Immigrant Concentration and Student Outcomes in Upper Secondary Schools: Norwegian Evidence

Inés Hardoy[a], Arne Mastekaasa[b] (corresponding author) and Pål Schøne[a]

[a] *Institute for Social Research, Oslo, PO Box 3233 Elisenberg, 0208 Oslo, Norway*

[b] *Department of Sociology and Human Geography, University of Oslo, PO Box 1096 Blindern 0317 Oslo, Norway, arnema@sosgeo.uio.no*

We analyse the effects of immigrant concentration on two measures of native students' outcomes in upper secondary schools in Norway, completion and exam grades. Administrative data for full cohorts of new students 2002-2008 are employed. To take into account potential selection effects, we rely mainly on models with fixed school and educational programme effects. The analyses present a consistent picture: Immigrant concentration seems to have no effect on either school completion or grades. Sensitivity analyses provide further evidence that these results hold across subsamples and when various methodological problems are addressed. Our results do not lend support to policies aimed to redistribute immigrants' students more evenly across schools.

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1 Introduction

The influx of non-European immigrants has become a major issue in many European countries. A crucial issue is whether educational institutions in the host countries are able to adapt to this influx without a decline in education quality. A number of studies have addressed this, asking whether a high proportion of immigrant students has a negative impact on various measures of the school performance. In this paper, we provide further evidence on this issue. More specifically, we examine whether a high concentration of immigrant students leads to lower completion rates and/or poorer exam results among native students in Norwegian upper secondary education.

In theory, there are several reasons to expect immigrant concentration (the percentage of immigrants in a school or class) to have an impact. A more heterogeneous student body may increase the need for teachers and other resources and thus reduce the quality of the education (if not compensated by additional funding) (Conger 2015; Fletcher 2010). Increased workloads and a more challenging work situation may also make it more difficult to recruit and keep good teachers (Clotfelter et al. 2005). Direct interaction between immigrant and native students may also affect school outcomes, although not necessarily negatively (Goldsmith 2004).

Previous studies have provided mixed results (e.g., negative effect in Jensen and Rasmussen 2011; no effect in Cebolla-Boado and Medina 2011; positive effect in Fekjær and Birkelund 2007). Further evidence is therefore needed. Previous research has also focused mainly on primary and lower secondary education, and few studies provide evidence on impacts in upper secondary education.

Estimated associations between immigrant concentration and school performance are not necessarily causal, but could also be due to selection effects, for instance, if native

students or parents tend to avoid schools or residential areas with many immigrants. Our main strategy for dealing with this problem is school fixed effects models (Hoxby 2000). With this method, all between-school variation is removed, and thus also potential selection effects based on stable school characteristics. Unfortunately, elimination of between-school variation means that even some true effects of immigrant concentration may be removed. Models without school fixed effects are therefore also of interest. A standard control variable strategy is, moreover, of more interest in our study than in much previous research, as we have access to a relatively rich set of control variables. In particular, we are able to control for students' grades (grade point average, or GPA) from lower secondary school; results in Guarino et al. (2015) suggest that this may be a quite robust method to estimate the 'value added' by a particular grade or school level (and by implication the impact of immigrant concentration on this value added).

We analyse two outcome variables, school completion and grades obtained on national exams. Analysis of school completion is arguably particularly appropriate for measuring the potential impact of immigrant density on academically weak and/or unmotivated students, since it is primarily these who are under the risk of dropping out. Analyses of exam results are likely to be more sensitive to effects occurring among average or academically strong students.

We focus on the effects of immigration from non-European countries. It is particularly students from non-European countries who stand out with a considerably poorer school performance than native students, and the linguistic and cultural differences from the host population are generally larger. However, the main analyses are also carried out with immigrant concentration measured over all immigrants.

In Section 2, we discuss types of social processes that may lead to immigrant concentration effects. This is followed by a review of previous research (Section 3) and a

brief account of the Norwegian institutional setting (Section 4). We present the data in Section 5 and the estimation strategy in Section 6. Results are presented in Section 7 and further discussed in Section 8.

2 Potential effects of immigrant concentration at the upper secondary school level

A high number of immigrants in a school or class may affect the outcomes of native students in a number of ways. We may differentiate between at least three pathways.

One way in which immigrant students may affect native students is through direct peer interaction. This might occur through some sort of social contagion (Mayer and Jencks 1989). The presence of low-performing or unmotivated students may for instance encourage the same behaviour in others. However, it is far from obvious that a large representation of immigrant students will have such an effect. On the contrary, research both in Norway and other countries suggests that immigrant students (and particularly their parents) are on the whole more motivated and school-oriented than native students (and their parents), although their educational performance is lower (Jonsson and Rudolphi 2011). More positive or pro-school attitudes in schools with many immigrant students may also be the result of social comparison processes, as immigrant students with relatively low levels of performance may contribute to lower standards of comparison (Demanet and Van Houtte 2014; Goldsmith 2004).

Second, a high proportion of immigrant students may affect the learning environment and the quality of instruction provided (Conger 2015; Fletcher 2010). This is most obviously the case when students do not have sufficient knowledge of the native language. Lack of knowledge of cultural codes in the host country or low educational quality in the home country (for those having part or all of their earlier education from abroad) may have similar impact. All these factors may affect the workload and time allocation of the teacher and

reduce his/her ability to address the needs of native students. The learning outcomes of native students may also be negatively affected if the teacher covers less of the curriculum than otherwise would have been the case or adopts pedagogical methods less suitable for most native students. Moreover, a larger share of immigrants might imply using a larger share of a school system's resources to support the needs of immigrant children at the expense of the quality of the education for the native children.

A third possible pathway between a high proportion of immigrant students and native students' educational performance is by way of the quality of the teachers. Previous research suggests that well qualified teachers may be more likely to leave schools with a high proportion of immigrants, or less likely to choose such schools in the first place (Clotfelter et al. 2005; Hanushek et al. 2004; Bonesrønning et al. 2005).

Associations between immigrant concentration and school outcomes do not necessarily reflect causal effects of the latter variable, but could be the result of differential selection of students (Hoxby 2000; Gould et al. 2009). Immigrants are more likely to settle in some areas than others, for instance disadvantaged areas with relatively cheap housing. It is also possible that native students (or their parents) tend to prefer schools with relatively few immigrant students. The direction of a possible selection bias on estimates of immigrant concentration is not obvious, however, as it depends on whether it is the school choices of relatively poor or of relatively good native students that are more strongly affected by immigrant concentration. At least implicitly, it seems that a negative bias is most often assumed in the literature, implying that good students are more likely to move to schools with lower immigrant density. However, the opposite might also well be the case, since a potential quality loss in schools with high immigrant density could be more serious for weak students, and these students would then have more to gain by moving to schools with lower immigrant density.

3 Previous research

Although the general question of whether immigrant concentration in schools affect native students' school outcomes has been the subject of a number of studies, only a few have analysed secondary (and particularly upper secondary) school students. In a study of academic track students in Oslo, the capital of Norway, positive relationships between the proportion of immigrant students on the one hand and grades and later enrolment in higher education on the other were found (Fekjær and Birkelund 2007). A favourable effect of immigrant concentration on school-related attitudes is reported in a Dutch study (Demanet and Van Houtte 2014). Another Norwegian study covering the whole country and including vocational track students found instead that the proportion of immigrant students led to a small increase in school dropout, although no effect on GPA was found (Hardoy and Schøne 2013). A Swedish study of upper secondary school students also reports a zero effect of immigrant concentration on GPA (Brännström 2008). Similar results were obtained in an American study of high school students in Florida (Conger 2015).

A much larger literature considers effects of immigrant concentration at the primary or lower secondary school level. A recent Norwegian study (Hermansen and Birkelund 2015) reports no effect of the proportion of immigrant pupils on the later school achievements of native pupils. A lack of effect on native pupils' school outcomes is also reported in a number of other studies, for instance, Agirdag et al. (2012; the Netherlands), Boado (2007; France), Cebolla-Boado and Medina (2011; Spain), and Geay et al. (2013; England). Other studies report negative effects, for instance, Ballatore et al. (2014; Italy), Brunello and Rocco (2013; cross-national), Gould et al. (2009; Israel), Jensen and Rasmussen (2011; Denmark) and Veerman et al. (2013; the Netherlands).

The literature varies with regard to the treatment of (first generation) immigrants and

their (second generation) children. Some include both generations in their measure (e.g., Demanet and Van Houtte 2014; Hermansen and Birkelund 2015; Veerman et al. 2013), some only first generation (e.g., Gould et al. 2009), and a few have separate measures for both generations (e.g., Boado 2007; Contini 2013). We follow the latter practice. At least to the extent that immigrant concentration effects arise because of insufficient language skills, one would expect them to be stronger for first generation than for second generation immigrant density.

To sum up, previous research has not provided a consistent picture of the effects of immigrant concentration. This may reflect national differences in educational systems, in the selection of immigrants, or in the populations studied, but it could also be due to methodological differences.

4 The institutional setting

4.1 The Norwegian educational system

Primary and lower secondary schooling is compulsory for children aged 6–16 (7–16 before 1997). There is no ability tracking in compulsory school. As far as public schools are concerned, the place of residence generally determines which compulsory school children attend. The number of pupils attending private primary and lower secondary schools in Norway is very low (about 4 percent), and these schools are heavily subsidized. Exams and methods of grading in secondary school are uniform across the country. There is little emphasis on grading in primary schools in Norway.

Regarding the school starting age, parents can apply to the municipality to delay starting age by one year or start one year early on pedagogical or psychological grounds. However, Norway practices very strict compulsory school enrolment rules, based on year of birth, so changing the school starting year is very rare. Furthermore, there is essentially no

grade retention, so almost all pupils start in compulsory school at the same age and finish together.

As of 1997, all students are guaranteed at least three years of upper secondary school after completing compulsory school, and nearly all students go directly from lower secondary to upper secondary school (98 percent in 2013). Upper secondary school offers a choice among three academic programmes (providing preparation for higher education) and nine vocational programmes. The academic programmes are of three years' duration, whereas most vocational programmes consist of two years in school and two years as an apprentice. In general, applicants are free to choose among programmes available in their home county. If demand exceeds availability, those with best grades have priority. Some counties have similar rules for choice of school, but there are also counties that give priority to geographical proximity rather than grades. Although private upper secondary schools are available in most urban areas, they account for only 9 per cent of enrolment.

The vocational/academic distinction represents a clear differentiation of the student body (cf. Dronkers and Korthals 2016). The differentiation is mainly external, as there is no tracking within programmes (cf. Bol and van de Werfhorst 2016). Although largely choice based, academic track students have much better performance records from lower secondary school (about a one standard deviation difference in terms of lower secondary GPA) and come from higher status backgrounds (7 percent of vocational programme students have two parents with higher education, 28 percent of academic programme students). There is not a similar differentiation with regard to immigration background. About half of the native students attend the academic programmes, and the same applies to first generation immigrant students; second generation immigrants display a clear preference for the academic programmes, and 64 percent attend these, despite considerably lower GPAs from lower secondary school than native students.

4.2 Immigrants and immigration policy in Norway

Historically, Norway has mostly had considerable restrictions on labour immigration. The only exception is a period of liberalisation between 1957 and 1975. In this period, and especially at the beginning of the 1970s, there was a considerable influx of low-skilled labour immigrants, particularly from Pakistan, Turkey and Morocco. From 1975, Norway implemented an immigration stop for non-Nordic citizens. Exceptions were made for a limited number of immigrantss with specialized skills needed in the Norwegian labour market.

The immigrants' share of the Norwegian population has increased considerably since the immigration stop of 1975, from two percent of the population in 1980, to eight in 2005 and to nearly 16 percent by January 2015. Until the mid-2000s the increase was mainly due to refugees and asylum seekers, and to family reunification. By 2004, almost 75 per cent of immigrants in Norway were non-western compared to 25 per cent in 1980. With the inclusion of new member states in the EU in 2004, immigration from Eastern and Central Europe increased rapidly (due to Norway's membership of the EEA). The largest immigrant group has long been Pakistanis, but since 2008 Poles is the largest group.

5 Data, sample and variables

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 for education at all levels. The NUDB is linked via unique personal identifiers to other registers containing demographic information on the students and teachers.

We include students who started in the upper secondary school in 2002-2008. To

restrict the heterogeneity of our sample, we include only students starting at the age of 16 and thus entering directly from lower secondary school (about 95 percent of each cohort). Two outcome variables are analysed. One is whether upper secondary school is completed or not within the stipulated time (three or four years, depending on programme) plus one year; completion is coded 1, non-completion 0. The second is the average of the student's score on exams taken during the first two school years. We include only these exams since most vocational programme students do not have regular school based education, but are instead apprentices in year three and four. The grading scale is from one to six; in the analyses we use standardized scores (z-scores). Data on exams are available for the years 2003 (school year 2003-2004) onwards.

The main explanatory variables are the percentage of students who are themselves immigrants from non-European countries (with a few countries populated mainly by European settlers, viz. Canada, USA, Australia and New Zealand counted as European) or have two immigrant parents from these countries (i.e., second generation immigrants). Percentages are computed within cohort by school by programme, and not within cohort by school only as in much previous research. We do this because we believe school by programme provides a better approximation to the context the students actually experience. Choice of programme is also not more endogenous than choice of school as students apply to programmes and schools simultaneously. In addition, we control for school by programme fixed effects, sweeping away any unobserved time invariant effects by this combination.

We control for a number of individual level variables: GPA from lower secondary school (range 1 to 6), a dummy variable for students with an insufficient number of grades to calculate the GPA[1], level of schooling for both parents (dummy variable for each level),

[1] Students with less than eight subject-specific grades are not given a valid GPA (but are coded zero; the median number of valid grades for each student is 15).

average annual earnings for mother and father when the child is 14 to 18 years of age, number of siblings, whether the student lived together with both mother and father at the age of 16 (dummy), whether firstborn child or not (dummy), and gender. We also control for a number of school and peer characteristics, viz. the total number of students in the school, the number of students per teacher, and the level of education and earnings of the peers' parents (i.e., the parents of students in the same school, programme, and grade). For level of education, we do this by calculating the proportion of mothers and fathers, respectively, at each level. With regard to parental earnings, the school by programme measures are simple averages of the earnings of mothers and fathers, respectively, within the school by programme unit. The composition of the immigrant background population is taken into account by control for a similar set of variables based only on information on the parents of first and second generation immigrant peers.

The data sets for the completion and exam grades analyses are structured in slightly different ways. In the completion analyses, the individual is the basic unit of observation, and individuals are clustered within school by programme and within years. In the exam grades analyses, each specific course exam is treated as a separate unit of observation, and these exams are clustered within individuals, who are in turn clustered within school by programme and year. In the completion analyses, all peer and school characteristics are measured in the starting year in upper secondary school; in the exam grade analyses, these characteristics are measured for the specific school year in which the exam takes place.

6 Estimation strategy

A model for upper secondary school completion that combines control variables and school by programme fixed effects can be written as:

$$(1) \quad Y_{ijt} = \beta_0 + \beta_1 F_{jt} + \beta_2 S_{jt} + \beta_3 X_{ijt} + \beta_4 Z_{jt} + \tau_t + \upsilon_j + \varepsilon_{ijt}$$

Y is upper secondary school completion for individual *i* in school by programme *j* and cohort *t* (calendar year when starting in upper secondary school); *F* and *S* are the percentages of first and second generation immigrants, respectively; *X* is a vector of individual and parental characteristics, including lower secondary GPA; *Z* is a vector of time-varying school or school by programme characteristics; τ and *v* are cohort and school by programme fixed effects, and ε is an observation specific error term. Robust standard errors (Huber-White) adjusted for clustering at the school level are reported.

The models estimated to analyse exam grades are similar to (1), except for the fact that the unit of observation is the course specific grade, and except for the addition of a fixed effect for each course (δ_k with k indexing courses). In order to take into account potential differences in grading, fixed course effects are included in all models.

In practice, school by programme fixed effects can be implemented by deviating all variables from their school by programme specific means; thus, only variation within schools, between years will be used to estimate the coefficients (Stata 2015:423). This controls for selection due to school characteristics that are stable over the included years. With data covering seven years (2002 to 2008) it is, however, not obvious that control for school by programme fixed effects is sufficient, as parents' or students' choice of school may also be influenced by changes in immigrant concentration during this period. We therefore also include models implementing the moving average method suggested by Black et al. (2013). In this approach we include for each time-varying school or peer variable not only the value of the variable as measured in the year in question (year t), but also the average of the variable's values in years t-1, t, and t+1. Thus, only variation within three-year periods is used in the estimation.[2]

[2] The computation of moving averages over three years leads to a loss of cases. This is exacerbated by a change in the programme structure in upper secondary education affecting cohorts from 2006 onwards. Analyses of

The moving average method may help if school fixed effects are not restrictive enough. As noted above, however, school fixed effects may also err in the opposite direction and control away true effects of immigrant concentration, more specifically the causal pathway going through teachers' choice of school. This is so because teachers' choices of where to work are likely to be influenced primarily by more stable school characteristics and not by annual variations. It is therefore also of interest to estimate a pure control variable model that does not include school fixed effects.

Below we present only the coefficients for the main explanatory variables. Complete tables are available as online supplementary material.

[Figure 1 about here]

7 Results

7.1 Descriptive results

Means and standard deviations (when appropriate) for all variables and for both data sets (completion data and exams data) are presented as supplementary material (Table A1). The percentage completing within four or five years is 71. The mean of the exam scores is 3.284 with standard deviation 1.231 (z-scores are used in the regression analyses).

Figure 1 provides information on immigrant concentration in Norwegian upper secondary schools in the period under study. For the country as a whole, the percentage of non-European students born abroad is about three percent throughout the period 2002 to 2008. The percentage born in Norway but with immigrant parents increased from about two to about three percent. The immigrant concentration is much higher in the capital, and there is a

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completion can therefore only be done for cohorts starting in 2002, 2003, 2004 and 2007 (since peer variables are measured in the starting year). Analyses of exam grades are limited to years in which the exam in question was also administered in the preceding and the succeeding year.

distinct increase in the percentage of second generation immigrant students and also a distinct decrease in first generation immigrant students during the period under study.

The largest groups of first generation non-European students are students from Iraq, Turkey, Somalia, Iran and Afghanistan; together these groups make up 70 percent of the total number of first generation non-European students. Among second generation immigrant students, the most important countries, with 58 percent of the students, are Pakistan, Turkey, Vietnam, India and Sri Lanka.

[Table 1 about here]

7.2 Main analyses

Table 1 presents results from regression analyses for a series of model specifications. In Model 1 we control for calendar year and educational programme only, while subsequent models add progressively more controls: Model 2 adds all individual level and school level controls except lower secondary GPA (see list of variables in the Note to Table 1); Model 3 equals Model 2 plus lower secondary GPA; Model 4 also builds on Model 2, but adds school by programme fixed effects instead of GPA; and Model 5 combines control for GPA and fixed effects. In Model 6 moving averages of both the percentage of immigrant students and the remaining time-varying context variables are added. Results for upper secondary completion are shown in Panel A, exam results in Panel B.

Model 1 in Panel A shows that the percentage of non-European first generation immigrants is negatively associated with non-immigrant students' school completion. A one percentage point increase in the percentage of immigrants is associated with a .5 percentage point decline in the probability of completing. This negative association is considerably weakened, but remains significant, when individual and contextual controls are added (Model 2). With additional control for lower secondary GPA in Model 3, the coefficient changes sign and is no longer significant. The same happens if instead of GPA school fixed effects are

included (Model 4). The coefficient remains non-significant with combined control for GPA and fixed effects (Model 5) and even in the moving average model (Model 6). None of the models shows a significant association between the percentage of second generation immigrants and completion.

The results from the analyses of the exam scores are presented in Panel B. The pattern of results is quite similar to what was found for school completion. In Model 1, there is again a negative association between the dependent variable and the percentage of first generation non-European immigrants. In this case, however, neither GPA nor school by programme fixed effects are necessary in order to reduce this association to non-significance. There is no significant relationship between second generation immigrant density and exam scores in any of the models.

[Table 2 about here]

7.3 Subgroup analyses

To allow for potential effect heterogeneity, we have performed subgroup analyses. First, we carried out separate regression analyses in groups defined by quartiles in the distribution of lower secondary GPA. As noted above we expect academically weak students to be the most sensitive to immigrant density effects. The model (Model 5 as defined in Table 1) with school by programme fixed effects and the full set of control variables is used. Fifteen of sixteen coefficients are not significantly different from zero. We, therefore, conclude that there is no evidence of immigrant density effects, not even for the weakest students.

[Table 3 about here]

Non-European immigrants are to a considerable extent concentrated in the capital (Oslo) area, and the number of immigrants in large parts of the country is very low. It is therefore possible that our results primarily reflect the conditions in low-immigration areas. To assess whether the findings also hold for an area with a relatively high, or at least

moderate, level of immigrant concentration, we made a separate analysis of students at schools in Oslo. Results for both completion and grades are presented in Table 3.

The analyses reveal a quite consistent pattern for both outcome variables. In Model 1 the associations are negative, although significant only for two out of four coefficients. In Model 2 all coefficients turn negative, and three are significantly different from zero. Additional analyses not reported here show that this change is mostly due to control for school by programme averages of parents' earnings and education; thus, our findings are in line with previous analyses of Oslo reported in Fekjær and Birkelund (2007), who found initially negative coefficients turn to positive when the average educational level of the parents was taken into account. Our results indicate that the estimated positive effect is spurious, however, as it disappears with control for either lower secondary GPA or school by programme fixed effects (or both).

[Table 4 about here]

7.4 Sensitivity analyses

The main results from some sensitivity analyses are reported in Table 4. Panels A and B present separate results for students in academic versus vocational programmes. The results for both types of programmes confirm the lack of immigrant density effects. Panel C and D shows that inclusion of teacher characteristics or removal of small schools (with presumably less reliable results) has no impact on the findings. In Panel E we use an alternative measure of immigrant concentration, including all immigrant students and not only those from non-European countries. Again, the lack of effects is confirmed.

A concern not addressed so far is that the estimates might be biased by systematic selection taking place during upper secondary education. This is particularly obvious with regard to exam grades as those who drop out of school will not be included in the analyses, but change of school might be a concern even in analyses of upper secondary school

completion. This will be so if change of schools is systematically related to the share of immigrants at the school, for example if students with some favourable unobserved characteristics move away from schools with high immigrant shares.

To provide information on this we carried out analyses of a summary measure of all kinds of departure after the first year in upper secondary school. We do not present detailed results, but note only that neither the percentage of first generation nor of second generation non-European immigrants is related to departure (moving between schools) from upper secondary schools (based on Model 5 as described above).

The analyses above assume linear effects of immigrant density. We also experimented with more flexible specifications, allowing for non-linear relationships (cf. Cebolla-Boado and Medina 2011). Results using dummy variables measuring varying shares of immigrants generally revealed non-significant differences.[3]

We have followed common practice in the literature by controlling for characteristics of peers' parents. This may not be entirely unproblematic, however, as these characteristics may not be truly exogenous to immigrant density. A low average level of parental education, for instance, may in part be a result of the immigration. However, the results remain almost unchanged even if variables measuring characteristics of peers' parents are omitted.

Finally, we carried out analyses using a stricter definition of completion, i.e., counting only completion within the stipulated time (three or four years, depending on programme). No results were altered.

8 Discussion and conclusion

[3] A single exception was a significant positive estimate for more than eleven percent first generation immigrants in the analysis of completion if the model without moving average controls (corresponding to Model 5 in Table 2) was used, but this was not found when these controls were added.

The analyses above present a consistent picture: Immigrant peers seem to have no effect on either the upper secondary school completion of native students or on the grades they obtain in nationwide exams. The sensitivity analyses provide further evidence that these results hold across subsamples and with alternative specifications. It strengthens our findings that very similar effects were obtained for upper secondary school completion and for grades, and also that no effect of immigrant density was found even among academically weak students (lowest quartile in the lower secondary GPA distribution). It is also noteworthy that no effect of immigrant density was found when we restricted the analysis to Oslo, which is the area with highest concentration of immigrants.

Our findings add to the sparse evidence on the effects of immigrant concentration in upper secondary education. We reach the same conclusion as Brännström (2008) and Conger (2015) did in their analyses of Swedish upper secondary students and Florida high school students, respectively, i.e., that foreign-born peers have no effect on the academic results of native students. Although our conclusion is different, the findings also seem consistent with Fekjær and Birkelund's (2007) analyses of Oslo; even we find positive associations between immigrant density and educational performance, but this holds only if neither lower secondary GPA nor school fixed effects are included.

We have no similarly straightforward answer to why we reach somewhat different conclusions than did Hardoy and Schøne (2013), who also analysed data covering Norway as a whole. A potentially important difference, however, is that Hardoy and Schøne analysed the 1996 to 2003 cohorts, whereas the present analyses cover the 2002 to 2008 cohorts. Still, the difference in results compared to Hardoy and Schøne (2013) are modest. For grades, Hardoy and Schøne also report no significant results, and the significant results for dropout are very small.

We note that the main findings do not depend on the use of school fixed effects. This

is important since school fixed effects may also remove true effects of immigrant density, in particular a potential effect working through teachers' job choices. Since inclusion of control variables is enough to remove any association between immigrant density and academic performance, we can conclude that there is no evidence that teachers' job mobility contribute to lower educational quality in upper secondary schools with high immigrant density in Norway. The fact that a control variable strategy appears to work well in our data cannot be generalized to other settings, however, since there may be differences in the underlying selection processes.

In summary, the results in this study suggest that the initial negative association between the immigrant share and native students' performance can be explained by a sorting of immigrants into schools with less favourable characteristics. This is evident for analyses controlling for native students' grade point average from lower secondary school, or by controlling for unobserved time fixed school by programme characteristics. Results from this study do not add weight to arguments focussing on negative impacts of ethnic segregation on student performance, or to suggestions that improved school outcomes may be obtained by redistributing immigrant students more evenly across schools.

Our results should be relevant beyond the Norwegian context, particularly for countries with recent experience of large-scale immigration. Our findings are quite comparable to the UK results reported by Geay et al. (2013), using a rather similar approach but for a country with a very different institutional setting. They state that their results make sense in the light of other UK studies reporting that ethnic groups in UK progress more favourably than the natives in the educational sector. Our results suggest that this is not a precondition for a lack of negative immigrant concentration effects, as both completion rates and grades are clearly lower among non-European immigrant groups in Norway than among natives.

The most important strength of this study is the large and detailed data set, which also made it possible to estimate models with relatively high internal validity. However, the data do not allow us to disentangle the causal mechanisms involved; thus, it is possible that we observe only the net result of several processes that cancel each other out. It should also be noted that our analyses are limited to the upper secondary school level, and do not rule out immigrant concentration effects at lower educational levels.

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Table 1. Unstandardized coefficients from OLS regression of completion of upper secondary school and exam grades on the percentage of peers with non-European origin. Native students only.

Panel A. Completion within the expected time plus one year

	Model 1		Model 2		Model 3	Model 4	Model 5	Model 6
Perc. non-European 1. gen.	-0.00490	***	-0.00108	*	0.00040	0.00041	0.00083	-0.00035
	(0.00061)		(0.00054)		(0.00039)	(0.00052)	(0.00046)	(0.00074)
Perc. non-European 2. gen.	-0.00042		0.00079		0.00015	0.00031	0.00065	-0.00023
	(0.00089)		(0.00080)		(0.00039)	(0.00067)	(0.00065)	(0.00108)
N (schools)	475		475		475	475	475	435
N (programmes x schools)	3327		3327		3327	3327	3327	2790
N (students)	347125		347125		347125	347125	347125	182035

Panel B. Exam grades (z-scores)

	Model 1		Model 2	Model 3	Model 4	Model 5	Model 6
Perc. non-European 1. gen.	-0.00581	***	-0.00138	0.00136	-0.00110	-0.00008	-0.00052
	(0.00165)		(0.00150)	(0.00120)	(0.00137)	(0.00116)	(0.00185)
Perc. non-European 2. gen.	0.00109		0.00165	0.00105	-0.00275	-0.00194	-0.00028
	(0.00263)		(0.00201)	(0.00115)	(0.00163)	(0.00160)	(0.00280)
N (schools)	468		468	468	468	468	423
N (programmes x schools)	3254		3254	3254	3254	3254	2404
N (exams)	294461		294461	294461	294461	294461	165572

Note: Coefficients with robust standard errors adjusted for clustering (schools) in parentheses. Model 1: Control for year and programme; Model 2: Model 1 plus control for no. of siblings, firstborn or not, living together with both parents or not, mother's level of schooling, father's level of schooling, mother's earnings, father's earnings, no. of students in the school, no. of students in the school per teacher, peers' mothers' schooling, peers' mothers' earnings, peers' fathers' schooling, peers' fathers' earnings; Model 3: Model 2 plus lower secondary GPA; Model 4: Model 2 plus fixed school x programme effects; Model 5: Model 2 plus lower secondary GPA and fixed school x programme effects; Model 6: Model 5 plus moving average versions of no. of students, no. of students per teacher, peers' mothers' schooling, peers' mothers' earnings, peers' fathers' schooling, peers' fathers' earnings. Significance probabilities: *** < .001, ** < .01, * < .05.

Table 2. Unstandardized coefficients from OLS regression of upper secondary completion (Panel A) and exam grades (Panel B) on the percentage of peers of non-European origin. Separate analyses for quartiles of the distribution of lower secondary grade point average. Native students only

Panel A. Completion within the expected time plus one year

	Q1 (low)	Q2	Q3	Q4 (high)
Perc. non-European 1. gen.	0.00114	0.00092	0.00095	0.00003
	(0.00077)	(0.00082)	(0.00086)	(0.00062)
Perc. non-European 2. gen.	0.00043	0.00059	0.00025	0.00135 *
	(0.00100)	(0.00102)	(0.00114)	(0.00067)
N of schools	470	470	468	459
N of schools x programmes	3203	3283	3203	2779
N of observations	87609	88177	84984	86355

Panel B. Exam grades (z-scores)

	Q1 (low)	Q2	Q3	Q4 (high)
Perc. non-European, 1. gen.	0.00036	0.00057	-0.00207	0.00022
	(0.00165)	(0.00207)	(0.00225)	(0.00305)
Perc. non-European, 2. gen.	-0.00283	-0.00265	0.00132	-0.00230
	(0.00305)	(0.00284)	(0.00280)	(0.00369)
N of schools	460	459	456	443
N of schools x programmes	2973	3017	2855	2254
N of observations	73196	75244	78036	67985

Note: See the note to Table 1. The model estimated corresponds to Model 5 as defined there.

Table 3. Unstandardized coefficients from OLS regression of upper secondary completion (Panel A) and exam grades (Panel B) on the percentage of peers of non-European origin. Schools in Oslo only. Native students

Panel A. Completion within the expected time plus one year

	Model 1		Model 2		Model 3	Model 4	Model 5
Perc. non-European 1. gen.	-0.00690	***	0.00166		0.00023	-0.00090	0.00035
	(0.00154)		(0.00142)		(0.00118)	(0.00187)	(0.00150)
Perc. non-European 2. gen.	-0.00278		0.00406	**	0.00005	0.00166	0.00201
	(0.00143)		(0.00135)		(0.00116)	(0.00152)	(0.00152)
N (schools)	39		39		39	39	39
N (programmes x schools)	164		164		164	164	164
N (students)	23515		23515		23515	23515	23515

Panel B. Exam grades (z-scores)

	Model 1		Model 2		Model 3	Model 4	Model 5
Perc. non-European, 1. gen.	-0.00411		0.01204	*	0.00676	0.00045	0.00252
	(0.00514)		(0.00478)		(0.00339)	(0.00446)	(0.00416)
Perc. non-European, 2. gen.	-0.01193	**	0.01159	**	-0.00308	-0.00262	-0.00307
	(0.00348)		(0.00338)		(0.00287)	(0.00284)	(0.00241)
N (schools)	40		40		40	40	40
N (programmes x schools)	157		157		157	157	157
N (students)	16476		16476		16476	16476	16476

Note: See note to Table 1.

Table 4. Sensitivity analyses of upper secondary school completion and exam grades. Regression analyses for the full sample of the 2002 to 2008 school cohorts.

	Completion within the stipulated time plus one year		Exam grades (z-scores)	
A. Vocational programme				
Perc. non-European, 1st. gen.	0.00096	(0.00057)	0.00020	(0.00129)
Perc. non-European, 2nd. gen.	0.00044	(0.00082)	-0.00268	(0.00235)
	169997		147587	
B. Academic programme				
Perc. non-European, 1st. gen.	0.00030	(0.00062)	-0.00059	(0.00129)
Perc. non-European, 2nd. gen.	0.00042	(0.00072)	0.00218	(0.00141)
	166725		700977	
C. With control for teacher charact.				
Perc. non-European, 1st. gen.	0.00084	(0.00046)	0.00030	(0.00118)
Perc. non-European, 2nd. gen.	0.00036	(0.00066)	-0.00206	(0.00160)
	336722		287985	
D. Only schools with more than 250 students				
Perc. non-European, 1st. gen.	0.00079	(0.00049)	0.00058	(0.00122)
Perc. non-European, 2nd. gen.	0.00039	(0.00069)	-0.00181	(0.00167)
	307509		264310	
E: Density defined over all immigrants				
Perc. immigrants, 1st. generation	0.00023	(0.00037)	0.00032	(0.00105)
Perc. immigrants, 2nd. generation	0.00083	(0.00058)	-0.00294	(0.00179)
	347125		294123	

Note: Regression coefficients with standard errors in parentheses. Estimates are based on Model 5 as explained in the Note to Table 1. All analyses of grades are limited to grades obtained in the first two years of upper secondary school, except those limited to the Academic programmes (B), which also includes grades obtained in the final (third) year. Significance probabilities: *** < .001, ** < .01, * < .05. The additional controls in C are school level means of teachers' level of education (master or not), college/university GPA, labour force experience, and school specific seniority, and the proportion of female teachers.

Figure 1. First and second generation non-European immigrant students as a perecentage of all new students in upper secondary education 2002-2008. Norway as a whole and Oslo only.