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Does the Clustering of Immigrant Peers Affect the School Performance of Natives?

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We analyse whether the proportion of immigrant students affects the school performance – measured by drop out - of natives in secondary school. To derive causal statements, we construct a time-varying school quality indicator and exploiting potential random variation in the number of immigrants within the same school. The results reveal a positive and significant relationship between the proportion of immigrants and the dropout rate of natives. It is only with larger proportions of immigrants that we find significant peer effects. Regarding the mechanisms of influence, our results point to the importance of peer quality. .

Abstract

In this paper, we analyse whether the proportion of immigrant students affects the school performance of natives in secondary school. To derive causal statements, we construct a time-varying school quality indicator exploiting potential random variation in the number of immigrants in different grades within the same school. Performance is measured in terms of the likelihood to drop out of upper secondary school. The results reveal a positive and significant correlation between the proportion of immigrants and the dropout rate of natives. The coefficient suggests that a 10% increase in the proportion of immigrants leads to a 2% increase in the dropout rate. The effect is non-linear. It is only with larger proportions of immigrants that we find significant peer effects. This suggests there is a tipping point for segregation, but it is high and generally only relevant for a small percentage of the schools in our sample. Regarding the mechanisms of influence, our results point to the importance of peer quality. Our interpretation of this is that it is not an "ethnic" effect per se, but a consequence of the skill deficit of immigrants.

Keywords: Peer effects, dropout rates, immigrants

JEL classification: I20, J24

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I. Introduction

During the past three decades, the immigrant population in Norway has increased from 2%–10%. As in other high-income countries, the composition of immigrant inflows has changed radically in recent decades with regard to country of origin (OECD, 2008). Prior to the 1980s, the majority of Norway's immigrants came from countries that are geographically and culturally close. Today, a larger proportion of the immigrant population comes from countries much more distant in both respects.

The increased number of immigrants has spurred a great amount of economic research analysing the impact of immigration on the labour markets of receiving countries (Card 2001, 2009; Borjas 2003, Ottaviano and Peri 2012). In this paper, we shed light on a particular aspect—the impact of immigration on native students' school performances—that until recently has not received as much attention. Along with the increasing number of immigrants, Norwegian educational policy has been concerned with the impact of segregated schools, especially at the primary and secondary school levels. Many politicians have expressed concern about whether ethnically segregated schools have a negative impact on the learning environment of students. In a period when many western countries are expected to absorb an increasing number of immigrants, this issue is of particular relevance. The concern over segregated schools is closely linked to a general concern about high secondary school dropout levels. In 2002, almost 20% of young people aged 18–24 in the European Union (EU) dropped out of school prematurely. At that time, ministers of education agreed to bring this

rate down to 9% by 2010. However, insufficient progress had been made by 2011 and the 2020 target is to reduce the school dropout rate to below 10% (OECD 2010).

In Norway, approximately 30% of people who start upper secondary school never finish. This has spurred the need for an explanation. In this paper, we analyse the impact of the proportion of immigrant peers on the performance of native students in upper secondary school, where performance is measured in terms of dropping out. A school dropout is defined as someone who does not complete upper secondary school within five years after entry.

In recent years, the literature has revealed an increasing interest in modelling and measuring the effects of social interactions between students, so-called school peer effects. Studies have identified peer effects based on race, gender and immigrant background (Angrist and Lang 2004, Hoxby 2000, Gould et al 2009, Lavy and Schlosser 2011). We will discuss this further in the next section.

There are several mechanisms that can explain why there might be a relationship between the proportion of immigrant students and the performance of native students. One potential mechanism is peer group quality. Immigrants tend to have lower marks than natives (Statistics Norway 2012). If individual achievement is affected by the average test score potential of classmates, an increase in the proportion of immigrant classmates will lower the expected performance of students (holding constant their own characteristics).[1] Another potential influence is school quality. Schools vary in quality with respect to their ability to provide a good learning environment. These differences may be both time-invariant and time-varying. In our study, we control for school quality by including school fixed effects, time-

[1] According to Norway's Educational Act ("Opplæringsloven"), immigrant students in compulsory school have the right to receive extra Norwegian language classes until they reach a level when they can follow the ordinary class. The schools and municipalities are obliged to map out the need for extra language training among immigrant students. A separate curriculum for language training for immigrants has been implemented. Still, several Norwegian reports have revealed there are large variations between schools when it comes to both the opportunity to receive training and the quality of training.

varying indicators of school quality and a three-year moving average approach. We will discuss the specifications of these variables later.

To identify the causal effects of peers, we first draw on two studies from the peer effect literature. Hoxby (2000) and Gould et al. (2009) both have an ethnic focus and use potential random variation in the number of immigrants in the different grades within the same school as an identification strategy. Hoxby (2000) exploited across-grade variation in peers within the same school that arises because of random demographic differences between cohorts. We assume that, conditional on the number of immigrants in the 11^{th} and 12^{th} grades (the first two years of upper secondary school), the proportion of immigrants in 11^{th} grade is determined by the random variation in the distribution of grades levels in the immigrant pool in the local area. Second, we draw on Black et al. (2010) and control for potential time-varying school quality, where time fixed-effect school quality is controlled for by school dummies. We use a three-year moving average approach, including school-level mean characteristics.

Our contribution to the literature is threefold. First, we present evidence from the upper secondary school level (the majority of previous studies focussed on lower levels of schooling). Second, we use a comprehensive set of controls to derive causal statements, including within-school idiosyncratic variation and a moving average approach. Third, we present some tentative evidence of what kind of mechanisms of influence may be revealed by the peer effect.

Our data covers all students starting upper secondary schooling in the period 1996–2003. We followed these eight cohorts for five years, i.e. all students had five years to complete school. The results show that the concentration of immigrants has a positive impact on the dropout likelihood of natives. The preferred estimate suggests a 10% increase in the number of immigrants leads to a 3% increase in the dropout rate of natives. This effect is

sustained after controlling for potential endogeneity problems. The result is also sustained after running a placebo test involving peers belonging to another grade and another stream of study (academic versus vocational). Regarding the mechanisms at play, our results point to the importance of peer quality. It is only effects stemming from immigrant students with low-skilled parents and immigrant students who arrived in Norway at an older age (older than seven years of age) that we find significant effects. Our interpretation is that it is not an "ethnic" effect as such, but rather it is the skill deficit of immigrants that causes the peer effect.

The paper proceeds as follows. In the next section, we give a brief overview of the related literature. In Section III, we describe the Norwegian educational system and immigration history. In Section IV, we present the data, the variables and the sample. Section V deals with the modelling and identification strategy, Section VI consist of the results and Section VII is the conclusion.

II. Related literature

Our study relates to the economic literature analysing peer effect in education (Ammermueller and Pischke 2006, Black et al. 2010, Lavy and Schlosser 2011, Gibbons and Talhaj 2008, Lavy et al. 2012), especially the strand of the literature analysing ethnic peer effects (Hoxby 2000, Gould et al. 2009, Card and Rothstein 2006, Hanushek et al. 2009). Gould et al. (2009) analyse the impact of immigrant concentration in elementary school on the long-term academic performance of native high school students in Israel. They control for the endogeneity of immigrant placement between schools by conditioning on the total number of immigrants in a school and exploiting random variation in the number of immigrants across grades within the same school. Their results suggest the overall presence of immigrants in a

grade has a significant, and large, positive effect on the dropout rate and a negative effect on the chances of passing the high school matriculation exam required to attend college.

Hoxby (2000a) exploits idiosyncratic variation in the gender and race composition of neighboring cohorts in public schools in Texas. Her results show that students' elementary school test scores are affected by those of their peers, with intra-race peer effects appearing to be particularly strong. Card and Rothenstein (2006) analyse the relationship between racial segregation and the black–white test score gap in the US. They compare black–white test score gaps across metropolitan areas that differ in the extent of school segregation. They decompose the effects of school segregation into three components: one arising from differences in residential sorting patterns, one due to court-ordered school desegregation and a residual. The results show the residential component has a large effect on test score gaps, while the remaining components do not. They conclude that the composition of neighborhoods matters, but not that of schools.

Hanushek et al. (2009) use rich panel data on the achievement of students in Texas, and disentangle racial composition effects from other aspects of school quality and from differences in abilities and family background. Their results suggest a higher percentage of black schoolmates reduces the achievement of blacks, while it has a much smaller and generally insignificant effect on whites.

Rumberger and Lim (2008) review 25 years of international research on why students drop out of school. Among other things, they found a clear indication that the proportion of ethnic or linguistic minorities was correlated to dropout rates. Traag and van der Velden (2008) indicate that student composition in the Netherlands seems to have an effect on early school leaving. They estimate that decreasing the percentage of minority students in a school by 10% reduces the risk of dropping out by 13%. However, after controlling for resources and school practices, Rumberger and Lim (2008) found the composition variables became

insignificant, showing that school practices can have a positive effect in terms of counteracting the negative impact of student composition.

III. The Norwegian educational system and immigration to Norway

The educational system

Since 1997, school has been compulsory for children aged 6–16. Before 1997, school was compulsory for children aged 7–16. There are no ability school tracking in compulsory school. Municipalities operate schools to provide compulsory education and where one resides determines which compulsory school children attend. Furthermore, the number of private primary schools in Norway is very low and they are heavily subsidized. Exams and methods of grading are uniform across the country.

As of 1997, all students are guaranteed at least three years of upper secondary school after completing compulsory school. In upper secondary school, students can choose between an academically oriented track and a vocational track. The vocational track leads directly to occupational qualifications. The vocational track usually consists of two years of classroom training followed by two years of on-the-job training, by way of an apprenticeship or some other scheme. The three-year academic track qualifies one solely for college or university admission certification. However, the system permits students following a vocational track to switch to the academic track after two years. In other words, it is possible to change tracks along the way.

Immigration to Norway

Since World War II, Norway has had considerable restrictions on labour immigration from non-western countries. The exception is the period of liberalisation between 1957 and 1975. In this period, and especially in the beginning of the 1970s, there was a considerable influx of

low-skilled labour immigrants, particularly from Pakistan, Turkey and Morocco. In 1975, a ban on labour immigration from countries other than the Nordic ones was implemented. Exceptions were made for immigrants with specialized skills not found in the Norwegian labour market.

Still, the immigrant population in Norway has increased considerably since the immigration ban of 1975, from approximately 2% of the population in 1980 to approximately 8% in 2005. A large part of this increase is due to immigration of refugees, asylum seekers and family reunification. As a consequence, the composition of the immigrant population changed from being dominated by Nordic and western immigrants to being dominated by immigrants from non-western countries (Asia, Africa, Eastern Europe and Latin America). By 2004, almost 75% of the immigrants in Norway were from non-western countries, compared to 25% in 1980 (Statistics Norway 2006). The increase in immigration from non-western countries is due to the influx of refugees and asylum seekers, and family reunification. A common immigration pattern for refugees is for husbands to arrive first, followed by wives and children via family reunification programmes. The largest, most recent groups of refugees and asylum seekers came from Bosnia-Herzegovina and Kosovo in the 1990s in the aftermath of the Balkan wars.

IV. Data, variables and sample

All analyses are based on a comprehensive set of individual register data collected and administrated by Statistics Norway. The starting point is individual register information from the Norwegian National Education Database (NUDB) containing detailed longitudinal information on all individuals in compulsory school, secondary school and higher education. The NUDB is linked via unique personal identifiers to other registers containing demographic information.

The sample

From this database, we draw a sample comprised of all students who started their first year of upper secondary school during the period 1996–2003. All these students finished compulsory school at age 16 after nine years of attendance. We follow eight "fresh" cohorts of students during five years. This means that all students had five years to complete their upper secondary level education, an education which under normal circumstances takes three years to complete if the academic track is chosen and four years if the vocational track is chosen.

For the seven cohorts of students, we link data on individual characteristics (fixed and time-varying), family characteristics, school-related characteristics, regional information (at the neighbourhood and municipality level) and information on their peers. We focus on young men and women who started their first year of secondary school the year they turned 16, i.e. we limit the analyses to students who started secondary school when they were supposed to according to their time of birth.[2]

Variables

The dependent variable is a dummy variable measuring whether a student dropped out of upper secondary school during the five-year period we followed them. If the student was not registered as having passed all the final exams five years after starting upper secondary school, he/she is classified as a school dropout, which is the standard definition of dropout in the Norwegian school system.

Individual information includes age, gender, number of siblings, whether he/she is the oldest child, whether he/she started an academic or vocational track at secondary school and parents' education and annual income. Parents' education is measured using six dummy

[2] In Norway the rule is to continue from one year to the next irrespective of marks, which means the vast majority of students turn 16 the year they start upper secondary school..

variables: i) compulsory school, ii) secondary school low level (completed one or two years of education after compulsory school), iii) secondary school high level (completed all secondary school education), iv) college/university low level (lower than a master's degree), v) college/university high level (master's degree or higher) and vi) unknown education. Parents' annual income is measured as the average annual total income for the nine years the student went to compulsory school, deflated to the value of the 2003 Norwegian kroner. For the non-western immigrants, we include mean values for each individual variable mentioned above.

Control variables at the school level include information regarding the number of students in each cohort and fixed school effects. Time-varying regional controls include aggregated mean values of the average wage level, the educational attainment and the proportion of non-western immigrants. This is measured at the neighbourhood level, which is the most detailed regional unit in Norway. There are approximately 13,000 neighbourhoods in Norway. With a population of approximately 4.5 million, the average population in a neighbourhood is approximately 350. We also control for the unemployment rate at the municipality level (there are 435 municipalities in Norway).

The key explanatory variable is the proportion of non-western immigrant students in the same cohort in the first year of upper secondary school in the same school. For simplicity, we henceforth refer to non-western immigrants as immigrants. Immigrants include individuals born in Asia (including Turkey), Africa, South America and Central and Eastern European countries of two foreign-born parents. In our sample, the six most heavily represented countries of birth are (the percentage of all immigrants in our sample is in parentheses) Bosnia-Herzegovina (13.4), Iran (8.7), Pakistan (7.9), Kosovo (6.8), Vietnam (6.4) and Chile (5.9). Refugees from Bosnia-Herzegovina and Kosovo came following the Balkan wars in the 1990s. The average age at arrival in our sample is 7.5 years old.[3]

[3] We have also experimented with models where western immigrants were included as peers. These are very few in number and did not produce any significant findings.

V. Identification strategy

A positive relationship between individual behaviour and the behaviour of a group the individual interacts with may exist for several reasons. Manski (1993) distinguishes between three possible sources: i) endogenous social interaction effects, arising from a mechanism whereby the behaviour of certain people in the group directly affects the behaviour of an individual member of the group, ii) contextual interactions, where the behaviour of a person in some way varies according to the exogenous characteristics of the group members and iii) correlated effects, where people in the same group tend to act in the same way because they have the same individual characteristics or face a similar institutional environment. The aim of this paper is to present evidence regarding the first of these mechanisms.

Five main identification strategies dominate the economic literature on this topic. One strategy is to use randomized experiments where peers are distributed randomly, sweeping away all problems related to unobserved selection. Analyses of randomized roommates in college are probably the most well-known studies exploiting this variation (Sacerdote 2001). A second strategy is to estimate individual fixed effects models, using movers between schools to identify causal effects (Hanushek et al. 2003). A potential problem with this approach is that mobility between schools may be endogenous with respect to school characteristics or the characteristics of movers in interaction with the schools. A third approach is to use instrumental variables (Goux and Marin 2007). A fourth approach is to aggregate the data to a level where sorting is reduced or eliminated (Evans et al 1992, Card and Rothenstein 2006). A fifth approach is the use of idiosyncratic variation arising from within-school variation in immigrant exposure by exploiting variation in the immigrant composition of each cohort within each school (Hoxby 2000, Gould et al. 2009, Hanushek et al 2009). Their approach assumes that while students may sort themselves between schools

based on factors such as immigrant composition, these choices are unaffected by cohort-specific variation of these factors. Finally, as in Black et al. (2010), one can use a moving average approach, whereby instead of comparing over a prolonged period of time, one narrows the time span to control for time-varying school quality. It is the latter two approaches we draw on in this paper.

The estimated model is as follows:

$$(1)\ A_{ics} = a_1 + a_2 x_{ics} + a_2 \bar{x} + a_3 IMM_{ics} + a_4 g_{sc} + \sum_{c=1}^{6} a_5 d_c + a_6 NIMM\_11\_12_{ics} + \mu_{rc} + \lambda_s + u_{ics},$$

where *i* stands for individual, *c* for cohort and *s* for school. A_{ics} is the outcome variable, taking the value 1 if the individual has not completed upper secondary school five years after first being registered and 0 otherwise. x_{ics} is a vector of individual and family characteristics (gender, number of siblings, whether the student is the oldest child, whether the student started on a vocational or academic track, mother's educational attainment, father's educational attainment, mother's annual income and father's annual income). $\bar{x}$ is a vector of the average values of the corresponding variables for the peers, g_{sc} measures the number of students in that cohort (in the freshman year), d_c are cohort dummies (1996–2003) and μ_{rc} represents the time-varying characteristics of the neighbourhood. A neighbourhood is the smallest administrative geographical unit; there are 13,000 neighbourhoods in all. Fixed neighbourhood effects are taken care of by the fixed school effects. The time-varying variables at the neighbourhood level include the mean level of annual labour market earnings, the local skill distribution (six dummy variables) and the share of immigrants, which are measured for all inhabitants in the neighbourhood who are 20–60 years of age. Furthermore, λ_s represents school fixed effects. *IMM* is the key variable and measures the proportion of

immigrants in the cohort. Finally, although not shown in equation (1), we also include controls for the annual unemployment rate at the municipality level.

The coefficient of main interest in equation (1) is a_3, which we estimate in two different ways. First, in (1) we assume that, conditional on the number of immigrants in the 11th and 12th grades of upper secondary school (*IMM_11_12*) and school fixed effects, peer characteristics in a particular cohort are potentially randomly assigned. We know that selective residential sorting takes place, but we expect such effects are picked up by variables measuring the number of immigrants across school levels and school fixed effects (λ). This approach is inspired by the approach of Gould et al. (2009), which is mentioned in the previous section. Conditional on the number of immigrants in the 11th and 12th grades, the proportion of immigrants in the 11th grade is potentially determined by random variation in the grade distribution among the pool of immigrants in the neighbourhood.

Second, we need to account for potential time-varying school quality effects. School quality can vary over time if, for instance, the school reputation changes and this, in turn, affects the quality of the pool of applicants to the school. Our strategy to account for this potential bias is to use a moving average approach (Black et al. 2010), which takes school quality changes over time into account. The idea is that, instead of comparing across long periods of time, we narrow the comparison. For each year, we regress the dropout likelihood of a student in that year based on the characteristics of his/her peers, conditional on the average characteristics of other students in the school that same year and the two adjacent years (the one before and the one after). By construction, any deviation in peer characteristics from this three-year average cannot be due to a linear trend over this three-year period and can therefore be treated as an idiosyncratic variation. We add the three-year moving average of student characteristics as an extra control variable in equation (1). It is important to note that this is a restrictive comparison. To the extent that peers in the different grades actually do

have an effect on a student's performance, we will underestimate the role of peers on student outcome. Therefore, this approach provides a conservative measure of the true peer effect.

To sum up, our identification strategy combines the approaches of Gould et al. (2009) and Black et al. (2010) in the sense that we incorporate both the within-school across grades approach and the moving average approach. If the identification criteria hold, a_3 captures the causal impact of peer immigrants on the performance of native students. To further ensure the robustness of the results, we also present results of simple balancing tests and placebo analyses.

VI. Results

Table 1 presents some descriptive statistics regarding the students, their peers and their families, as well as school and regional characteristics. Statistics are presented separately for those who completed secondary school and for school dropouts. All variables were measured at the start of the first year in upper secondary education.

Our data shows that 29% of the students dropped out, i.e., they did not complete secondary school within the five-year period. More female students completed secondary school than male students. Furthermore, oldest siblings seem to have a somewhat higher likelihood of completing secondary school, which is well established in the empirical literature about birth order (see for example Black et al. 2007). The dropout rate is also higher among those in the vocational track than in the academic track. When compared to students who complete secondary school, dropouts are more likely to have parents with lower education levels and low income.

The differences in time-varying neighbourhood characteristics between dropouts and non-dropouts are small. Still, the mean level of parents' labour market earnings and the proportion of parents with higher education are somewhat lower, and the share of non-western

immigrants in the neighbourhood is somewhat higher among school drop outs than among those who complete.

With respect to peer variables, it is noteworthy that the proportion of parents with higher education is much lower and the proportion with unknown education is higher among parents of immigrant students than among parents of native students. The mean income of immigrants' parents is considerably lower compared to that of the parents of natives, which is a robust finding in the economic assimilation literature. The peer variables also reveal that immigrant students come from larger families, as measured by the number of siblings. The mean age level of peers is just above 16 years old. Finally, the mean regional unemployment rate is marginally higher in municipalities where the dropouts live, a finding that is in accordance with the lower human capital in these municipalities.

[Table 1 about here]

The proportion of immigrant students varies considerably between regions. The largest proportion is in the capital, Oslo, where approximately 13% of the students are non-western immigrants (not shown in Table 1). This is almost twice as high as in the municipality with the second largest number of immigrant students. In Bergen, which is the second largest city in Norway, 3.2% of students are immigrants. The third and fourth largest cities, Trondheim and Stavanger, both have approximately 4% immigrant students.

Before presenting results from the regression analyses, we show in Table A1 in the appendix the results of some simple balancing tests. The underlying assumption in the analyses is that, conditional on the controls, variation in the proportion of immigrants is close to random. That is, we assume that, conditional on controls, the proportion of immigrants is not significantly related to pre-determined variables such as parental education and the number of siblings. The dependent variables regressed against the peer variable are: mothers'

education, fathers' education, number of siblings and whether the individual is the oldest child. Table A1 presents two models, one with the peer variables only and one where the full battery of controls except for all the individual variables, are included. The results in the first model show significant and strong relationships with the peer variables. However, when we control for the rest of the variables, all significant relationships disappear (except for the 'oldest child' variable, which is marginally significant at 10%). The large gap between the gross coefficient in Model 1 and the net coefficient in Model 2 suggests the chosen identification strategy successfully reduces potential bias arising from selection of immigrant students to different schools.

Table 2 shows the first regression results. We present results from the following models. Model 1 includes seven-year dummies, in addition to the percentage of immigrants. Model 2 adds individual variables and variables for the number of immigrants in the 11^{th} and 12^{th} grades. Model 3 adds the remaining variables, including school fixed effects. All models are estimated using simple linear probability models. Finally, Model 4 is the same as Model 3, except it covers all native "freshmen" irrespective of age, rather than just native students who were 16 at the start of upper secondary school.

[Table 2 about here]

Model 1 reveals a positive and significant relationship between the percentage of immigrants and the dropout rate of natives. The coefficient suggests that a 10% increase in the immigrant share leads to a 3.7 % increase in the dropout rate. Adding individual controls and controls for the number of immigrants in the 11^{th} and 12^{th} grades in Model 2 changes the size of the coefficient only slightly. In Model 3, we add the rest of the controls, including school fixed effects and the three-year moving average variables. This reduces the coefficient for the immigrant share considerably, suggesting that time-varying school quality matters; however,

the impact is still significant at the 5% level. The coefficient indicates that a 10% increase in the immigrant share leads to a 2% increase in the dropout rate. Therefore, our preferred estimate suggests there is a sizeable peer effect of immigrants on natives' performance. Finally, Model 4 is equivalent to Model 3, but includes all native students instead of only those who were 16 years old when they started secondary school. Such a sample is, in a sense, a more symmetric sample, since it relates all native students to all immigrant peers. However, the results show the peer effect is only moderately altered, suggesting that our results are not driven by such restrictions.[4] One natural extension of the estimations in Table 2 would be to test whether the peer effect is linear or non-linear. We return to this question in a later section.

Placebo controls

In order to put our identification strategy to the test we carry out two so-called placebo tests. The first test replaces the actual proportion of immigrants in one grade with the proportion of immigrants in the grade above, i.e., the students who started the year before. If the coefficient picks up the peer effect, then it should be smaller when we measure the effect of peer immigrants using the grade above than when peers in the same grade are used. The second test entails running a regression for those students in the academic track using two peer variables: one with the number immigrants in the academic track and one with number of immigrants in the vocational track. This exercise is limited to schools that offered both academic and vocational programmes. The hypothesis is that the peer effect from one's own peers should be larger than the impact from the alternative track. Table 3 presents the results.

[4] The fact that pupils may change schools does not necessarily create a problem of attrition because pupils that switch schools are no more difficult to track than pupils that do not switch schools. However, if there are some systematic relationship between schools movers and the immigrant share, our estimate might be biased. Since we have a unique pupil-school identifier, we can control for school for this by running a regression where we included a dummy variable measuring whether the pupil is a school-switcher or not. This did not change the results.

[Table 3 about here]

The first model in Table 3 does not show any significant peer effects from the grade above. Assuming that peer effects are coming from school mates in the same cohort, this result is expected. The second model shows that the peer effect is more than twice as large from peers in the same track (academic track) than from peers in another track (vocational track). These results indicate that we are actually picking up a peer effect..

Mechanisms

In this final section, we investigate how the peer effect arises. Are we able to identify the mechanisms of social interaction behind the peer effects? In order to answer this question, we must focus on the importance of peer quality, which was mentioned earlier in the identification strategy section as one potential explanation. Such question is difficult to address using register data, and is one of the reasons why there has been a lack of academic research on this mechanism (Lavy et al. 2012, Duflo 20011).

We use two approaches as an indicator of peer quality. The first is parents' educational attainment. We have information regarding parents' educational attainment for the entire period of analysis and we know that there is a positive correlation between parent's educational attainment and their offspring's educational attainment. Accordingly, we can use a parent's education as an indicator of the marks capacity of their offspring (i.e., how well their offspring will do at school). We construct two measures: i) the number of immigrant peers who have at least one parent with a higher education and ii) the number of immigrants whose parents do not have a higher education.[5] Once again, equation (1) is used to estimate but this time the above mentioned variables are incorporated. The hypothesis is that, if the peer effect picks up peer quality, then the impact from peers with parents with low education

[5] This latter group includes parent with missing education

(category ii) should be stronger than the impact from peers who have at least one parent with higher education (category i).

The second indicator of peer quality is the age of immigrants when they arrived in Norway. We construct two groups: i) *immigrants 7-*, who arrived in Norway by age seven at the latest and ii) *immigrants 8+*, who arrived in Norway when they were older than seven years of age. Our hypothesis is that if peer quality is important, then the peer effects from immigrants 8+ should be stronger than that of immigrants 7- because this group has had less time to acquire language and other local specific skills. Table 4 presents the results. We only present results from the most elaborate model. The left hand side of the table presents results based on parents' education, while the right hand side presents results that are based on the age of immigrant students when they arrived.

[Table 4 about here]

The results reveal that there is a positive and significant peer effect (0.296) from immigrants that have parents with low education, and the effect from immigrants with parents with higher education is not statistically significant. Regarding their age at time of arrival, we find that there is a positive and significant peer effect from immigrants 8+. In sum, these results suggest that peer quality might be an important mechanism behind the general peer effect result obtained earlier. Immigrants with parents with lower education and immigrants arriving after the age of seven may have a skill deficit when compared to immigrants with parents with higher education and immigrants arriving before compulsory school age. A rise in the number of immigrants from these two groups may lower the performance potential of the entire student body. This may be because the teacher may use more resources to attend to the needs of those falling behind or the whole class may be covering less than they otherwise would

have been covering. This may suggest that language and skill deficiency of immigrant students and their parents lies behind the peer effect.

So far, we have not looked at the importance of marks from lower secondary school for performance in later schooling. Unfortunately, we only have information on marks from lower secondary school for the last three cohorts of students (2001, 2002 and 2003). This relatively short time period limits our ability to make significant observations. Still, this is valuable information that cuts to the heart of the peer quality issue. The information available is an average measure of all marks from all three levels in lower secondary school, which are used as criteria for admission into upper secondary school. The average measure varies between 0 and 60. Our data shows lower average marks for immigrants than for natives, with 38 points and 43 points respectively. In this section, we use this measure to examine the importance of peer quality. In addition to an interaction term between the average marks of immigrant peers and the share of non-western immigrants, we also include the average marks of immigrant peers at the same school as an additional variable. If the individual achievement is affected by the average marks potential of other students in the same grade, then we expect the interaction term to be negative. Table 5 presents the results.

[Table 5. about here]

The first row in Table 5 presents a strong positive peer effect at the lowest mean mark level of immigrants from lower secondary school. The positive relationship is reduced with the average mark level of immigrants from lower secondary school. The negative interaction effect implies that the peer effect is largest from immigrants with low marks. This supports the notion that peer quality, as expressed through marks from lower secondary school, is an important mechanism of social interaction behind the peer effects and a plausible channel for natives' dropout rate.

Heterogeneous effects

Thus far, we have only reported regression results for the entire population of native students. To determine whether the effects differ between subgroups, we present results according to choice of track and gender. The descriptive statistics in Table 1 showed that the dropout rate is higher for those enrolled in the vocational track when compared to those in the academic track. The share of immigrants in the two tracks is very similar, approximately 3.9 per cent in both tracks. Table 6 presents results when we estimate equation (1) separately for the academic track and the vocational track. For both programmes, we also present separate analyses for men and women. The rationale for presenting two separate analyses is that males and females typically choose different tracks: when compared to men, women more often chose the academic track. We present results for the most elaborated model only (Model 3 in Table 2).

[Table 6 about here]

When pooling men and women, we find that the impact of immigrant peers on the likelihood that native students will drop out of school is positive for both programmes, but it is only statistically significant for native students in the academic track. One possible explanation for this is that the peer effect from classmates might be more important in more theoretical and academic classroom courses than in more practically-oriented subjects. Such a view is in accordance with the notion that peer quality is a major mechanism behind peer effects and that peer quality is more relevant in theoretical subjects than in practically oriented subjects.

By presenting separate estimates for men and women, we find that, in both tracks, peer effects are larger for men than they are for women. However, for both men and women, it is only in the academic track that we find any significant effects. Given the available register data, it is difficult to investigate the gender differences in peer effects further. Nevertheless, a

tentative explanation is that males at this age are more easily influenced by the behaviour of their fellow classmates than females. This may be due to differences in gender roles or the fact that males mature both physically and mentally later than their female counterparts. Moreover, recall that dropout rates are higher in vocational programmes than in academic programmes. Results in this section, together with the results in Table 3, indicate stronger peer effect for the academic than for the vocational track and also there is little spillover effects between tracks. Synthesizing, these findings suggest that peer effects from immigrants may only moderately contribute to the overall explanation of dropout rates in upper secondary school.

Regional differences

As in most other developed countries, immigrants are disproportionally located in the big cities. In Norway, a large number of immigrants live in the capital, Oslo. As mentioned above, approximately 13 per cent of the students in upper secondary school in Oslo are non-western immigrants, compared to 3.5 per cent in the rest of the country. In this section, we analyse the peer effect in Oslo as compared to the rest of the country. We present results for all students, and separately by gender.

[Table 7 about here]

When considering both genders, we find small difference between Oslo and the rest of the country, but the estimate is only significant for students outside Oslo. Separate analyses by gender suggests that the non-significant overall impact in Oslo is explained by very heterogeneous effects for men and women, with a strong and positive peer effect for men and no significant effect for women. Outside Oslo, the coefficients also suggest that the impact is

stronger for men than it is for women. However, none of the effects are statistically significant.

Non-linear effects

So far, we have assumed that the peer effects are linear. In this section, we relax the assumption of linearity and categorize the share of non-western classmate in 9 dummy variables: no immigrants; 0-1 per cent share of immigrants; 2-3 per cent; 3-4 per cent; 4-5 per cent; 5-10 per cent; 10-15 per cent; 15-20 per cent; over 20 per cent. Table 8 presents the results for all students, as well as separately for men and women.

[Table 8 about here]

Of particular interest in Table 8 is that there is no indication of peer effects for very low shares of immigrants. It is only for shares from 5 per cent and above that we find a positive and significant peer effect. As mentioned above, the average share of immigrants in our sample is 3.5 per cent; however, for the capital city, the average share is 13 per cent. This means that the positive peer effect is at work only in a few schools in the sample. The last two models show that the peer effect is stronger for male students and that, for female students, there is a positive effect for large shares of immigrants.

Pupils' ability

In this subsection we analyse whether the impact of immigrants on native pupils' performance varies with the ability of native pupils. We use grade score from lower secondary school to proxy for the ability of native pupils. This exercise will shed light on the question whether more disadvantaged native pupils (measured by low grade scores) are more strongly affected by immigration than native students that do well at school.

To test this relationship we include an interaction term between the share of immigrants and the grade score average from lower secondary school. The analyses are limited to the 2001-2003 cohorts, for which we have information on grades from lower secondary school. Table 9 presents the results. We estimate the most elaborate model, i.e., similar to Model 3 in Table 2.

[Table 9 about here]

Results in Table 9 reveal a negative, but far from significant, relationship between grade point average and the share of immigrants, indicating that the previously reported immigrant effect does not vary across native pupils with different ability. Therefore, at face value this result does not lend support to a hypothesis postulating that the more disadvantaged pupils are the more strongly affected by immigration. Including a squared term for the grade score variable, allowing for non-linearity in grades – do not change the result. The coefficient for the grade score is, as expected, negative and significant.

Impact on marks

We have focused on school drop-out as the performance measure. However, one could argue that this is a rather crude measure of pupil performance. In this final section we add to the analyses by using grade scores in upper secondary as a supplementary performance measure. The reason for not giving this performance measure more attention is that we only have information on marks from the 2003 cohort and onwards, reducing the period of analysis considerably. Therefore, we downplay these analyses somewhat, but still, the results should be indicative of the direction of the relationship, and they should be interesting to compare to the drop-out results. To maximise the number of observations we now focus on a sample that comprises all pupils that enrolled in upper secondary school in the period 2003-2005.

Compared to the dropout analyses this implies that both the time period is shorter, and the sample is different (the dropout sample comprised all pupils enrolled in upper secondary education in the period 1996-2003).

Marks vary from 1 to 6, with 2 as the pass level. For each pupil we calculate the average across courses. The grade average for the whole sample of pupils (enrolled 2003-2005) is 3.8, with 4.0 for pupils in the academics track and 3.6 for pupils in the vocational track. Naturally, we only measure marks for pupils that have not dropped out. This means that our grade results apply for a selected group of pupils, and not for all pupils that enrolled. Table 10 presents the results; first for all pupils, then separately for the academic and vocational track. Again, the estimation comes from the most elaborated model, i.e., similar to Model 3 in Table 2.

[Table 10 about here]

For all pupils, the first models reveals a negative but not significant (significant at 15 per cent) between the share of immigrants and the grade score average of native pupils. Looking at the size of the coefficients, the negative relationship appears to be somewhat stronger in Academic track. Generally, the sign of the coefficients are in line with the results from the drop-out analyses. The lack of significance can be explained by several factors. First, the number of observations are fewer compared to the drop-out analyses. Second, pupils that (already) have dropped out are not included in the analyses. If they *had not* dropped, they would probably have been at the lower end of the grade distribution, contributing to a stronger negative relationship between immigrants and marks. Therefore, the estimate in Table 10 is probably a conservative measure of the "total" effect of immigrants on native marks. In summary, the results for marks correspond fairly well with the results for drop-out.

VII. Conclusion

During the last 30 years, the immigrant population in Norway has increased from two to ten per cent. During this period, the number of immigrants from non-western countries has increased considerably. This development, as well as changes in the number and composition of immigrants, is endemic across most modern western countries. The concern for the increasing migration to western societies has resulted in a growing literature that seeks to analyse the labour market impacts of immigration on receiving countries, among other things with regards to possible consequences for employment and wages. In this paper, we turn to a more scant literature that investigates the relation between ethnic peer effects and schooling. We focus on the impact of immigration on the performance of native students in upper secondary school. In addition to concerns about the consequences of the increasing number of immigrants in the Norwegian educational system, educational policy makers are also alert with the eventual drawbacks of potentially increasingly segregated schools, particularly in Oslo, the capital of Norway.

We analyse the impact of immigrant concentration on the performance of native students in upper secondary school, i.e. the last three years of school after compulsory school. Performance is measured in terms of the likelihood of dropping out of school and dropping out is defined as not having completed upper secondary school within five years after enrolment.

The sample comprises all students starting upper secondary school in eight consecutive years, from 1996–2003. We follow these students until 2008. By that point, all cohorts have had five years to complete secondary school. To reach causal statements, we exploit potential random variation in the number of immigrants between levels within the same school and we control for time fixed and potential time-varying school quality.

The results reveal a positive and significant relationship between the number of immigrants and the dropout rate of natives. The preferred coefficient suggests that a 10 percentage point increase in the immigrant share leads to a 2 percentage point increase in the dropout rate. Since results "survive" our different control procedures, we interpret the result as a causal mechanism. The results are strengthened by the results from a simple placebo test, using "pseudo"-peers from other tracks as peers.

Moreover, we investigate the importance of peer quality as a mechanism of social interaction behind the observed peer effects. We use three indicators of peer group quality: i) the education of the peers' parents; ii) information on whether the peers immigrated before school age or during school age and iii) marks from lower secondary school. Results show a positive and significant peer effect from immigrants that have parents with low education, but no impact if at least one of the parents has higher education. Regarding age of arrival in Norway, it is only from those that immigrated after school age that we find a positive and significant peer effect. Finally, regarding marks from lower secondary school, we find that the peer effect is largest from peers that have low marks from lower secondary school. These results suggest that peer quality might be an important mechanism behind peer effects. Lastly, we also checked for non-linear peer effects, by categorising the share of immigrants in the school into nine dummy variables. We find that the effect is, indeed, non-linear. It is only for larger shares of immigrants that we find significant peer effects. Compared to the average share of immigrants in our sample, this peer effect is only present for above average immigrant shares. This suggests that there is a tipping point for segregation, which is high and generally only relevant for a minority of schools in Norway. Hence, it is highly relevant to find successful policies that increase the quality of immigrant peers and restrain the concentration of immigrants in certain geographical areas and schools, particularly since

Norway, as well as other western countries, is expected to absorb an increasing number of immigrants in the coming decades.

Finally, one caveat needs to be mentioned. We controlled for school quality by using time fixed and time varying indicators. However, we cannot rule out the possibility that our control procedures did not sweep out all components of time-varying school quality. For instance, we lack valuable information on the role of teachers. There is abundant research evidence on the importance of teachers for the learning environment (see Bonesrønning et al. 2003, Aaronson et al. 2007). If high quality teachers systematically avoid schools with a high number of immigrants, then this may mean in our case that we overestimate the peer effect. Access to data that permits us to take into account the teacher quality component would enrich research in this area.

References

Ammermueller, A and J. Pischke. 2009. "Peer Effects in European Primary Schools: Evidence from PIRLS." *J. Labor Economics.* 27: 315-348.

Angrist, J.D. and K. Lang. 2004. "Does school integration generate peer effects? Evidence from Boston's Metco Program." *A.E.R.* 94: 1613–34.

Aaronson, D, L. Barrow and W. Sander. 2007. "Teachers and Student Achievement in Chicago Public High Schools". *J. Labor Economics.* 24: 95–135.

Black, S., P. Devreux, and K. G.Salvanes. 2007. "Older and Wiser? Birth order and IQ for young men." NBER working paper No. 13237.

Black, S., P. Devreux, and K. G.Salvanes. 2010. "Under pressure? The effect of peers on outcomes of young adults." IZA DP No. 4946.

Bonesrønning, H., T. Falch, and B. Strøm. 2003. "Teacher sorting, teacher quality, and student composition." *E. Economic Review.* 49: 457-483.

Borjas, G.J. 2003. "The Labor Demand Curve *Is* Downward Sloping: Reexamining the Impact of Immigration on the Labor Market." *The Quarterly J. Economics.* 118: 1335-1374.

Boyd, D, H Lankford, S Loeb and J Wyckoff. 2003. "Analyzing the Determinants of the Matching Public School Teachers to Jobs: Estimating Compensating Differentials in Imperfect Labor Markets." NBER working paper No. 9878.

Card, D. 2001. "Immigration Flows, Native Outflows, and the Local Markets Impacts of Higher Immigration." *J. Labor Economic.* 19: 22-64.

Card, D.,and J. Rothenstein. 2007. "Racial Segregation and the Black-White Test Score Gap." *J. Public Economics.* 91: 2158-2184.

Card, D. 2009. "Immigration and Inequality." *A.E.R.* 99: 1–21.

Duflo E., P. Dupas and M. Kremer. 2011. "Peer Effects and the Impact of Tracking: evidence from a Randomized Evaluation in Kenya." *A.E.R.* 101: 1739–1774.

Evans, W.N., Oates, W.E. and R.M. Schwab. 1992. "Measuring peer group effects: a study of teenage behavior." *J. Political Economy.* 100: 966–91.

Gibbons, S and S. Telhaj. 2008. "Peers and Achievement in England's Secondary Schools." Spatial Economics Research Centre (SERC) DP No 1.

Gould, E. D., V. Lavy, and M. D. Paserman. 2009. "Does immigration affect the long-term educational outcome of natives? Quasi experimental evidence." *Economic J.* 119: 1-27.

Goux, D. and E. Maurin. 2007. Close Neighbours Matter: Neighbourhood Effects on Early Performance at School." *Economic J.* 117: 1-24.

Hanushek, E., J. Kain, J. Markman and S. Rivkin. 2009. "New evidence about Brown vs Board of education: The complex effects of school racial composition on achievement." *J. Labor Economics.* 27: 349-384.

Hanushek, E., J. Kain, J. Markman and S. Rivkin. 2003. "Does Peer Ability Affect Student achievement?" *J. Applied Econometrics.* 18: 527-544.

Hoxby, C. M. 2000. "Peer Effects in the Classroom: Learning from Gender and Race Variation." NBER Working Paper No. 7867.

Lavy, V., O., A. Schlosser. 2011. "Mechanisms and impacts of gender peer effects at school." *American Economic J.: Applied Economics.* 32: 1-33.

Lavy, V., O. Silva, and F. Weinhardt. 2012. "The good, the bad, and the average: Evidence on the scale and nature of ability peer effects in schools." *J. Labor Economics.* 30: 367-414.

Manski, C.F. 1993. "Indentification of Endogeneous Social Effects: The Reflection Problem." *The Review of Econ. Studies.* 60: 531-542.

OECD 2008. *Jobs for immigrants*. Labour market integration in Norway. OECD.

Ottaviano, G.I.P., and G. Peri. 2012. "Rethinking the Effects of Immigration on Wages," *J. European Economic Association.* 101: 152-197.

Rumberger, R. and Lim, S. 2008. "Why Students Drop Out of School: A Review of 25 Years of Research." California Dropout Research Project, Santa Barbara.

Sacerdote, B. 2001. "Peer effects with random assignment: results for Dartmouth roommates." *Quarterly J. Economics.* 116: 681–704.

Statistics Norway (2012), Marks statistics. http://www.ssb.no/kargrs/

Traag, T. and R. van der Velden. 2008. "Early School Leaving in the Netherlands, the Role of Student-, Family-, and School Factors for Early School-leaving in Lower Secondary Education." Manuscript. Research Centre for Education and the Labour Market, Maastricht.

Table 1

Descriptive Statistics. All students who are enrolled in Upper Secondary School. Students who Completed Upper Secondary and Students who Dropped out of Upper Secondary School.

	All	Completed	Drop out
Individual characteristics:			
Women	0.487	0.520	0.399
Number of siblings	0.958	0.967	0.934
Oldest child	0.548	0.556	0.526
Academic track	0.479	0.398	0.696
Mother's education:			
Compulsory school	0.289	0.236	0.431
Secondary school I	0.236	0.238	0.233
Secondary school II	0.166	0.169	0.158
College/university I	0.276	0.319	0.162
College/university II	0.029	0.036	0.010
Unknown education	0.003	0.002	0.006
Father's education:			
Compulsory school	0.209	0.165	0.326
Secondary school I	0.201	0.197	0.211
Secondary school II	0.257	0.257	0.259
College/university I	0.226	0.257	0.144
College/university II	0.094	0.116	0.037
Unknown education	0.013	0.009	0.023
Mother's yearly income (in 1000 NOK)	158.519	167.019	135.774
Father's yearly income (in 1000 NOK)	328.486	347.998	276.277
Peer characteristics:			
Women	0.473	0.481	0.450
Age	16.305	16.300	16.339
Number of siblings	1.504	1.488	1.545
Oldest child	0.654	0.652	0.660
Peers' mothers education:			
Compulsory school	0.424	0.421	0.430
Secondary school I	0.037	0.036	0.039
Secondary school II	0.163	0.165	0.159
College/university I	0.107	0.113	0.092
College/university II	0.032	0.034	0.028
Unknown education	0.237	0.231	0.252
Peers' fathers education:			
Compulsory school	0.298	0.297	0.301
Secondary school I	0.041	0.041	0.042
Secondary school II	0.145	0.146	0.140
College/university I	0.122	0.125	0.115
College/university II	0.040	0.043	0.032
Unknown education	0.354	0.348	0.370
Mother's yearly income (in 1000 NOK)	55.295	56,685	51.647
Father's yearly income (in 1000 NOK)	100.685	103.174	94.028
School characteristics:			
Number of schools	427		
Number of students	176.457	175.698	178.479
Fraction non-western immigrants	0.039	0.038	0.041
Number of immigrants at grade 11 and 12	7.043	6.805	7.678
Neighborhood characteristics:			
Yearly labour market earnings (in 1000 NOK)	210	210	204
Compulsory school	0.239	0.233	0.257
Secondary school I	0.182	0.182	0.183
Secondary school II	0.271	0.271	0.271
College/university I	0.237	0.242	0.224
College/university II	0.050	0.053	0.043
Unknown education	0.018	0.017	0.019
Non-western immigrants	0.033	0.031	0.038
Community characteristics:			
Unemployment rate in municipality	3.404	3.371	3.472
N	277233	201813	75420

Note.- The sample comprises all students enrolled in secondary school 1996-2003. NOK is Norwegian kroner.

Table 2

Estimates for the Effect of the Immigrant Share on the Performance of Native Students.

	1	2	3	All native students
The share of non-western immigrants	0.369***	0.409***	0.212**	0.199**
	(0.088)	(0.070)	(0.091)	(0.091)
Additional controls:				
Year effects?	Yes	Yes	Yes	Yes
Number of immigrants in grade 11 and 12?	No	Yes	Yes	Yes
Individual?	No	Yes	Yes	Yes
Peer effects?	No	No	Yes	Yes
School - time varying effects?	No	No	Yes	Yes
School - fixed effects?	No	No	Yes	Yes
School quality moving average?	No	No	Yes	Yes
Regional unemployment?	No	No	Yes	Yes
Time varying neighbourhood effect	No	No	Yes	Yes
N	277233	277233	277233	285021
R^2-adj	0.01	0.08	0.135	0.135

Note.- Individual variables include gender, number of siblings, whether the oldest sibling, participation in vocational programme, mother's education, father's education, mother's annual income, father's annual income. Time varying school effects include number of students. Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table 3

Placebo Regressions. Estimates for the Effects of Immigrants on the Performance of Native Students. Peers from another Grade and Peers from another Branch of Study.

	Test 1 Peers from the grade above	Test 2 Peers from the vocational track
The share of non-western immigrants	0.002	
	(0.116)	
The share of non-western immigrants at vocational programme		0.085
		(0.051)
The share of non-western immigrants at academic programme		0.255***
		(0.083)
Additional controls:		
Year effects?	Yes	Yes
Number of immigrants in grade 11 and 12?	Yes	Yes
Individual?	Yes	Yes
Peer effects?	Yes	Yes
School - time varying effects?	Yes	Yes
School - fixed effects?	Yes	Yes
School quality moving average?	Yes	Yes
Regional unemployment?	Yes	Yes
Time varying neighbourhood effect	Yes	Yes
N	276450	87832
R^2-adj	0.134	0.121

Note.- In test 2 the sample comprises natives in the academic track only. Individual variables include gender, number of siblings, whether the oldest sibling, participation in vocational programme, mother's education, father's education, mother's annual income, father's annual income. Time varying school effects include number of students. Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table 4

Mechanisms of Peer Effect: Parents' Education and Immigrants' Age at Arrival to Norway. Estimates of the Effects of immigrants on Performance of Native Students.

	Parents education		Age at arrival
The share of non-western immigrants with parents with higher education	0.042 (0.183)	The share of non-western immigrants 7-	0.050 (0.131)
The share of non-western immigrants with parents with lower education	0.296** (0.111)	The share of non-western immigrants 8+	0.305*** (0.100)
N	277249		277249
R^2-adj	0.134		0.134

Individual variables include gender, number of siblings, whether the oldest sibling, participation in vocational programme, mother's education, father's education, mother's annual income, father's annual income. Time varying school effects include number of students. Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table 5

Estimates for the Effects of Immigrants on Performance of Native Students. Importance of Immigrants Marks from Lower Secondary School

	Parents education
The share of non-western immigrants	0.927** (0.419)
Mark point average for immigrants in lower secondary school	-0.001 (0.003)
The share of non-western immigrants X Mark point average for immigrants in lower secondary school	-0.021** (0.010)
N	110123
R^2-adj	0.150

Note.- Individual variables include gender, number of siblings, whether the oldest sibling, participation in vocational programme, mother's education, father's education, mother's annual income, father's annual income. Time varying school effects include number of students. Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table 6

Estimates for the Effects of Immigrants on Native Student's Performance. Depending on Programme of Study

	Academic programme			Vocational programme		
	All	Men	Women	All	Men	women
The share of non-western immigrants	0.352*** (0.119)	0.424** (0.171)	0.250** (0.124)	0.147 (0.131)	0.230 (0.174)	0.052 (0.192)
Full battery of controls?	Yes	Yes	Yes	Yes	Yes	Yes
N	147570	68789	78781	129663	73082	56581
R^2-adj	0.102	0.118	0.081	0.074	0.076	0.079

Note.- Individual variables include gender, number of siblings, whether the oldest sibling, participation in vocational programme, mother's education, father's education, mother's annual income, father's annual income. Time varying school effects include number of students. Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table 7

Estimates for the Effects of Immigrants on Native Student's Performance.
The Capital Area (Oslo) and the Rest of the Country

	Oslo			Rest of the country		
	All	Men	women	All	Men	women
The share of non-western immigrants	0.154	0.415*	-0.074	0.187*	0.221	0.151
	(0.161)	(0.226)	(0.208)	(0.105)	(0.142)	(0.126)
Full battery of controls?	Yes	Yes	Yes	Yes	Yes	Yes
N	19740	10086	9654	257493	131785	125708
R^2-adj	0.199	0.187	0.196	0.132	0.128	0.124

Note.- Individual variables include gender, number of siblings, whether the oldest sibling, participation in vocational programme, mother's education, father's education, mother's annual income, father's annual income. Time varying school effects include number of students. Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table 8

Estimates for the Effects of Immigrants on the Performance of Native Students.
Non-Linear Effects

	All	Men	women
Share non-western immigrants:			
0-1.99 per cent	-0.001	-0.002	-0.003
	(0.004)	(0.005)	(0.005)
2-2.99 per cent	-0.004	-0.003	-0.007
	(0.004)	(0.006)	(0.006)
3-3.99 per cent	0.001	0.001	-0.001
	(0.005)	(0.006)	(0.006)
4-4.99 per cent	0.004	-0.001	0.006
	(0.005)	(0.007)	(0.007)
5-9.99 per cent	0.014**	0.016*	0.011
	(0.006)	(0.008)	(0.008)
10-14.99 per cent	0.029**	0.034**	0.020
	(0.011)	(0.015)	(0.013)
15-19.99 per cent	0.049**	0.033	0.061***
	(0.021)	(0.027)	(0.023)
20 per cent and more	0.011	-0.001	-0.028
	(0.027)	(0.036)	(0.033)
Full battery of controls?	Yes	Yes	Yes
N	277233	141871	135362
R^2-adj	0.136	0.132	0.127

Note.- Individual variables include gender, number of siblings, whether the oldest sibling, participation in vocational programme, mother's education, father's education, mothers annual income, fathers annual income. Time varying school effects include number of students. Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table 9

The Effects of Immigrants on Native Student's Performance.
The Importance of Natives' Marks from Lower Secondary School

The share of non-western immigrants	0.211
	(0.256)
Grade point average	-0.026***
	(0.001)
The share of non-western immigrants X	-0.006
Grade point average	(0.005)
Full battery of controls?	Yes
N	9148
R^2-adj	0.315

Note.- Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table 10

The Effects of Immigrants on Native Student's Performance.
Dependent Variable: Grade Point Average

	All	Academic	Vocational
The share of non-western immigrants	-0.358	-0.486	-0.240
	(0.243)	(0.345)	(0.304)
Full battery of controls?	Yes	Yes	Yes
N	110919	54661	56258
R^2-adj	0.184	0.181	0.127

Note.- Level of significance: *** 1 per cent; ** 5 per cent; * 10 per cent. Robust standard errors are clustered at the school level.

Table A1

Balancing Tests for the Share of Immigrants

Dependent variables:	Gross coefficient	Net coefficient
Number of siblings	-1.353***	-0.118
	(0.066)	(0.215)
Oldest child	-0.439***	-0.199*
	(0.031)	(0.118)
Mother's education:		
Compulsory school	-0.306***	0.107
	(0.060)	(0.105)
Secondary school	-0.264***	-0.127
	(0.041)	(0.105)
College/university	0.566***	0.041
	(0.087)	(0.087)
Father's education:		
Compulsory school	-0.149***	-0.099
	(0.052)	(0.088)
Secondary school	-0.561***	-0.012
	(0.047)	(0.102)
College/university	0.621***	0.083
	(0.089)	(0.087)

Note.-. Level of significance:*** 1 per cent; ** 5 per cent; * 10 per cent.
Robust standard error clustered at the school level.