	-0.0208	-0.0185
	(0.0552)	(0.00467)	(0.0349)	(0.0567)	(0.0169)	(0.0164)
$(R_{it} - c)$	0.633	0.0358	0.0785	0.805	0.229	0.185
	(0.590)	(0.0562)	(0.471)	(0.610)	(0.211)	(0.194)
Vocational edu	-0.0163**	0.0127***	-0.0697***	-0.373***	-0.0365***	-0.0128***
	(0.00786)	(0.00201)	(0.0160)	(0.0197)	(0.00465)	(0.00267)
Technical edu	-0.0456***	0.00190***	0.253***	-0.333***	-0.00994**	-0.0197***
	(0.00786)	(0.000634)	(0.0163)	(0.0179)	(0.00426)	(0.00271)
Arts education	-0.0712***	0.0128***	0.00423	-0.0534***	-0.0228***	-0.0143***
	(0.0102)	(0.00117)	(0.0281)	(0.0155)	(0.00865)	(0.00466)
N	84,349	145,274	145,274	145,274	145,274	145,274
R^2	0.013	0.009	0.195	0.235	0.180	0.133

Note: Robust standard errors in parentheses. T_{it} is the fitted value for the treatment indicator for student *i* at time *t* is positioned; R_{it} is the forcing or running variable, c represents the cutoff; N denotes the number of observations. Additional covariates used: sex, Belgian nationality, special needs education in primary school, the number of students in the school, birth year, all EEO indicators and schoolyear. The bandwidth around the cutoff is 4.7%. *** p<0.01, ** p<0.05, * p<0.1