VATT Working Papers 91

Targeted Funding, Immigrant Background, and Educational Outcomes: Evidence from Helsinki's "Positive Discrimination" Policy

Mikko Isak Silliman

VATT INSTITUTE FOR ECONOMIC RESEARCH

VATT WORKING PAPERS

91

Targeted Funding, Immigrant Background, and Educational Outcomes: Evidence from Helsinki's "Positive Discrimination" Policy

Mikko Isak Silliman

Valtion taloudellinen tutkimuskeskus
VATT Institute for Economic Research
Helsinki 2017

Mikko Silliman, VATT Institute for Economic Research,
mikko.silliman@gmail.com

Thanks to Matti Sarvimäki, Manuel Bagues, Hanna Virtanen, Tuomas Pekkarinen, Oskari Harjunen, Venla Bernelius, Aarne Rissanen, Martti Kaila, Miika Päällysaho and Tuuli Vanhapelto as well as seminar participants at ETLA and the City of Helsinki Department of Education for useful comments and help along the way. Special thanks to Hanna Pesola who helped with getting access to the data. This research was funded by the Strategic Research Council at the Academy of Finland (grant 293445).

ISBN 978-952-274-198-1 (PDF)

ISSN 1798-0291 (PDF)

Valtion taloudellinen tutkimuskeskus
VATT Institute for Economic Research
Arkadiankatu 7, 00100 Helsinki, Finland

Helsinki, August 2017

Targeted Funding, Immigrant Background, and Educational Outcomes: Evidence from Helsinki's "Positive Discrimination" Policy

VATT Institute for Economic Research
VATT Working Papers 91/2017

Mikko Isak Silliman

Abstract

I estimate the impact of a targeted funding policy that provides disadvantaged schools in Helsinki with extra resources for hiring additional staff. Using a differences-in-differences strategy, I identify significant improvement in transitions to secondary education for low-performing native students and students from an immigrant background. As a result of the policy native students are 3 percentage points less likely to drop out of education after middle school, and students from immigrant backgrounds are 6 percentage points less likely to drop out of education after middle school as well as 7 percentage points more likely to attend the academic track of upper-secondary school. The impacts of the policy are particularly large for male native students and female students from an immigrant background. The analysis suggests that these results are driven by improvements in non-academic skills rather than only in academic coursework. The results, robust to various checks, provide evidence that extra resources can be particularly effective when targeted towards students from an immigrant background.

Key words: targeted school funding, secondary education

JEL classes: I24, I28

1 Introduction

Although control over school resources is one of the policy-levers most readily available to governments for improving educational outcomes, its efficacy remains hotly contested. In a review of literature on the topic, Hanushek (2006) argues that there is no consistent relationship between school resources and educational outcomes. More recent research also finds mixed results (Guryan, 2003; Häkkinen et al., 2003; Leuven et al., 2007; Benabou et al., 2009; Holmlund et al., 2010; Gibbons et al., 2011; Hægeland et al., 2012; Jackson et al., 2015; De Haan, 2017).[1] Moreover, despite the rapid and steady increase in immigration to OECD countries (OECD, 2017), these papers do not identify the relationships between school resources and educational outcomes specifically for students from an immigrant background.[2]

This paper presents evidence that targeted funding programs can be remarkably effective in improving the medium-term outcomes of immigrant and low-performing native students. I examine a targeted funding policy in Helsinki that provides disadvantaged middle schools with extra resources, primarily to be used to hire additional staff. Using a differences-in-differences design that compares schools impacted by the policy to other schools in Helsinki as well as similar schools in other cities in Finland, I find that immigrant students who are exposed to the intervention are 6 percentage points less likely to drop out of education after middle school and 7 percentage points more likely to be accepted to high school rather than vocational school. At the same time, native students who are exposed to the intervention are 3 percentage points less likely to drop out of education after middle school. The impacts of the policy are particularly large amongst low-ability native male students and female students from an immigrant background. These results are statistically significant and withstand several robustness checks.

[1] There is stronger evidence that points to the positive impacts that specific interventions that increase support staff, no doubt tied to school resources, can have on educational outcomes (see, for example, Jacob and Ludwig 2008; Dobbie and Fryer Jr 2015).

[2] A few papers (Leuven et al., 2007; Benabou et al., 2009) examine changes in school resources in contexts with large immigrant populations. That said, they do not estimate differential impacts of school resources on immigrant and native students.

Using data on student applications to secondary education as well as performance in academic and non-academic courses, I am able to study the mechanisms that underlie these results. In contrast to the impact of the policy on transitions to secondary education, the improvement in academic performance resulting from the intervention amongst immigrants is relatively modest - less than one tenth of a standard deviation in GPAs. At the same time, the intervention results in improvement in non-academic subjects that may be associated with non-cognitive skills. Moreover, using a differences-in-differences framework, I estimate that over half of the increase in high school acceptances for immigrant students is driven by increased or better targeted applications to high school instead of improved academic performance.[3] Building on the growing literature on the importance of social skills (Heckman and Rubinstein, 2001; Brunello and Schlotter, 2011; Kautz et al., 2014; Deming, 2017; Jokela et al., 2017), I argue that this evidence is consistent with the importance of skills such as motivation in explaining later life outcomes such as educational choices.

Further, the importance of non-academic measures may help to explain the mixed findings from previous research on the relationship between school resources and educational outcomes. Similar to the large positive impacts on medium-term outcomes that I identify in this paper, Jackson et al. (2015) find large-positive impacts on medium and longer-term outcomes as measured by years of education and later-life income.[4] In contrast, the majority of papers that study the impact of school resources on exam scores find little or only modest relationships between the two (Häkkinen et al., 2003; Leuven et al., 2007; Benabou et al., 2009; Holmlund et al., 2010).[5] Lastly, like Sarvimäki and Hämäläinen (2016), who study the impact of an active labor market policy in Finland, the results from this paper suggest that small-scale interventions can have outsize impacts amongst immigrant populations.

[3]Similar to the phenomenon identified in the United States regarding applications to universities by Hoxby and Avery (2013), a number of immigrant students who qualified for admission to high school were previously not applying.

[4]While longer-term impacts of the targeted funding policy in Helsinki cannot yet be studied, prior research in Finland by Virtanen (2016) shows that secondary school transition outcomes are closely linked to longer-term outcomes.

[5]Some studies do find a positive impact of school resources on exam results (Hægeland et al., 2012; De Haan, 2017).

This paper is organized as follows. Section 2 provides an overview of the institutional context and describes the intervention. Section 3 explains the empirical strategy. Section 4 describes the data. Section 5 presents the results and several robustness checks. Section 6 concludes. Additional background statistics and estimation results are found in the Appendix.

2 Institutional Context: Helsinki, Finland

2.1 Overview of the Education System

In Finland compulsory education consists of elementary and lower-secondary school (hereafer: middle school) and ends after ninth grade. Middle school spans three grades, 7th through 9th, with students typically graduating from middle school at the age of 15. After compulsory education, students have two options by which to continue their education: 1) the more academic general upper-secondary school (hereafter: high school), or 2) vocational upper-secondary education (hereafter: vocational school). During the last year of middle school students rank their preferences and apply to their choice of secondary education. Admission to secondary education is decided based on middle school GPA.

In Helsinki, roughly two thirds of students graduating from middle school attend high school, whereas roughly one third attend vocational school.[6] The number of starting spots in general upper-secondary school in Helsinki is fixed as a share of the cohort, and has not been changed in the last years. On the other hand, the number of starting spots in vocational schools has experienced an increase over the time period of the study.

The funding for Helsinki schools is provided at the national level, but is supplemented by municipal taxes. Municipalities are free to decide how to allocate funding - as long as

[6] See Section A.3 in the Appendix.

they meet the minimum number of curriculum hours for each subject as set in the National Core Curriculum. The overall level of funding for education in Helsinki is determined by the City Council. The School Board then determines how the funding is distributed between schools in the city. At its core, funding is proportional to the number of students enrolled at a school.

2.2 The Targeted Funding Policy in Helsinki

This paper will exploit the one element of school funding in Helsinki that makes funding levels uneven between schools is "positive discrimination" (PD) funding. The PD funding policy provides extra resources for schools in Helsinki that serve larger portions of low-performing students.

The first wave of the existing PD funding model was implemented in 2008 - with the first cohort of students potentially impacted by the funding graduating from middle school in 2009. Prior to the existing model, an earlier model functioned on the same premise - to provide extra resources to schools located in tougher areas - but operated with fewer funds and targeted a smaller and different group of schools (see: Lankinen, 2001). The newer model, like its predecessor, aims to support schools without tying current performance, as measured by test scores, to financial support. Instead, an index constructed using area-based characteristics that have been shown to correlate with school performance in Helsinki for several years determines the funding schools receive (Bernelius, 2013).

The characteristics that the PD index is calculated from are: immigrant share, parental education, income level, and the popularity of the school. These characteristics are measured by catchment level indicators for the percentage of adults without education past basic schooling, per capita income, as well as school level indicators for the percentage of non-native Finnish or Swedish speakers. The popularity of the school is measured by the number of students who leave the catchment area for school compared to the number of students in the local school from outside the catchment area. Then, the level of extra resources is

determined by the PD index value multiplied by the number of students in a school each year and a constant euro amount.

Perhaps equally important as the increase in the support level associated with the existing PD funding policy are the non-pecuniary actions associated with the policy. In the fall of 2008, senior officials from the Department of Education met with individual principals of schools receiving PD funding to discuss effective ways to use the extra resources, classroom pedagogy, and intercultural integration. During these meetings, officials encouraged principals to, for example, use the additional resources to hire teaching assistants to target at-risk populations rather than reduce in class size more broadly.

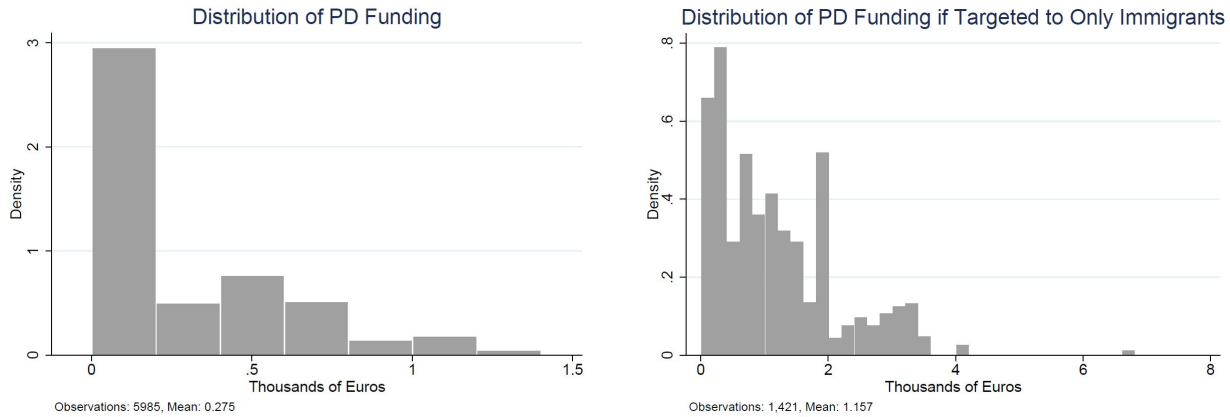
Nonetheless, principals are in charge of deciding how the extra resources are spent. In most schools in Helsinki these decisions are then ratified by the governing board of the school, generally composed of the principal, teachers and other staff, parents, and often a student. Apart from reporting a breakdown of their budget to the School Board, principals and schools are not under pressures associated with performance-based accountability. Moreover, comparable test-based performance indicators between schools are not used. Interviews with middle school principals suggest that the primary use of PD funding is on additional non-classroom-teacher staff (Silliman, 2016): most importantly, classroom assistants rather than classroom teachers.

Figure 1 shows how the PD funding is distributed between schools. Depending on how the resources are targeted within schools, the estimate of the funding level each student is exposed to may be misleading. For example, if we assume that instead of splitting the extra resources equally, the funding is targeted only to students with an immigrant background, the mean funding level shifts from 275 to 1,175 euros per student, as shown in Figures 1a and 1b.[7]

[7]In Finland, the total school level per pupil expenditure is roughly 8,000 USD, or roughly 7,000 euros (OECD, 2014). Since these numbers measure the annual expenditure for all services, it is difficult to estimate the how the resources available for student learning change as a result of the policy. We can estimate the change in total school expenditures rather than those that go into teaching through a back of the envelope calculation. Dividing 275 and 1,175 by 21,000 (the total per pupil spending accumulated over three years), this translates to either roughly a mean of a 1.5% or 5.5% increase in annual per pupil resources throughout

Figure 1: The Distribution of PD Funding in Helsinki Schools

(a) (b)



Note: To facilitate comparison, both graphs group together students in bins of width = 200 euros.

3 Empirical Strategy

3.1 Identification: Differences-in-Differences

The goal of this paper is to identify the impact of the PD funding policy on transitions to secondary education. To attempt to identify this causal impact, I employ a standard differences-in-differences strategy (see, for example: Angrist and Krueger (1999); Athey and Imbens (2006); Angrist and Pischke (2010)). Under this approach, causal impact is understood as the difference in potential student-level outcomes between the scenarios in which the school they attend receives extra resources and one in which it does not. Since both of these scenarios cannot be observed for each school, the causal impact is estimated by comparing changes in student outcomes between schools receiving PD funding and comparable schools. In this research, two sets of schools for control groups are created using schools that do not receive extra funding. If, apart from the policy, nothing happens in the same time period that impacts students in schools affected by the policy and not the other sets of schools or

middle school, depending on how resources are targeted within the school.

vice versa, changes in the trends of students in the group of schools affected by the policy compared to those in schools that are not can be attributable to the PD funding policy.

In more concrete terms, a causal interpretation requires that if no schools received extra funding, the trends in outcomes between the schools studied would be parallel. This hypothetical scenario - a world in which no school receives extra funding - cannot be observed. As such, whether or not this assumption is reasonable can only be argued for by examining the empirical evidence, drawing from theory, and understanding the institutional context. After I report the results, I perform various robustness checks, and discuss other potential mechanisms by which the results might be explained.

3.2 Estimation Methods

Before this paper shifts from descriptive trends between schools to causal estimation, an event study framework is used to examine student outcomes, controlling for various background characteristics as well as year and school fixed effects. By plotting the coefficients (β) from Model (1), below, we see how the student outcomes between schools receiving PD funding evolve compared to those that do not receive funding.

$$Y_i = \beta(G_s * \upsilon_t) + cX_i + \pi_s + \varepsilon_{ist} \tag{1}$$

In this equation student outcomes (Y_i) are a function of year (υ_t) and school (π_s) fixed effects as well as a vector of student background characteristics (cX_i). Schools are split into two groups (G_s) by whether or not the school a student attends receives PD funding. Standard errors clustered at the school level. The results from the model serve as a falsification excercise to ensure that any results the differences-in-differences model identifies do not result from a continuous trend in outcomes or a change that takes place before the funding is implemented.

After this, a differences-in-differnces model (DiD) is used to estimate the impact of being

exposed to PD funding. The main model used in this paper is specified as follows:

$$Y_i = \beta I_{st} + \delta(I_{st} * F_i) + G_s + cX_i + \pi_s + \upsilon_t + \varepsilon_{ist} \tag{2}$$

The differences-in-differences model is similar to Model (1). The key difference, however, is that instead of estimating the impact of the receipt of PD funding for each year separately, this model estimates the impact of the PD funding policy across all years a school is affected by the policy. This is done by coding the treatment variable, I_{st}, to measure the annual receipt of PD funding, and removing the interaction between the year fixed effects and the treatment variable. Dummy variables (F_i) can be included to estimate the impact of the policy on specific subgroups. Again, standard errors clustered at the school level.

3.3 Choice of Control Groups

Changes in possible factors that can impact educational outcomes of students in the schools that receive PD funding can take place at both the municipal and national levels. As such, this analysis attempts to control for both types of changes by using two control groups. Since a causal interpretation relies on whether or not a suitable control group is chosen, the use of two control groups also serves to confirm that the results are not merely due to the choice of control group.

The first control group is composed of students from the set of schools in Helsinki that do not receive PD funding. The strength of using this set of schools as a control group is that it allows the estimates to take into account changes that take place at the municipal level that impact all schools in Helsinki. The possible worry, however, is that since the student population in schools that receive PD funding versus those that do not are distinctly different, they may be subject to different trends.

The second control group, composed of schools serving comparable populations in other large cities in Finland, is designed to control for changes that take place at the national

level. Additionally, since the composition of the students in this "comparable" control group is more similar to that of the schools in Helsinki that receive PD funding, trends likely to impact only specific types of students or schools are better taken into account. This is not to say that these cities are identified as being similar to Helsinki, but that these schools in these cities tend to serve relatively similar populations to those served by schools in Helsinki receiving PD funding.

More specifically, this second control group is created as follows. First, the variables for the characteristics that determine the PD index in Helsinki are regressed on the index itself. Then, once the regression estimates the relative weights of each variable, these weights are used to predict PD index values for all schools in the 9 next largest cities in Finland.[8] Once PD index values are estimated, I limit this second control group to the set of schools that, according to the estimates of their PD index values, would have received PD funding had they been in Helsinki.

4 Data and Descriptive Statistics

4.1 Data

This research combines registry data from the Finnish Linked Employee-Employer Database (FLEED), the Joint-Application Registry, and the Compulsory School Registry, all from Statistics Finland, with data on annual PD funding from the City of Helsinki.

All students in their last year of middle school between the years 2000 and 2015 are included in the study. The school funding data from the City of Helsinki includes all the PD funding allocated to Finnish language elementary and middle schools between 2009 and 2015. As such the data consists of 65,342 students in the City of Helsinki from 46 schools.

[8]The cities used to create the "comparable" control group are: Espoo, Tampere, Vantaa, Oulu, Turku, Jyväskylä, Lahti, Kuopio, and Kouvola. The control group is then composed of the schools in these cities that resemble schools that receive PD funding in Helsinki, and which would have received extra support if they been located in Helsinki.

Of these schools, 18 receive PD funding at some point and enroll 22,801. Of these, 5,985 graduate from middle school having been exposed to PD funding. The group of schools from other cities that resemble the schools in Helsinki receiving PD funding enroll 122,061 students in the time period of study.

The students are observed while they are in their final year of middle school. All students who are in their last year of middle school and only these students are included in the data; for example, if a student applies for secondary education for a second or third time they are not included in our data. For the purposes of the estimations, it is assumed that they attend this school for the entirety of their middle school education. Since students cannot be linked to their elementary school, elementary schools funding data is not included in the main analysis. That said, the elementary school that a student attends can be estimated; results from an analysis that includes estimates of elementary PD funding exposure are shown in Section B.1 of the Appendix.

If a student speaks a language other than Finnish or Swedish (the two official languages of Finland) as their mother tongue, they are considered as coming from an immigrant background for the purposes of this research. By linking students to their parents, family income variables and parental education variables are included as controls. The total family income variable is calculated by summing together the annual incomes of both parents from the five years prior to each students final year in middle school. The education variables measure whether each parent obtained a higher educational degree.

Since the PD funding was only implemented in the fall of 2008, this research is only able to observe medium term outcomes of students graduating from schools receiving PD funding. The main outcome variables observed in this study come from the Joint Application Register: whether or not a student is accepted to high school, vocational school, or no school at all, and the educational applications of all middle school students. In this research, dropouts are defined as when a student shows up in the Joint Application Register, but are not accepted to any secondary educational institution. This could be for two reasons: their middle school

GPA does not qualify them for admission to the institutions they apply to or they choose not to apply to any form of secondary education. The aspirations of middle school students are defined as the first choice upper-secondary school type that students apply to.

Student-level data on academic performance measured by academic and non-academic GPA's as well as grades in individual classes (ex. math, foreign languages, physical education) is used to understand the channels through which secondary school transition outcomes are realized.[9] Additionally, in order to investigate the school-level mechanisms behind any possible impacts of PD funding, this research uses school level data on technology investment (measured as the number of computers a school buys each year), school-level special needs classifications, and class size.

4.2 Descriptive Statistics

The following subsections report summary statistics for family background, school transitions, grades, and school characteristics for the two groupings of schools used in this analysis: all schools in Helsinki, and schools from other large cities in Finland that are similar to those in Helsinki that receive PD funding.

4.2.1 Family Background

Since the socioeconomic background characteristics of the student population in a school determines a school's PD support level, it is not surprising that there are significant differences in socioeconomic indicators between students attending schools receiving PD funding and those that do not. For example, as shown in Table 1, schools that receive PD funding enroll about twice as many students from an immigrant background as other schools in Helsinki, and the families they serve earn about one quarter less than families whose children attend other schools in Helsinki. The differences in the education level of parents in the two

[9]The academic GPA is provided in the statistics, and used in the upper-secondary school admissions process. The non-academic GPA is calculated by taking the mean of grades from non-academic courses: physical education, arts and crafts, music, etc...

Table 1: Background Statistics for Treatment and Control Groups

	HKI PD mean	HKI nPD mean	Comparable mean	Imm. HKI PD mean	Imm. HKI nPD mean	Imm. Comparable mean
Female	0.48	0.49	0.48	0.48	0.51	0.48
Immigrant background	0.16	0.07	0.09	1.00	1.00	1.00
One foreign parent	0.09	0.08	0.05	0.06	0.13	0.06
Both parents foreign	0.15	0.06	0.08	0.92	0.81	0.91
Family Income	62638.87	83432.08	61673.56	27181.10	37768.51	24756.50
Father's Income	34538.16	48397.90	35624.43	13922.16	20454.62	12835.29
Mother's Income	28100.71	35034.18	26049.13	13258.95	17313.89	11921.21
Mother HE grad	0.47	0.49	0.38	0.67	0.66	0.70
Father HE grad	0.56	0.58	0.47	0.71	0.73	0.74
Lowest parent ed.	0.27	0.26	0.38	0.13	0.12	0.11
Highest parent ed.	0.30	0.33	0.22	0.51	0.51	0.56
Observations	22801	42541	122061	3684	3126	10508

Notes: The columns should be interpreted as follows: HKI PD refers to students in schools in Helsinki that receive PD funding; HKI nPD refers to students in schools in Helsinki that do not receive PD funding; Comparable refers to schools in other large cities that are identified as comparable to schools in HKI that receive PD funding. The three columns on the right use the same categories, but only include students from an immigrant background.

areas are not as stark. Looking only at immigrant students in the two groups of schools in Helsinki, differences in family background persist. Immigrant students from schools receiving PD funding are less likely to have a Finnish parent, and come from families earning one quarter less than immigrants in schools that do not receive PD funding.

The socioeconomic background measures of students in PD schools and comparable schools in other cities are more similar (the process of identifying similar schools is described in more detail in Section 3.3), particularly amongst the immigrant populations in the two sets of schools (also in Table 1). While there are more immigrant students in the schools in Helsinki, immigrant students in both sets of schools come from families with more or less equivalent levels of income. Moreover, the similarities between the two groups of schools carry over to their immigrant populations.

Figure 7 in the Appendix shows how trends in socioeconomic background variables develop in each school group over time.

4.2.2 Secondary School Transitions

In this section, descriptive statistics on the transition to secondary education are presented visually. The graphs in Figure 2 and Figure 3 show trends in the secondary school transitions of the full sample of students and immigrant students respectively.[10] They do not include any controls for changes in the socioeconomic characteristics of the student population from year to year.[11]

Figure 2 plots the development of the dropout and high school acceptance rates by school group between the years 2000-2015. The panels on the left show trends in the dropout rate; while the the difference in rate between PD schools and other schools remained either relatively stable or grew up until 2009, beginning in 2010 the dropout rates between the

[10] Figure 6 in Section A.1 of the Appendix shows trends in drop out rates and high school acceptance rates in Helsinki and other large cities in Finland, not split by exposure to the targeted funding policy.

[11] Tables 13a and 13b in Section A.3 of the Appendix presents descriptive statistics on transitions to secondary education for all students, broken down by school group and immigrant classification.

Figure 2: Secondary School Transitions, Full Sample

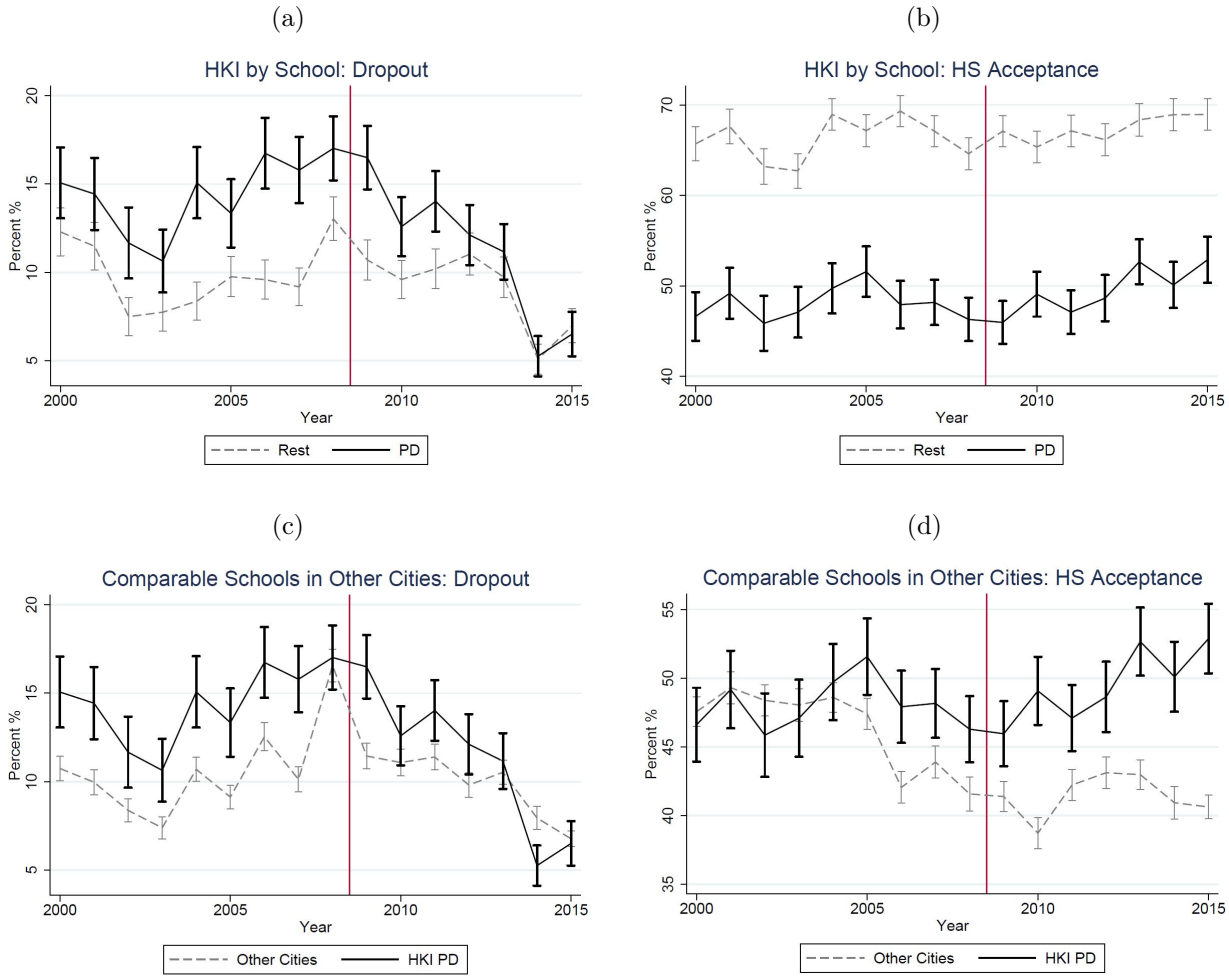
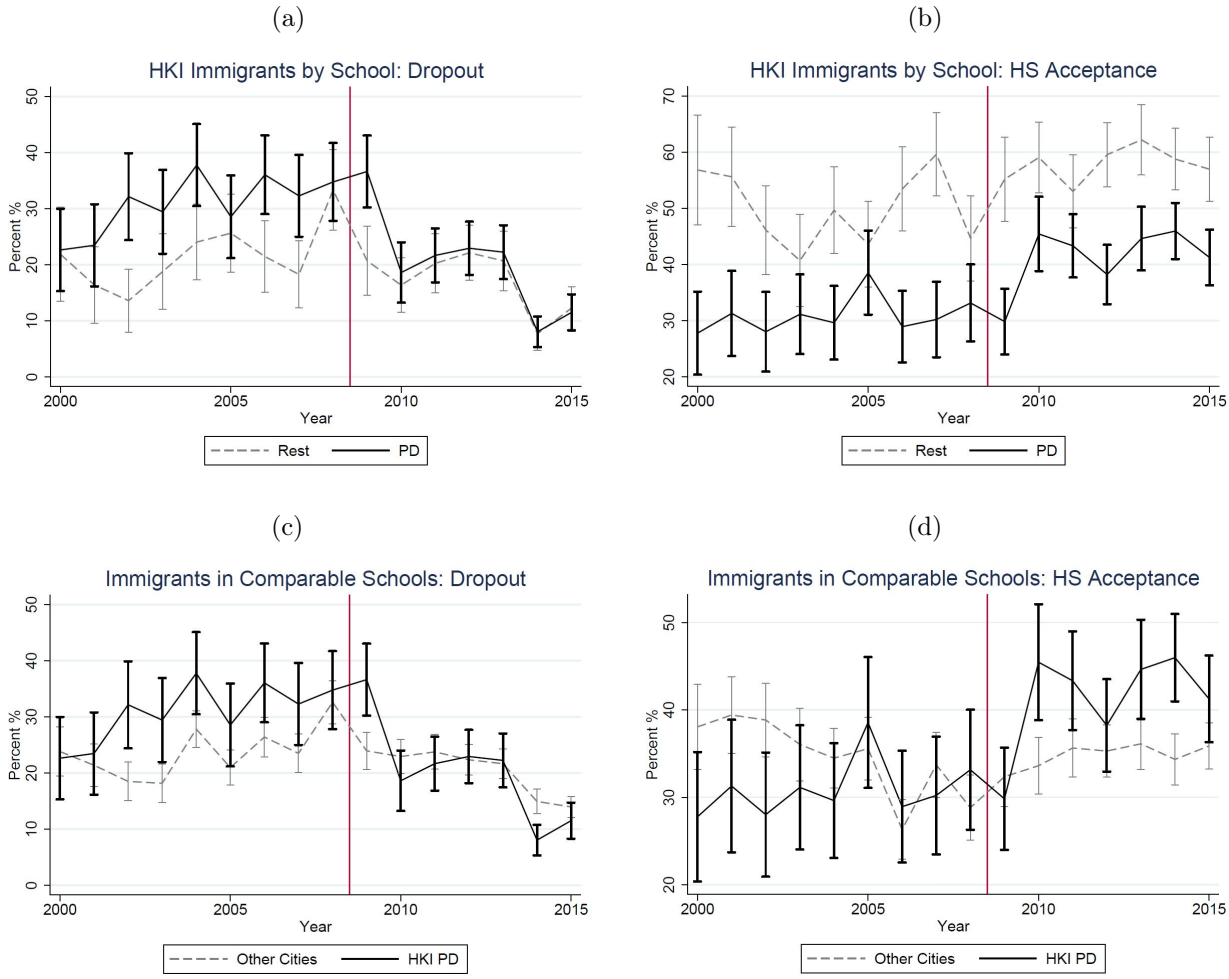


Figure 3: Secondary School Transitions, Immigrant Students



two groups of schools converged, to remain that way through 2015. The panels on the right show trends in the high school acceptance rate in schools receiving PD funding compared to other schools. It is hard to discern any shift in trends that takes place around the time PD funding is implemented.

Figure 3 plots these same outcomes, but limits the sample to only immigrant students. The panels on the left show that between 2000 and 2009 the dropout rate amongst immigrant students in schools that PD funding is targeted towards rose from just over 20% to well over 30%, while the dropout rate of immigrants in other schools grew in roughly a parallel manner. Suddenly, in 2010, the dropout rate for immigrant students in schools receiving PD funding fell by over 10 percentage points, closing the gap between schools that received PD funding and those that did not. In contrast to Figure 2, the panels on the right show a clearly discernable increase in high school acceptance that takes place after the implementation of PD funding in the fall of 2008. Immigrant students in PD schools experience a 10 percentage point jump in the high school acceptance rate in 2010, while their counterparts in other schools experience no such jump.

4.2.3 Middle School Grades

Similar differences to those in the socioeconomic background characteristics between the schools in Helsinki that receive PD funding and those that do not are visible in middle school grades (Table 2). The mean academic GPA amongst students in schools receiving PD funding is nearly half a standard deviation below those in other schools in the city, and is visible in nearly each subject. This difference carries over to the immigrant populations in the two sets of schools in Helsinki.

At the same time, however, we see that the educational performance, as measured by middle school grades, is considerably more similar between students in schools in Helsinki that receive PD funding and students in the comparable set of schools in other cities. Moreover, the mean grades for immigrant students in these two sets of schools are remarkably

Table 2: Middle School Grades Summary Statistics

	HKI PD mean/sd	HKI nPD mean/sd	Comparable mean/sd	Imm. HKI PD mean/sd	Imm. HKI nPD mean/sd	Imm. Comparable mean/sd
GPA	7.51	7.97	7.54	7.04	7.56	7.09
	(1.24)	(1.15)	(1.18)	(1.37)	(1.16)	(1.33)
Non-Acad. GPA	8.10	8.37	8.09	7.96	8.17	7.92
	(0.89)	(0.82)	(0.80)	(0.86)	(0.83)	(0.82)
Observations	22528	42230	120571	3580	3081	10141

Notes: The columns should be interpreted as follows: HKI PD refers to students in schools in Helsinki that receive PD funding; HKI nPD refers to students in schools in Helsinki that do not receive PD funding; Comparable refers to schools in other large cities that are identified as comparable to schools in HKI that receive PD funding. The three columns on the right use the same categories, but only include students from an immigrant background. The mean outcome as well as the standard deviation are shown for all groups of students. The mean is displayed above the standard deviation for each outcome indicator.

similar.

5 Results

Three main types of results are reported in the following sub-sections: estimates of the impact of PD funding on the transition to secondary education, on middle school grades, and on possible school-level mechanisms behind these outcomes. These results are further broken down by the specific estimation method used - whether the treatment is coded as a dummy variable or whether it measures the intensity of exposure to PD funding.

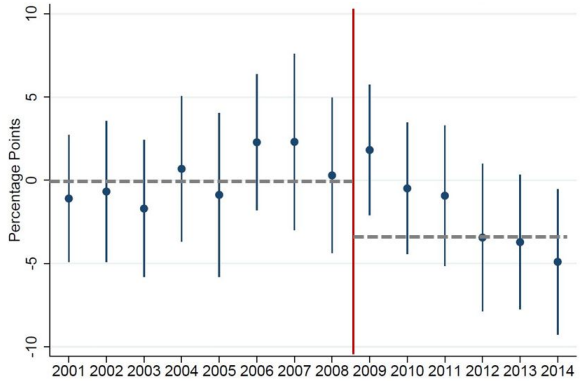
5.1 Event Study Graphs of Secondary School Transition Outcomes

The graphs in Figure 4 show secondary school transition statistics in a similar fashion to the descriptive trends in Figure 2, but with controls for school and year fixed effects and changes in the composition of socioeconomic background characteristics between middle school graduating classes. Since the point estimates in these graphs are estimated for each year separately, the individual estimates are not statistically significant, and we should not draw firm conclusions from these graphs. Nonetheless, they provide a falsification excercise for the difference-in-differences (DiD) results (gray dashed lines overlayed on the graphs) from the following sections, ensuring that the DiD results are not driven by changes that take place before the implementation of the policy.

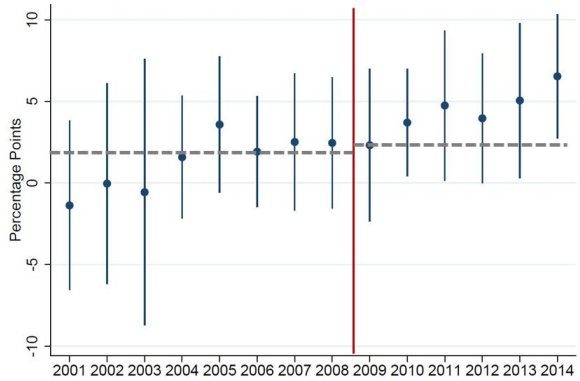
The two graphs on the left (4(a) and 4(c)) show the dropout rate in PD schools compared to other sets of schools. When compared to either control group, the graphs suggest that the trends in dropout rates before and after the implementation of the PD funding policy (marked by the red line) are not the same. Before the policy is implemented, the dropout rate seems to be stable or increasing, only to decrease after the implementation of the policy. This story is in line with the estimates from the following section (marked by the gray dashed line), and passes our falsification excercise.

Figure 4: Graphs of annual group means for the full sample, with controls

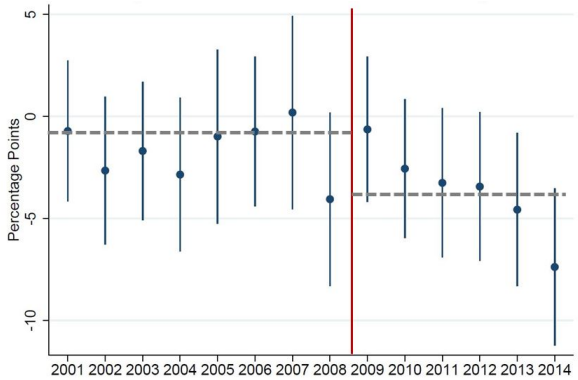
(a) Dropouts in PD schools compared to other HKI schools



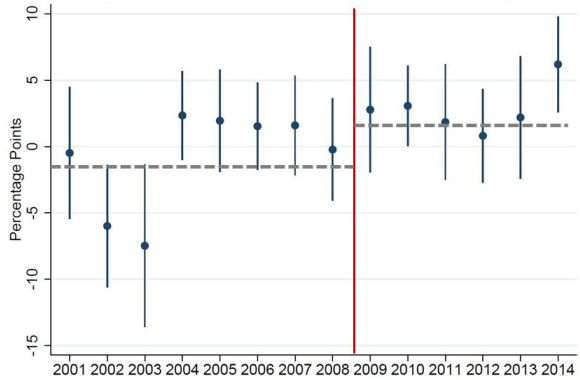
(b) HS acceptance in PD schools compared to other HKI schools



(c) Dropouts in PD schools compared to similar schools in other cities



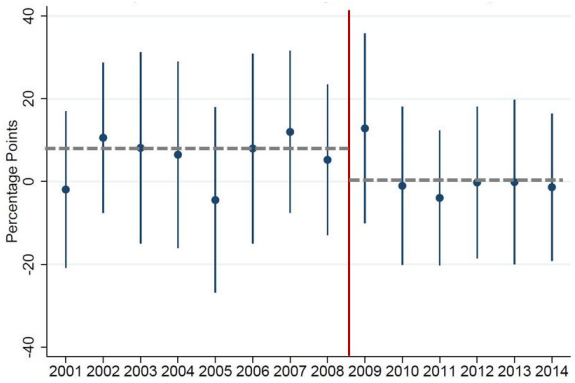
(d) HS acceptance in PD schools compared to similar schools in other cities



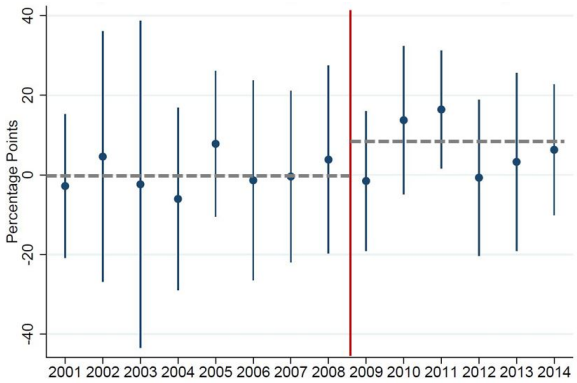
Notes: These four event study plots show the difference in annual mean outcomes of all students in PD schools and other groups of schools, with a rich set of controls. These controls include control variables for family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level. The red line indicates the implementation of the PD funding policy. The gray dashed lines overlayed on the graphs are from the DiD estimates in the following section.

Figure 5: Graphs of annual group means for immigrant students, with controls

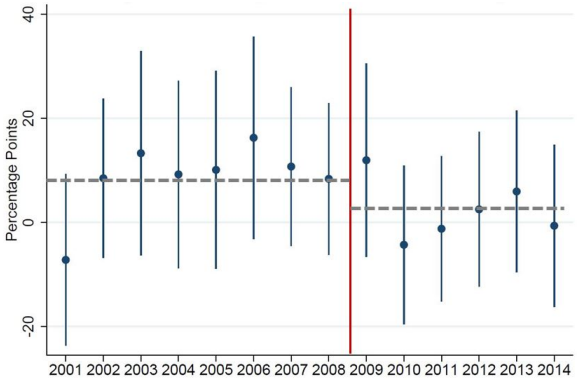
(a) Dropouts in PD schools compared to other HKI schools



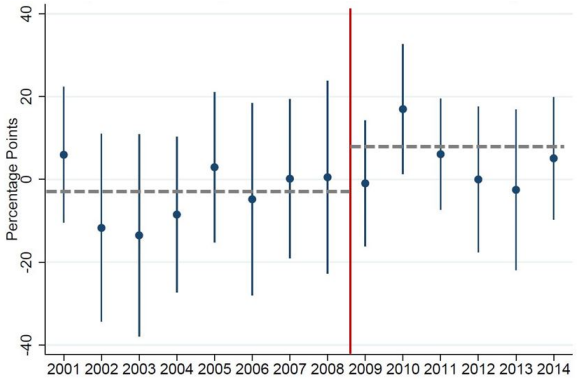
(b) HS acceptance in PD schools compared to other HKI schools



(c) Dropouts in PD schools compared to similar schools in other cities



(d) HS acceptance in PD schools compared to similar schools in other cities



Notes: These four event study plots show the difference in annual mean outcomes of immigrant students in PD schools and other groups of schools, with a rich set of controls. These controls include control variables for family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level. The red line indicates the implementation of the PD funding policy. The gray dashed lines overlayed on the graphs are from the DiD estimates in the following section.

The two graphs on the right (Figures 4(b) and 4(d)) show the high school acceptance rate in PD schools compared to other sets of schools. The point estimates in the two graphs do not indicate any change in the trends in high school acceptance before and after the implementation of the policy. Moreover, the graphs show that the pre-treatment trend is in the same direction as the post-treatment trend. The increase in high school acceptances between 2003 and 2004 indicates that these estimates fail to pass our falsification excercise and should be interpreted cautiously. As it turns out, this is in line with the DiD estimates: the full sample DiD estimates of the impact of PD funding on high school acceptance are small and not statistically significant.

In contrast to Figure 4, Figure 5 shows the annual group means in dropout and high school acceptance rates for students from an immigrant background in PD schools compared to other schools. Again, these graphs serve to ensure that any results from the DiD estimates are not simply a result of a trend that spans both pre-treatment and post-treatment periods.

As in Figure 4, the two graphs on the left of Figure 5 plot trends in dropout rates. These graphs suggest that, if anything, prior to the treatment the dropout rate amongst immigrant students in PD schools increased disproportionately to other sets of schools, only to drop after the implementation of the PD funding policy. The two graphs on the right (Figures 5(b) and 5(d)) suggest that amongst immigrant students there is no increasing trend in high school acceptance prior to 2009. These estimates suggest that the DiD estimates (marked by the gray line) pass the falsification excercise provided by these event study graphs. While the point estimates are too imprecise to draw any conclusions from these graphs, these graphs do not give us any reason to doubt our DiD estimates for the impact of the PD funding policy on immigrant students.

5.2 Secondary Education Transition Full Sample DiD Estimates

Table 3 presents the estimates of the effect of the PD funding policy on the full sample of students in schools exposed to the policy. Instead of estimating changes in the performance of

Table 3: Full Sample Secondary Education Transition DiD Estimates

(a) With both control groups

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.013	0.029*	0.015	-0.035***
	(0.01)	(0.01)	(0.01)	(0.01)
Observations	151472	155104	155104	151472

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) With other schools in Helsinki as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.003	0.013	0.023*	-0.034***
	(0.01)	(0.01)	(0.01)	(0.01)
Observations	53900	55214	55214	53900

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(c) With similar schools in other cities as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.018	0.036**	0.009	-0.034***
	(0.01)	(0.01)	(0.01)	(0.01)
Observations	115702	118570	118570	115702

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) shows the estimates comparing students in PD schools to all students in both of the control groups, whereas Table (b) uses schools in Helsinki that do not receive PD funding as a control group, and Table (c) uses similar schools in other cities as a control group. Control variables are not shown in the table, however, these are: family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, as well as interactions between all family background variables and immigrant status, and whether or not each parent has graduated from higher education, with fixed effects for school and year. All standard errors are clustered at the school level.

schools that come to receive PD funding annually as in Figure 5, these estimates show mean changes in secondary school transition indicators for all years that students are exposed to PD funding. The equation used to calculate these point estimates is described by Model 2 in Section 3.2. The estimates for each outcome indicator are reported using both control groups (other schools in Helsinki and similar schools in other large cities in Finland) together and each control group separately. The treatment is measured by a dummy variable, indicating whether or not a student is exposed to PD funding before they apply to secondary education.

The estimates in Table 3(a) suggest that students attending schools that receive PD funding are 3 percentage points more likely to attend high school and 3.5 percentage points less likely to drop out of education after the PD funding policy is implemented. However, when other schools in Helsinki are used as a control group the estimate for high school acceptance is no longer statistically significant. Otherwise, Tables 3(b) and 3(c) indicate that the full sample estimates for the dropout rate are robust to the choice of control group.

5.3 Heterogeneity Analysis

Tables 4-6 present the estimated impact of the PD funding policy on various subgroups of students.[12] As described in Section 2.2, the PD funding policy aims to support the performance of lower-performing students. As such, there is reason to believe that the impact of the policy may vary by subgroup.

The estimates in Table 4 suggest that the fall in the dropout rate is driven primarily by a decrease in the dropout rate amongst boys, who are 4.5 percentage points less likely to drop out as a result of the policy. As indicated by the estimates in 4(b) and 4(c), these estimates are robust to the choice of control group.

Additionally, the estimates in Table 5 suggest that students from an immigrant back-

[12] Note that the magnitude of the estimates by subgroup should be interpreted as the sum of rows one and two, one and three, or one three and four respectively. This applies to all subgroup estimates that appear later on in the paper.

Table 4: Secondary Education Transition DiD Estimates by Gender

(a) With both control groups

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.003	0.023	0.032	-0.044***
	(0.02)	(0.02)	(0.02)	(0.01)
X female	0.021	0.012	-0.036	0.019
	(0.02)	(0.01)	(0.02)	(0.01)
Observations	151472	155104	155104	151472

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) With other schools in Helsinki as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	-0.013	0.002	0.050**	-0.048***
	(0.02)	(0.02)	(0.02)	(0.01)
X female	0.033	0.023	-0.057**	0.030*
	(0.02)	(0.02)	(0.02)	(0.01)
Observations	53900	55214	55214	53900

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(c) With similar schools in other cities as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.012	0.033	0.021	-0.040***
	(0.02)	(0.02)	(0.02)	(0.01)
X female	0.013	0.007	-0.025	0.014
	(0.02)	(0.01)	(0.02)	(0.01)
Observations	115702	118570	118570	115702

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) shows the estimates comparing students in PD schools to all students in both of the control groups, whereas Table (b) uses schools in Helsinki that do not receive PD funding as a control group, and Table (c) uses similar schools in other cities as a control group. Control variables are not shown in the table, however, these are: family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level.

Table 5: Secondary Education Transition DiD Estimates by Immigrant Status

(a) With both control groups

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.001	0.016	0.022	-0.030***
	(0.01)	(0.01)	(0.01)	(0.01)
X immigrant	0.071**	0.071***	-0.043*	-0.030*
	(0.02)	(0.02)	(0.02)	(0.01)
Observations	151472	155104	155104	151472

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) With other schools in Helsinki as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	-0.008	0.000	0.027*	-0.026***
	(0.01)	(0.01)	(0.01)	(0.01)
X immigrant	0.067*	0.072***	-0.026	-0.045**
	(0.03)	(0.02)	(0.02)	(0.02)
Observations	53900	55214	55214	53900

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(c) With similar schools in other cities as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.005	0.023	0.018	-0.029***
	(0.01)	(0.01)	(0.01)	(0.01)
X immigrant	0.079***	0.077***	-0.049*	-0.030*
	(0.02)	(0.02)	(0.02)	(0.01)
Observations	115702	118570	118570	115702

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) shows the estimates comparing students in PD schools to all students in both of the control groups, whereas Table (b) uses schools in Helsinki that do not receive PD funding as a control group, and Table (c) uses similar schools in other cities as a control group. Control variables are not shown in the table, however, these are: family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level.

Table 6: Secondary Education Transition DiD Estimates by Immigrant Status and Gender

(a) With both control groups

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	-0.004	0.018	0.038*	-0.045***
	(0.02)	(0.02)	(0.02)	(0.01)
X female	0.010	-0.005	-0.033	0.032*
	(0.02)	(0.02)	(0.02)	(0.01)
X immigrant	0.041	0.026	-0.036	0.005
	(0.03)	(0.02)	(0.03)	(0.02)
X immigrant X female	0.065	0.099*	-0.018	-0.076**
	(0.06)	(0.05)	(0.05)	(0.03)
Observations	151472	155104	155104	151472

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) With other schools in Helsinki as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	-0.020	-0.003	0.053**	-0.046***
	(0.02)	(0.02)	(0.02)	(0.01)
X female	0.025	0.007	-0.054*	0.042**
	(0.02)	(0.02)	(0.02)	(0.01)
X immigrant	0.043	0.027	-0.018	-0.010
	(0.03)	(0.02)	(0.03)	(0.02)
X immigrant X female	0.051	0.097	-0.017	-0.074**
	(0.06)	(0.05)	(0.05)	(0.03)
Observations	53900	55214	55214	53900

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(c) With similar schools in other cities as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.005	0.028	0.028	-0.041***
	(0.02)	(0.02)	(0.02)	(0.01)
X female	0.001	-0.011	-0.021	0.027*
	(0.02)	(0.02)	(0.02)	(0.01)
X immigrant	0.045	0.029	-0.039	0.005
	(0.03)	(0.02)	(0.03)	(0.02)
X immigrant X female	0.074	0.105*	-0.022	-0.077**
	(0.06)	(0.05)	(0.05)	(0.03)
Observations	115702	118570	118570	115702

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

ground experience outsize improvement in their educational outcomes as a result of the policy. Students from an immigrant background are 7 percentage points more likely to be accepted to high school and 6 percentage points less likely to drop out as a result of the policy. Again, these estimates are robust to the choice of control group.

Table 6 presents the results broken down by both gender and immigrant status. The results suggest that boys, regardless of immigrant status, are 4.5 percentage points less likely to drop out of education as a result of the policy. Perhaps more interestingly, however, the results indicate that immigrant girls are roughly 14 perentage points more likely to attend high school and 12 percentage points less likely to dropout as a result of the policy. Again, these estimates are robust to the choice of control group.

These results suggest that the full sample estimates mask considerable variation in the subgroup impact of the policy. These estimates amount to roughly a 30% reduction in the dropout rate of native boys, a 10% reduction in the dropout rates of immigrant boys, and a 40% reduction in the dropout rate as well as a 30% increase in the high school acceptance of immigrant girls who attend these schools. [13]

5.4 Grade-point Averages

This section reports differences-in-differences estimates of the impact of PD funding on middle school grades, using the treatment defined as a dummy variable. Tables 7a and 7b report the estimates of the impact of PD funding on academic and non-academic GPAs

The estimates suggest that middle school academic GPAs increased by nearly 0.1 points (less than a tenth of a standard deviation) as a result of PD funding for students from an

[13] In 2008, prior to the implementation of the policy mean dropout rates are particularly low in schools that come to receive PD funding: 15.5% of native boy, 14% of native girls, 37% of immigrant boys, and 32% of immigrant girls did not continue to secondary school. Similarly, only 40% of native boys, 57% of native girls, 20% of immigrant boys, and 48% of immigrant girls in schools that come to receive PD funding are accepted to high school in 2008. In comparison, in other schools in Helsinki only 10% of students drop out and 67% of students attend high school.

Table 7: Middle School Grades

(a) Academic and non-Academic GPA's, Other Schools in Helsinki as a Control

	(1) GPA b/se	(2) ncGPA b/se
PD Impact	0.037	-0.013
	(0.03)	(0.04)
X immigrant	0.054	0.094*
	(0.07)	(0.04)
Observations	54120	54692

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Academic and non-Academic GPA's, Similar Schools in Other Cities as a Control

	(1) GPA b/se	(2) ncGPA b/se
PD Impact	0.031	-0.018
	(0.03)	(0.03)
X immigrant	0.051	0.092*
	(0.06)	(0.04)
Observations	152329	153247

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) uses schools in Helsinki that do not receive PD funding as a control group, whereas Table (b) uses similar schools in other cities as a control group. Control variables are not shown in the table, however, these are: family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level.

immigrant background, but that this increase is not statistically significant.[14] That said, the estimates suggest that immigrant students experience a statistically significant increase in non-academic GPAs of over a tenth of a standard deviation. In comparison to the surprisingly large impacts on the transition to secondary school, these estimates of the impact of the PD funding policy on grades is smaller.

5.5 Academic Improvement or Fewer Missing "One-Offs"?

The increase in high school attendance amongst immigrant students in schools exposed to the targeted funding policy could be driven by at least two primary forces: 1) improved academic performance might put students above the admissions threshold for high school, or 2) increased or better targeted applications to high school by students who had GPA's

[14]The academic GPA has a standard deviation of roughly 1.2, whereas the non-academic GPA has a standard deviation of roughly 0.8 (see Table 2).

above the admissions threshold but who were not applying.[15] The analysis in this section disentangles these two possibilities.

This is done as follows. For each year, the lowest GPA of a student who is accepted to high school is identified in each school. This makes it possible to find all the students in each school each year who had the academic qualifications for high school, but chose not to apply. These students are labeled as "could-haves". Then, using the same differences-in-differences estimation framework as in the main analysis, the impact of exposure to the PD funding policy is measured with "could-haves" as the outcome variable.

The results from this estimation are shown below in Table 8. In order to ensure that any impact on "could-haves" is not explained by a change in the admissions requirements for high school, the differences-in-differences framework is used to estimate the relationship between the PD funding policy and the threshold for high school admission, as defined by the GPA of the student with the minimum GPA in each school, each year who attends high school.

The estimates in the first columns of Tables 8a and 8b show that, if anything, the lowest GPA of students admitted to high school from schools exposed to the PD funding policy increased. This confirms that the increase in high school acceptance for immigrant students is not caused due to a drop in the admissions requirements for high school. The estimates in second columns of both of these tables indicate that the number of "could-haves" decreases by almost 6 percentage points amongst immigrant students in schools exposed to the policy. The decrease in these "could-haves" amounts to most of the 7 percentage point increase in high school admission amongst immigrant students exposed to the policy shown in Table 3 .

These results suggest that the majority of the increase in high school acceptance amongst immigrant students is driven by a higher rate of or better targeted applications to high school from students labeled as "could-haves". This is in line with the results from the previous

[15] Hoxby and Avery (2013) show that a large number of high-achieving, low-income students in the Untied States do not apply to selective universities or colleges even if they are qualified for admission. A similar phenomenon could explain the increase in high school acceptance for immigrant students after the PD funding policy is implemented.

Table 8: What Happens to the "Could-haves"?

(a) Other Schools in Helsinki as a Control

	(1) minGPA b/se	(2) couldhave b/se
PD Impact	0.118	-0.006
	(0.10)	(0.02)
X immigrant		-0.052**
		(0.02)
Observations	65308	55214

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Comparable Schools in Other Cities as a Control

	(1) minGPA b/se	(2) couldhave b/se
PD Impact	0.070	-0.025
	(0.09)	(0.02)
X immigrant		-0.032*
		(0.02)
Observations	138037	118570

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) uses schools in Helsinki that do not receive PD funding as a control group, whereas Table (b) uses similar schools in other cities as a control group. Control variables are not shown in the table, however, these are: family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level.

sections which show that amongst immigrant students the PD funding policy increased applications to high school and, while having large impacts on secondary school transition outcomes, only had a modest impact on academic performance.

5.6 Robustness Checks

5.6.1 Triple-Differences Estimation

A possible worry regarding identification is that other changes take place in the schools receiving PD funding at the same time as the PD funding policy kicks in. One way to check against this worry is to see if the changes that occur after 2009 impact all students in the schools - rather than the group targeted by the policy. A triple-differences framework that isolates changes that occur between groups of students in a school provides one way to examine this. The triple-differences estimation employs the same equation as Model (2),

but adds fixed effects for the interaction between school and year (d_{ts}):

$$Y_i = \beta I_{st} + \delta(I_{st} * F_i) + G_s + cX_i + \pi_s + \upsilon_t + d_{ts} + \varepsilon_{ist} \tag{3}$$

Controlling for school-specific trends in outcomes, the above equation measures how the performance of students from an immigrant background changes compared to other students in the same school, the same year. The results, using the treatment defined as a dummy variable, are shown in Table 9.

These point estimates, measuring the difference between the performance of immigrant and native students, are in line with the main estimates presented in Section 5.2. Since the prior estimates suggest that PD funding corresponded with a decrease in the dropout rate for both immigrant and native students, the triple-differences estimates measuring the differential impact of PD funding on immigrant and native populations per school per year are of smaller magnitude and only border being statistically significant.

5.6.2 Family Fixed-effects

Checking the sensitivity of the results to different controls is another way to ensure that the results would be robust if ommitted variables were added to the estimation. Yet, many of these ommitted variables are hard to measure and concern factors like home-environment and family preferences. Instead of adding more control variables to our estimation equation, another way to test for the same issue is to limit the sample to families with more than one child and then include family fixed-effects. These regressions compare siblings who are exposed to the treatment to siblings who are not exposed to the treatment. The results in Table 10 show the results estimated using with family fixed effects. While the composition of families included in this estimation may be biased - since families with only one child are not included in the estimation - the point estimates are remarkably similar to the point estimates from the main estimates. If anything, these estimates suggest that PD funding may

Table 9: Triple-Differences Estimation Results

(a) With other schools in Helsinki as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
X immigrant	0.056*	0.062**	-0.017	-0.045**
	(0.03)	(0.02)	(0.02)	(0.02)
Observations	53900	55214	55214	53900

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) With similar schools in other cities as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
X immigrant	0.067**	0.066***	-0.040	-0.028
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	114684	117547	117547	114684

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) uses schools in Helsinki that do not receive PD funding as a control group, whereas Table (b) uses similar schools in other cities as a control group. Control variables are not shown in the table, however, these are: family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level.

Table 10: Family Fixed-effects Estimation

(a) Other Schools in Helsinki as a Control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
mPDdummy	-0.020	-0.006	0.031	-0.023*
	(0.02)	(0.02)	(0.02)	(0.01)
PD impact X immigrant	0.064	0.088**	-0.010	-0.069*
	(0.03)	(0.03)	(0.04)	(0.03)
Observations	39138	40472	40472	39138

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Similar Schools in Other Cities as a Control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
mPDdummy	-0.030	-0.016	0.042*	-0.012
	(0.02)	(0.02)	(0.02)	(0.01)
PD impact X immigrant	0.050	0.091**	-0.004	-0.098***
	(0.04)	(0.03)	(0.04)	(0.02)
Observations	69013	71637	71637	69013

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) uses schools in Helsinki that do not receive PD funding as a control group, whereas Table (b) uses similar schools in other cities as a control group. Instead of using family background controls, these estimates employ family fixed-effects, comparing siblings who are exposed to the treatment to siblings who are not exposed to the treatment. In addition to the family-fixed effects, the estimation uses school and year fixed effects. All standard errors are clustered at the school level.

have an even larger impact on students from an immigrant background. Siblings exposed to PD funding are 9 percentage points more likely to attend high school and between 7 and 10 percentage points less likely to drop out after middle school than siblings who are not exposed to PD funding. Since these estimates compare variation within families, these estimates ensure that the earlier estimates do not result from families selecting into schools with extra resources.

5.6.3 Restricted Set of Years (2004-2013)

The graphs of performance trends show that the mean performance of the treatment and control schools was somewhat volatile in the early 2000's. Likewise, after 2013, various other changes that impact the performance of schools under examination took place - particularly at the national level (see Section 5.6.5). While the annual fixed effects should be able to control for at least some of these changes, others may remain problematic, thereby constituting a threat to the validity of the main estimates. A simple way to overcome this concern is to restrict the data used in the estimations to the five years directly before and after the reform. The results from the estimations with the restricted set of years are shown in Table 11.

The estimates in Table 11 are of similar direction and statistical significance as our main results. If anything, it seems that restricting the years included in the estimation to those five years before and after the policy is implemented increases the magnitude of the point estimates for the impact of PD funding on high school acceptance amongst immigrant students.

5.6.4 School-level Mechanisms

The directives principals received regarding how to use the PD funding as well as prior research on the reported uses of PD funding (Silliman, 2016) suggest that the additional funding that schools received from PD funding was primarily spent on additional staff (not including classroom teachers), for example, classroom assistants or school psychologists. Although this research lacks rich data on school level inputs, this section provides a check that the secondary school transition results do not come from mechanisms that are not associated with PD-funding. The primary indicators available by which to examine possible mechanisms are technology investments as measured by the number of new computers and

Table 11: Restricted Set of Years (2004-2013)

(a) Other schools in Helsinki as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.002	0.007	0.018*	-0.027*
	(0.01)	(0.01)	(0.01)	(0.01)
X immigrant	0.078*	0.069**	-0.032	-0.045
	(0.03)	(0.02)	(0.03)	(0.02)
Observations	34546	35201	35201	34546

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Similar schools in other cities as a control

	(1) First choice: HS b/se	(2) Accepted to HS b/se	(3) Accepted to VT b/se	(4) Drops out b/se
PD Impact	0.003	0.006	0.025*	-0.023*
	(0.01)	(0.01)	(0.01)	(0.01)
X immigrant	0.095***	0.077***	-0.073**	-0.016
	(0.03)	(0.02)	(0.03)	(0.02)
Observations	69558	71358	71358	69558

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) uses schools in Helsinki that do not receive PD funding as a control group, whereas Table (b) uses similar schools in other cities as a control group. Control variables are not shown in the table, however, these are: family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level.

the portion of students receiving special needs support, as well as a measure of average class size.

The differences-in-differences estimation framework employed in this research is modified slightly to examine possible mechanisms by which any impact might be realized.

$$Y_{st} = \beta I_{st} + G_s + \pi_s + \upsilon_t + \varepsilon_{st} \tag{4}$$

The important difference in this model compared to the ones used in the main analysis is that estimates are calculated entirely using school level variables. As such, instead of measuring the treatment as the sum of accumulated PD funding a student receives, the treatment variable is calculated as the amount of per pupil PD funding each school receives each year. The idea here is that the number of stduents classified as special needs each year, for example, is assumed to vary by the level of extra resources a school receives that year - instead of those accumulated over time. Again, standard errors clustered at the school level.

The estimates in Table 12 suggest that the improvements in the educational outcomes of immigrant students were not achieved by technology investment, special needs classification, or class size. While this is certainly not an exhaustive list of possible school-level mechanisms apart from additional staff that may contribute to the improved outcomes this paper identifies, it provides a check that the results do not stem from other changes.

5.6.5 Possible Confounding Explanations

By using two control groups - one for municipal level-changes and the other for nation-wide changes - I try to account for other possible changes that may impact the results. Nonetheless, the possibility that another change occurs at the same time that has a differential impact on the set of students in schools receiving PD funding the years immediately after the policy is implemented remains a threat to the validity of these results. Through research on other

Table 12: School-Level Mechanisms

(a) Other Schools in Helsinki as a Control

	(1) New Computers	(2) Special Needs Classifications	(3) Avg. Class size
Annual PD funding	0.002	0.000	-0.001
	(0.06)	(0.00)	(0.00)
Observations	459	458	558

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Similar Schools in Other Cities as a Control

	(1) New Computers	(2) Special Needs Classifications	(3) Avg. Class size
Annual PD funding	0.028	0.000	-0.006
	(0.06)	(0.00)	(0.00)
Observations	2579	2558	3400

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) uses schools in Helsinki that do not receive PD funding as a control group, whereas Table (b) uses similar schools in other cities as a control group. Fixed effects for year are included in the regression. All standard errors are clustered at the school level.

reforms and discussions with experts in the City of Helsinki Department of Education I have tried to identify other possible confounding explanations. These are listed below.

In Helsinki, the Department of Education undertook a strategic reform in 2006 that attempted to shift the system of education governance to one geared more towards outcomes-based steering. Then, between 2007 and 2008, the Department of Education ran workshops on school leadership intended for its principals. If these changes have a differential impact on schools receiving PD funding, it is possible that some of the improvements in performance that the models attribute to PD funding come from these changes instead.

At the national level, at least three major changes took place. First, since 2010 changes in the national Basic Education Act as well as the government transfer system aimed to improve special education in Finnish schools (Basic Education Act, 642/2010). Replacing a two-tiered system with a three-tiered system, the Basic Education Act clarified and amended the rights students have to receive special education. On the other hand, changes to the government transfer system separated the channels of funding for special needs students from

the general compulsory education funding. While the reforms helped to direct resources to those with more needs, the results in Table 12 suggest that schools receiving PD funding did not experience a distinct change in special needs classifications. Moreover, other research suggests that the level of special needs funding remained relatively stable at the school level (Pulkkinen and Jahnukainen, 2016).

Second, beginning in 2013 a national policy gave municipal education providers with additional financial support based on demonstrated need. The model used to gauge whether or not a school qualified for need is similar to that used to determine PD funding in Helsinki, except that schools had to be knowledgeable of and apply for this additional funding. Since the policy takes place on the national level, it should be accounted for by using the set of schools outside Helsinki as a control group.

Third, in 2014 there was a nation-wide reform that aimed to decrease the number of students who do not continue directly from middle school to further education. As shown in Figure 6a and 6b, the dropout rate decreases noticeably in 2014, particularly for immigrant students. That said, this change impacts both students in our treatment and control groups, and should therefore not cause significant concern. Moreover, the estimates in Section 5.6.3 show that the estimates hold even when the years 2014 and 2015 are not included in the regressions.

6 Conclusions

This paper studies the impact of a targeted funding policy that provided disadvantaged schools in Helsinki with additional staff on educational outcomes. Using a differences-in-differences setup with two control groups, I estimate the impacts of the targeted funding policy on the transitions to secondary education and some of the mechanisms that underlie these impacts. I find that the policy had a large positive impact on secondary school tran-

sition outcomes for both low-performing native students and students from an immigrant background more broadly. The estimates suggest that native students are 3 percentage points less likely to drop out of education after middle school and that students from an immigrant background are both 6 percentage points less likely to drop out of education as well as 7 percentage points more likely to attend the academic track of upper-secondary school as a result of the policy. The impacts of the policy are particularly large for native male students and female students from an immigrant background.

These results provide two insights. First, that increasing school resources can improve medium term educational outcomes, particularly for low-performing native students and students from an immigrant background. Second, that improvements in educational outcomes can be obtained by focusing on non-academic skills alongside more traditional academic coursework.

There remains room for research on these topics. Using this same data it will be possible to examine the impacts of the PD funding policy on longer term outcomes such as secondary school completion and income, and by linking this data to the non-cognitive skills scores from the Finnish military service, it could be possible to determine the longer-term impact of the policy on non-cognitive skills. In the shorter term, further research on what actually happened inside schools that received PD funding would help to better understand the mechanisms through which the improved secondary school transition outcomes were realized.

References

Angrist, J. D. and Krueger, A. B. (1999). Empirical strategies in labor economics. *Handbook of labor economics*, 3:1277–1366.

Angrist, J. D. and Pischke, J.-S. (2010). The credibility revolution in empirical economics: How better research design is taking the con out of econometrics. *The Journal of economic perspectives*, 24(2):3–30.

Athey, S. and Imbens, G. W. (2006). Identification and inference in nonlinear difference-in-differences models. *Econometrica*, 74(2):431–497.

Benabou, R., Kramarz, F., and Prost, C. (2009). The french zones d'education prioritaire: Much ado about nothing? *Economics of Education Review*, 28(3):345–356.

Bernelius, V. (2013). Eriytyvät kaupunkikoulut: Helsingin peruskoulujen oppilaspohjan erot, perheiden kouluvalinnat ja oppimistuloksiin liittyvät aluevaikutukset osana kaupungin eriytymiskehitystä (the polarization of helsinki schools: Area-based variation in student background, school choice, and educational outcomes).

Brunello, G. and Schlotter, M. (2011). Non-cognitive skills and personality traits: Labour market relevance and their development in education & training systems. *Discussion paper series // Forschungsinstitut zur Zukunft der Arbeit (IZA)*.

De Haan, M. (2017). The effect of additional funds for low-ability pupils: A non-parametric bounds analysis. *The Economic Journal*, 127(599):177–198.

Deming, D. J. (2017). The growing importance of social skills in the labor market. *Quarterly Journal of Economics*.

Dobbie, W. and Fryer Jr, R. G. (2015). The medium-term impacts of high-achieving charter schools. *Journal of Political Economy*, 123(5):985–1037.

Gibbons, S., McNally, S., and Viarengo, M. (2011). Does additional spending help urban schools? an evaluation using boundary discontinuities. Centre for the Economics of Education. London School of Economics.

Guryan, J. (2003). Does money matter? regression-discontinuity estimates from education finance reform in massachusetts. *NBER Working Paper*, 8269.

Hægeland, T., Raaum, O., and Salvanes, K. G. (2012). Pennies from heaven? using exogenous tax variation to identify effects of school resources on pupil achievement. *Economics of Education Review*, 31(5):601–614.

Häkkinen, I., Kirjavainen, T., and Uusitalo, R. (2003). School resources and student achievement revisited: new evidence from panel data. *Economics of Education Review*, 22(3):329–335.

Hanushek, E. A. (2006). School resources. *Handbook of the Economics of Education*, 2:865–908.

Heckman, J. J. and Rubinstein, Y. (2001). The importance of noncognitive skills: Lessons from the ged testing program. *The American Economic Review*, 91(2):145–149.

Holmlund, H., McNally, S., and Viarengo, M. (2010). Does money matter for schools? *Economics of education review*, 29(6):1154–1164.

Hoxby, C. and Avery, C. (2013). The missing" one-offs": The hidden supply of high-achieving, low-income students. *Brookings papers on economic activity*, 2013(1):1–65.

Jackson, C. K., Johnson, R. C., and Persico, C. (2015). The effects of school spending on educational and economic outcomes: Evidence from school finance reforms. *The Quarterly Journal of Economics*, 131(1):157–218.

Jacob, B. and Ludwig, J. (2008). Improving educational outcomes for poor children. Technical report, National Bureau of Economic Research.

Jokela, M., Pekkarinen, T., Sarvimäki, M., Terviö, M., and Uusitalo, R. (2017). Secular rise in economically valuable personality traits. *Proceedings of the National Academy of Sciences*, page 201609994.

Kautz, T., Heckman, J. J., Diris, R., Ter Weel, B., and Borghans, L. (2014). Fostering and measuring skills: Improving cognitive and non-cognitive skills to promote lifetime success. Technical report, National Bureau of Economic Research.

Lankinen, M. (2001). Positiivinen diskriminaatio: mita se on? (positive discrimination: What is it?). *Helsingin kaupungin tietokeskus*.

Leuven, E., Lindahl, M., Oosterbeek, H., and Webbink, D. (2007). The effect of extra funding for disadvantaged pupils on achievement. *The Review of Economics and Statistics*, 89(4):721–736.

OECD (2014). *Education at a Glance 2014: OECD Indicators*, chapter Indicator B1: How much is spent per student? OECD Publishing.

OECD (2017). *International Migration Outlook 2017*. OECD Publishing.

Pulkkinen, J. and Jahnukainen, M. (2016). Finnish reform of the funding and provision of special education: the views of principals and municipal education administrators. *Educational Review*, 68(2):171–188.

Sarvimäki, M. and Hämäläinen, K. (2016). Integrating immigrants: The impact of restructuring active labor market programs. *Journal of Labor Economics*, 34(2):479–508.

Silliman, M. (2016). Area-based "positive discrimination school funding in helsinki. Master's thesis, University of Helsinki.

Virtanen, H. (2016). *Failure in Admission and the Process of Completing a Post-Compulsory Degree*. PhD thesis, Aalto University.

Appendix

A Additional Descriptive Statistics

A.1 The Transition to Secondary Education in Helsinki and Other Cities in Finland

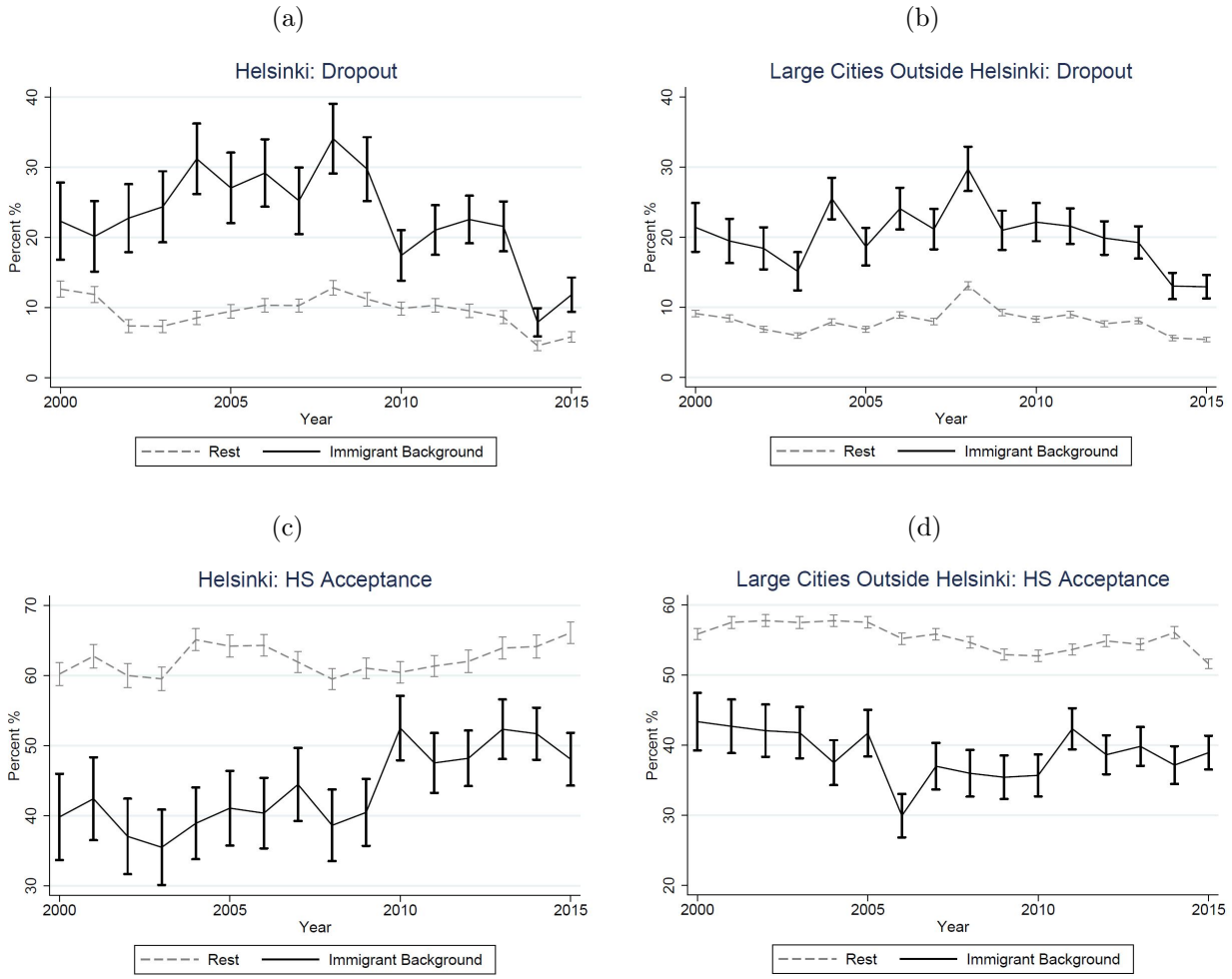
The dropout rate in Helsinki for students from an immigrant background peaked in 2008, when one in three dropped out of school after ninth grade. By 2010, however, immigrant students in Helsinki had experienced considerable improvement in their transitions to secondary education: they became over 10 percentage points less likely to drop out of education (Figure 6a), and over 10 percentage points more likely to continue to the academic track of secondary education (Figure 6c)[16]. This is not a temporary change; the improvement persists amongst later cohorts. A similar improvement in educational outcomes does not take place amongst native students in Helsinki, or immigrant students in other large cities in Finland (Figures 6b and 6d).

A.2 Socioeconomic Background Characteristics Over Time

The graphs in Figure 7 show trends in background characteristics of students attending the different groups of schools examined in this research. Figures 7a and 7b show that there were no sudden jumps in the trends of family income that coincide with the timing of PD funding. Figures 7c abd 7d show trends in the number of immigrants graduating from each of the groups of middle schools. Although the graphs show that there were more students from

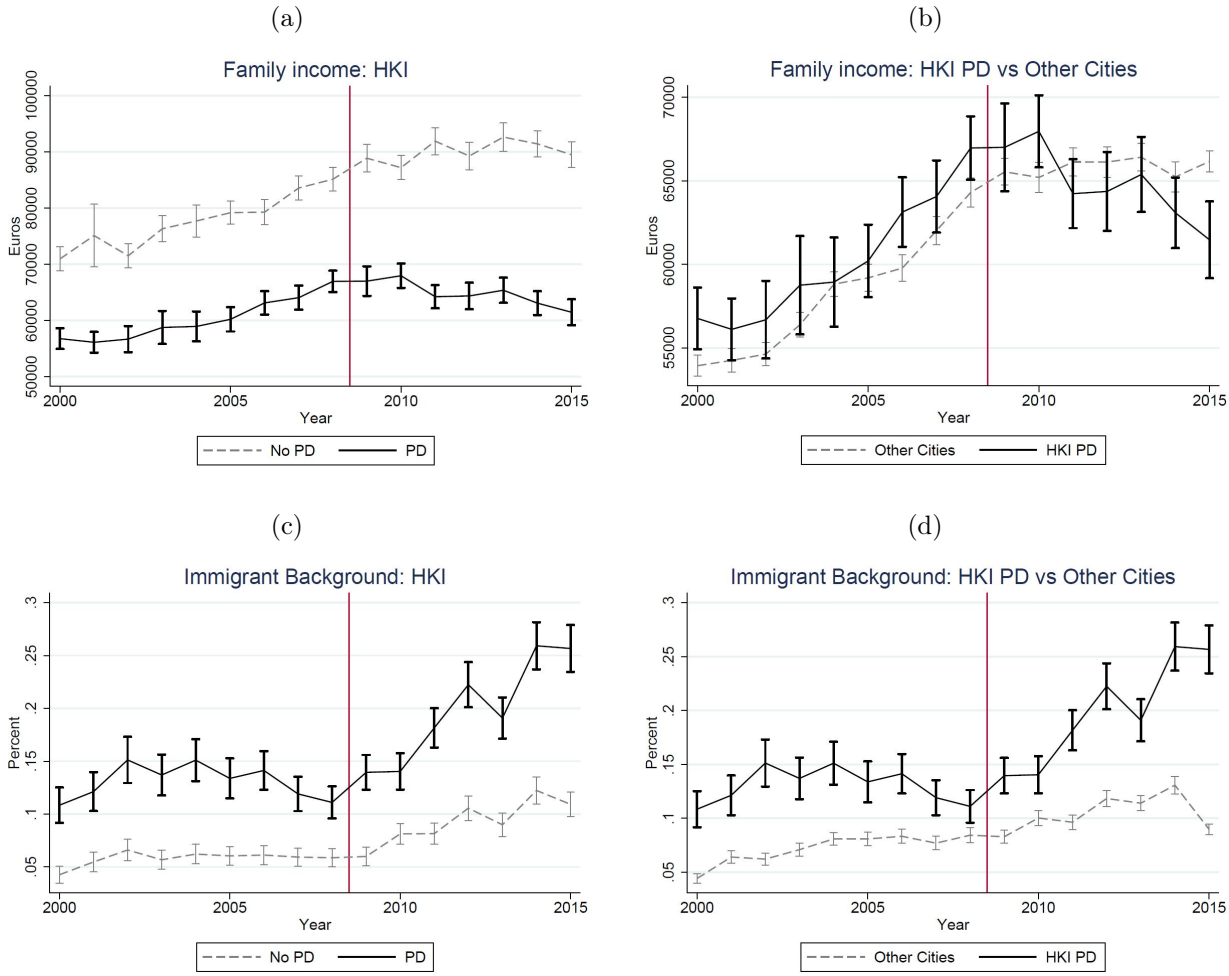
[16]The decrease in the dropout rate in 2014 both in Helsinki and other large cities coincides with a national youth guarantee, intended to ensure places in secondary education for all students.

Figure 6: Educational Outcomes in Helsinki and Other Large Cities, 2000-2015



an immigrant background in cohorts graduating from middle schools receiving PD funding after 2010, this increase appears to be steadyand does not coincide with the improvements in student outcomes between the cohorts graduating between 2009 and 2010.

Figure 7: Socioeconomic Background Characteristics Over Time



A.3 Statistics on Secondary School Transitions by School Group and Immigrant Status

Tables 13a and 13b show differences in secondary school transitions by school group and by immigrant status. The tables show that significant differences in secondary school preferences exist between all three groups of schools. Not suprisingly, it follows that similar differences exist between the secondary school transition outcomes of all three groups. Students in Helsinki are more likely to attend high school rather than vocational school compared to the students in other cities. At the same time, students attending middle schools that come to

receive PD funding are less likely to attend high school than students in schools that do not.

Table 13b shows that these differences grow when the outcomes are broken down by immigrant background. Immigrants in all three groups of schools are more than twice as likely not to continue directly to secondary education after middle school. Likewise, in all three groups of schools, immigrants are less likely to attend high school rather vocational school.

B Additional Estimation Results

B.1 Including Elementary School PD Levels

Later cohorts graduating from middle school also received PD funding in elementary school. Since the elementary school a student attends is not recorded in official statistics, we have to estimate the students level of elementary school PD support based on which elementary schools feed into which middle schools. Given the myriad possible issues that are associated with estimating elementary school exposure to PD funding, these measures are not included in the main analysis of this paper.

The same estimation employed in the main analysis is carried out with the expanded treatment variable. Table 14 show the differences-in-differences results with the re-calculated treatment. Table 14 presents results estimated using a dummy-variable treatment.

The results from Table 14 resemble those from the main analysis using only middle PD funding data. The primary difference between the results using elementary school data is that the estimates, when compared to other schools in Helsinki, grow in magnitude. This is most likely because some elementary schools that receive PD funding feed into middle schools that do not. Thus, these students were coded as not exposed to the PD funding in the prior analysis. When they are included in the treatment, the magnitude of the estimates

Table 13: Secondary School Transition Summary Statistics

(a) By School Group

	HKI PD mean	HKI nPD mean	Comparable mean
Prefers HS	0.56	0.75	0.49
Accepted HS	0.49	0.67	0.44
Accepted VT	0.36	0.22	0.44
Dropout	0.13	0.10	0.10
Observations	22801	42541	122061

(b) By Immigrant Status

	Nat. HKI PD mean	Nat. HKI nPD mean	Nat. Comparable mean	Imm. HKI PD mean	Imm. HKI nPD mean	Imm. Comparable mean
Prefers HS	0.57	0.75	0.50	0.49	0.69	0.42
Accepted HS	0.51	0.68	0.45	0.37	0.54	0.33
Accepted VT	0.36	0.22	0.44	0.35	0.25	0.42
Dropout	0.11	0.09	0.09	0.24	0.19	0.22
Observations	19117	39415	111553	3684	3126	10508

increases. The estimates using schools from other cities as a control are both qualitatively and quantitatively similar to those obtained in the main analysis.

Table 14: Including Exposure to PD Funding in Elementary School

(a) With other schools in Helsinki as a control

	(1) First choice: HS b/se	(2) Accepted HS b/se	(3) Accepted VT b/se	(4) Drops out b/se
PD Impact	-0.014	0.003	0.032**	-0.030***
	(0.01)	(0.01)	(0.01)	(0.01)
X immigrant	0.111***	0.103***	-0.069***	-0.031*
	(0.02)	(0.02)	(0.02)	(0.01)
Observations	53900	55214	55214	53900

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) With similar schools in other cities as a control

	(1) First choice: HS b/se	(2) Accepted HS b/se	(3) Accepted VT b/se	(4) Drops out b/se
PD Impact	-0.003	0.018	0.023*	-0.027**
	(0.01)	(0.01)	(0.01)	(0.01)
X immigrant	0.085***	0.081***	-0.063***	-0.021
	(0.02)	(0.02)	(0.02)	(0.01)
Observations	115702	118570	118570	115702

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table (a) uses schools in Helsinki that do not receive PD funding as a control group, whereas Table (b) uses similar schools in other cities as a control group. Control variables are not shown in the table, however, these are: family income, mother's income separately, father's income separately, a measure of whether or not both parents are foreign or one parent is foreign, gender, and whether or not each parent has graduated from higher education, as well as interactions between all family background variables and immigrant status, with fixed effects for school and year. All standard errors are clustered at the school level.