Ethnic segregation and educational outcomes in Swedish comprehensive schools: A multilevel analysis

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Abstract

We ask whether ethnic segregation in Swedish comprehensive schools, fueled by increased residential segregation and increased immigration during the 1990s, are associated with depressed educational outcomes as measured either by teacher-assigned school grades in ninth grade (age 16) or eligibility to enter an academic study programme at the upper secondary level. The data are based on two entire cohorts who graduated from comprehensive school in 1998 and 1999 (188,000 pupils and 1,043 schools), linking educational information from schools with Census data on social origin. Using multilevel analysis we find ethnic density in schools to depress grade point averages in general, and especially for immigrant pupils. For second generation immigrants these are accounted for by socioeconomic characteristics of the family of origin and of the composite socioeconomic status in schools. We argue that differences in school quality are unlikely to produce these results. Rather, a clustering of immigrant children is likely to create a more difficult learning environment, partly because of language problems, and relative lack of positive role models. Because ethnic density has strong negative effects in schools with 70 per cent or more immigrant students, desegregating policies could be an efficient means towards overall increasing academic standards as well as decreasing educational inequality. (204 words)

Keywords:

Ethnic inequality, Immigrant schooling, Educational attainment, Contextual effects, Hierarchical models

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INTRODUCTION

In Sweden, as in many other countries, immigration increased during the 1990s (Statistics Sweden 2004; cf. Table 1 below). This happened at the same time as a sudden and exceptionally deep recession hit the Swedish economy, with a loss of around 550,000 jobs out of an initial 4,5 million between 1991 and 1993 (Statistics Sweden 2004, Fig. 297). Though the overall situation improved during the latter half of the 1990s, many immigrants found it difficult to get a footing in the labour market, employment rates being below 75 per cent those of native-born Swedes in 1996 (Ekberg 1999), a figure that increased to around 80 per cent in 2003 (Integrationsverket 2004). There is extensive welfare state support for the poor in Sweden and therefore nothing like an "underclass" has yet emerged. Nevertheless, the development during the 1990s in combination with a strong and growing residential segregation based on country of birth and income levels (Andersson 2000) have led to concentrated disadvantage in many local areas, typically in the suburbs of big cities. As a result, many have expressed concern for the conditions and opportunities of children of immigrant origin in such areas. In particular, this concern has focused on their school results and educational attainment as a basis for their chances in the labour market and for their integration at large.

Judging by the results of recent research, there are reasons both for sharing the worries about the consequences of segregation for the school achievements of children to immigrants, and for being somewhat more optimistic. There is a number of studies showing the importance of the socioeconomic composition of schools for educational outcomes (Hanushek, Kain and Rivkin et.al. 2002, Robertson and Symons 2003, Willms 1986; for Sweden, see Erikson 1994, Dryler 2001), suggesting that socioeconomic segregation depress educational achievement for those who live in disadvantaged areas, where children of immigrants are over-represented. There is also a growing, and related, body of studies of neighbourhood effects (see Garner and Raudenbush 1991; Borjas 1995; Brooks-Gunn, Duncan and Aber 1997, and reviews by Dietz 2002; Sampson, Morenoff and Gannon-Rowley 2002). These studies show that "middle-class" schools and neighbourhoods are overall associated with better achievements of pupils, even when controlling for characteristics of their own family of origin; though the size of such neighbourhood effects appear to be rather limited (even if this conclusion is debated).

Studies of educational differences between ethnic groups, or immigrants and non-immigrants (e.g., Portes and MacLeod 1996; Similä 1994; Vallet and Cailee 2000; van Ours and Veenman

2003), show, in general, lower achievements among children born abroad ("first generation immigrants"), and also, though to a lesser extent, among native-born children with immigrant parents ("second generation immigrants"). The latter are however doing as well or even better than those of indigenous origin when taking account of differences in parental socioeconomic and educational attainment (e.g. Hagy and Staniec 2002; Rong and Brown 2001; Hirschman 2001; for Sweden Similä 1994). This is sometimes interpreted in terms of high aspirations on the part of immigration groups, but is likely to be partly explained by discrimination in the parental generation.

In the present study, it is our intention to do what few other studies have attempted, namely to address the question of the consequences of ethnic segregation for pupil achievements.[1] We measure segregation at the school-level which in Sweden is very highly correlated with neighborhoods. Studies of the related issue of racial segregation in the U.S.A. find that such segregation tend to depress school achievement (Boozer, Krueger and Wolkon 1992; Grogger 1996; Hoxby 2000; Hanushek, Kain and Rivkin 2002), though there are mixed findings in previous research, probably due to differences in methodology and in data (Hanushek et al. 2002; Durlauf 2004). Both from a sociological perspective – focusing on which processes produce educational differences, and in what ways segregation might affect opportunities – and from a policy perspective, it is important to try to estimate negative effects of segregation. Does it have negative consequences for overall school achievements of pupils, and are these consequences worse for pupils of disadvantaged groups? The answers to these questions have bearing both on issues of societal efficiency and inequality. It is also of interest to contrast previous findings, predominantly from the U.S.A., with an analysis of the Swedish case. Sweden has a quite different school system, one with an insignificant private sector, and characterized by relatively small quality differences between schools; but Sweden is also a country with marked residential

[1] We follow the convention and use the term "ethnic" in some instances (as in "ethnic segregation/density", or "composition") to denote the distribution or clustering of people of different immigrant statuses according to their own and/or their parents' country of birth (which is the information we have access to). We are aware, however, that the proper use of the term "ethnic" should require information about religion, language, cultural belonging etc. (an example are Kurds who migrate from Turkey).

segregation along ethnic lines and with relatively great language problems following substantial immigration waves in the 1980s and 1990s from non-Scandinavian and non-European areas.

We use Swedish data on pupils in the last (9^{th}) grade at comprehensive school, most aged 16, to study whether ethnic segregation is associated with depressed educational attainment; and, if so, whether this is true for all children in a school, or predominantly for first and/or second generation immigrants. To model this effect we control for individuals' socioeconomic background (parental education and employment, household poverty, and family size and structure) as well as the socioeconomic composition of schools. Because the study is made on almost two entire cohorts, its strength lies in representativity and statistical power, in the reliability with which we are able to construct compositional indicators, and in a detailed set of background variables for pupils. We are, like most of our colleagues, less able to distinguish the precise processes that lie behind segregation effects, and causal interpretations are also in our study debatable. However, we believe that we come quite a way towards reducing selection effects, partly because of extensive controls for observables, partly because we also use school-level fixed effect models.

THEORY AND HYPOTHESES

In understanding differences in school grades, parental resources and behaviour are essential. Theories focus on early (pre-school) socialization as well as parental support during the school years in the forms of continuous socialization, transmission of educational aspirations, economic resources, good advice on how to navigate in the school system and practical help with the school work (Erikson and Jonsson 1996). Over and above pupils' own "family context" (such as their social background), the composition of families in neighbourhoods and schools may also have an impact on the opportunities of performing well in school via social interaction, mainly with peers and their parents. Neighborhood studies emphasize institutional resources, social capital, and norms or collective efficacy (Coleman and Hoffer 1987; Sampson, Morenoff, and Gannon-Rowley 2002; Crowder and South 2003). School studies tend to focus on school climate, efficacy in instruction, resource differences, norms and educational aspirations (e.g. Mortimore et al. 1988; Lee and Bryk 1989). One element in these theories is that a clustering of children from less resourceful families in a school means that the average pupil faces less opportunities of learning, lower educational aspirations, and receives less relevant information about the educational

system and the labour market – there is a lack of positive "spill-over effects" or human-capital externalities (or there is a "contagious" effect of negative circumstances).

There are several plausible mechanisms behind: because pupils do homework together each one's skills and aspirations, as well as their parents', have an impact on the other; a concentration in a school of pupils who do not master the language of instruction may create problems with efficient teaching; the social problems of young people who experienced war, persecution, involuntary emigration (or whose parents did) may be of different magnitude than "normal" marginalization in the welfare state. Furthermore, role models of young people may attach low value to education and schoolwork.[2] The concentration of non-employment in ethnically segregated environments may make the lack of positive role models especially pronounced. Finally, to the extent that there is an ethnic divide in friendship patterns, those from ethnically disadvantaged backgrounds are more exposed to environments that do not promote school achievement – consequently, we expect ethnic segregation to depress school performance *particularly* for children from such backgrounds (cf. Borjas 1995). Another consequence of this line of argument is that we assume that negative contextual effects will be more pertinent for first-generation than for second-generation immigrants: the former have overall less resources, in particular language skills, and they are less likely to have become integrated into Swedish networks.

What we set out to test empirically are the hypotheses that 1) ethnic segregation (measured as the proportion first and second-generation immigrants in schools) is correlated with school achievement so that the larger the fraction of first- and second-generation immigrants the worse the school results 2) this correlation is partly dependent on differences in socioeconomic resources, but even controlling for such resources ethnic segregation will have a general negative impact on school achievement, 3) this negative effect is weakest for pupils born in Sweden by Swedish-born parents, and 4) resource convergence across generations makes the negative impact less for second-generation than for first-generation immigrants.

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[2] While mainstream culture of individual success may be wide-spread in segregated neighbourhoods, opportunities for individual progress may nonetheless be perceived as strongly limited (e.g., Ainsworth 2002).

THE SWEDISH SETTING

Almost all Swedish children pass through the public comprehensive school between 7-16 years of age. There is little streaming or tracking and school marks (grades) are only required in the 9th grade (and schools are not allowed to give grades before the 8th). These grades, however, are consequential for the array of available school choices at (upper) secondary school. In particular, only pupils who pass a grade limit can make the transition to the academic study programmes at this level; those who do not either have to leave school or go on to take vocational training.[3] The allocation of pupils to Swedish comprehensive schools is, unlike the U.S. and many European countries, based on which residential area the pupil lives in. There are some exceptions to that, particularly a voucher system and some "free" schools, but only around two per cent of pupils in our cohorts actually use this system, mainly because school choice is limited and because parents and pupils of that age prefer schools near the home (reducing travel times and facilitating socializing with friends). In practice, this makes it difficult to separate neighbourhood from school effects: for example, the percentages of immigrant children in the school and in the residential area will be very highly correlated. In our study, we concentrate on variables measured at school level because these are most likely to be of importance for school achievement.

In the absence of a significant private school system, the resource distribution among Swedish comprehensive schools is even, following governmental norms, which leads to a relatively equal quality between schools. Resources are also distributed according to standards of need, meaning that, for example, a greater share of immigrant pupils adds resources in order to compensate for difficulties in instruction, stemming from language problems in particular (more resources are also given to schools for pupils with other special needs). In our data, this is reflected in the fact that only five per cent of the individual-level variation in school grades, and eleven per cent of

[3] This vocational training also takes place within the school system, with a small amount of on-the-job-training, but this qualification provides far less possibilities of continuing on to higher education or getting a well-paid job.

the variation in eligibility for upper secondary studies were due to differences between schools in 1998/99.[4]

Up until 1930, Sweden was an "emigration country" and only since the second World War has it really been an immigrant society, beginning with immigration in the wake of World War II (e.g., Baltic) and later following the turmoil in Eastern Europe (Hungary in 1956s, Czechoslovakia in 1968, Poland etc.). It was not until the 1960s that labour shortage started a wave of immigration, primarily from Finland, the other Nordic and the Mediterranean countries. This has been followed by a large amount of refugees from various countries from the 1970s and onwards (such as Iran, Iraq, Turkey, Somalia, Lebanon, Chile), in particular during the 1990s – and then mostly from former Yugoslavia. Some of these trends can be seen in Table 1. At the turn of the 20th century, around eleven per cent of the Swedish population were born in another country (a figure similar to that of the U.S., for example). In our sample, consisting of people mainly born 1982-83, 7.5 per cent are first generation immigrants and 4.5 per cent are second generation immigrants (Table 2).

Table 1 about here

DATA AND VARIABLES

The data-set on which the empirical analyses in this paper are based include information on all pupils (about 193,000 individuals) who attended the ninth grade in all Swedish comprehensive schools in 1998 and 1999 (1,249 schools). The information on individual pupils come from an official school registry of nine-graders (*Åk9-registret*), including information on which school they attended. This data-set was matched (using unique personal identification numbers) with

[4] Erikson (1994) reports, on the basis of data from 1991-92, that 5 per cent of the variation in transition rates to upper secondary school were between schools and an additional 10 per cent between school classes (probably a teacher effect). In his analysis, only compositional variables at the school-level, and none at class-room level had any effect on transition propensities. This supports the strategy we follow in our analyses, to concentrate on schools.

registry data on parents, mainly from the 1980 and 1990 Censuses.[5] Thus, data on pupils' achievements are combined with information about basic characteristics of their families.

We excluded private schools and very small schools in which the total number of ninth grade students in the years studied was less than 20. The reason is partly that the vast majority of students attend 'normal' public schools, partly that the choice of other types of school is dictated by some unmeasured characteristic of families that may also be correlated with grade point averages. Among private and smaller schools, there are relatively more schools for children with special needs, and religious/ethnic schools with restricted intake and special curricula meaning that these schools have a pupil composition that sharply differs from ordinary public schools. The exclusion of private and small schools reduces the number of students to about 188,000 and the number of schools to 1,043.

Outcome variables

Two outcome variables are analyzed:

- the "merit value", which is the sum of the school grades in the 16 best subjects for each individual pupil
- whether or not the pupil passes the grade limit that makes him/her eligible for academic (upper) secondary education. (This indicator, based on having a "pass" in Swedish, English, and Maths, is in practice rather similar to high-school drop-out in the U.S.)

Level 1: the pupils and their parents

We have information about pupils' sex, country of birth, number of siblings and type of family. Four family types are distinguished: nuclear families, reconstructed families, single parent-families, and children living alone (in special homes or with other adults than the parents). Furthermore, we have data on the biological (or adoptive) parents' level of education, country of birth, unemployment experience, and experience of receiving social assistance during the year when the pupil left the compulsory school, i.e., 1998 or 1999.

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[5] Such matching procedures are standard in Sweden, carried out by Statistics Sweden, and are entirely accurate.

Pupils´ immigrant status is measured by three binary variables. The first variable is given the value 1 if the pupil and both his/her parents were born abroad, and zero otherwise; it thus distinguishes immigrant pupils.[6] The second variable is given the value 1 if the pupil was born in Sweden but both his/her parents were born abroad (second generation of immigrants). The third variable is given the value 1 if both parents were born outside Sweden, and zero otherwise. According to this definition, first and second generation immigrants are classified together.

The parents' level of education is based on the highest out of seven levels of education achieved, namely: short compulsory (less than nine years), compulsory (nine years), short secondary (two years studies in addition to compulsory school), upper secondary (three years), lower tertiary (less than three years in addition to secondary schooling, mostly higher vocational education), university degree, and postgraduate qualification, respectively. The lowest educational level is used as reference category in the analyses. The parents' experience of being on social welfare is a dummy variable coded as 1 if at least one of the parents obtained social support during the relevant year.[7] The parents' experience of unemployment is a dummy variable coded as 1 if at least one of the parents obtained unemployment benefits during the relevant year.

Level 2: schools in 1998 and 1999

The crucial independent variable is the ethnic composition of schools (or, more exactly, in the ninth grade) in 1998 and 1999, what we will term *ethnic density*. Three different compositional variables have been computed to measure this; the proportion of first generation immigrants in a school; the proportion of second generation immigrants; the sum of these proportions. In addition, two measures of the socioeconomic composition of schools are created: the proportion of students with at least one parent with university degree and the proportion of students with at least one parent receiving social welfare during the relevant year.

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[6] We define adopted children who were born abroad as born in Sweden. They normally arrive in Sweden at a very young age.

[7] As social assistance is given on a household basis, this is an indicator of household poverty.

MODELS AND ANALYTICAL STRATEGY

The data set includes information both on individual pupils and on the composition of the schools they attended. An appropriate statistical method for dealing with information of this kind, with individuals nested within schools, is hierarchical or multilevel modeling (Bryk and Raudenbush 1992). Multilevel models estimate within-school and between-school equations, accounting for potential dependence between observations within schools. In the hierarchical linear model, each level in the data structure is formally represented by its own sub-model. Each coefficient defined in the level-one model (equation 1 below) can be used as the outcome in the level-two model (equation 2, 3 and 4 below). The basic level-one model used has the following formal representation:

Level-one, within-school model:

$$Grade_{ij} = B_{0j} + B_{1j}*FIRST_{ij} + B_{2j}*SECOND_{ij} + B_k*\sum BACKGROUND_{ij} + R_{ij} \quad (1)$$

The level-one, or within-school model estimates the grades for each pupil within each school j. B_{0j} is the intercept (or average grade) for school $_j$. B_{1j} represents the gap in grades between first generation immigrants and children with Swedish-born parents for school $_j$ and B_{2j} does the same for second generation immigrants. Thus, both the intercept and the estimate of the grade gap between the groups are allowed to vary between schools. We also include in the level-one model a vector of the individual pupils' background characteristics. B_k are fixed parameters for these background characteristics.[8] R_{ij} is the level-one random variance, or each individual's unique contribution to the outcome. The random variance is assumed to be normally distributed.

Level-two, between-school model:

$$B_{0j} = G_{00} + G_{01}* \%FIRST + G_{02}* \%SECOND + G_{03} * \%WELFARE + G_{04} * \%DEGREE + U_{0j} \quad (2)$$

The level-two, or between-school model, estimates the variation in average school grade levels (B_{0j}). G_{00} is the intercept; G_{01} is the regression coefficient for the proportion of first generation immigrant children in the school on average grades in school; G_{02} is the corresponding regression

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[8] Measures of individual student's background included in the model are: sex; number of siblings; parents' experience of unemployment and social assistance, respectively; parents' level of education; family type.

coefficient for the proportion of second-generation Swedish children; G_{03} is the coefficient for the proportion of children with parents receiving social assistance; G_{04} is the coefficient for the proportion of children with academic background. U_{0j} is the random variation in school results between schools.

In equation 3 and 4, the gap in grades between first-generation immigrants and the reference group of pupils with at least one Swedish-born parent (B_{1j}), and second-generation immigrants and the reference group (B_{2j}), respectively, are the outcomes. G_{10} is the fictitious average gap in grades between the reference group and first generation Swedish pupils in schools with no such pupils, G_{11} is the regression coefficient for the effect of the proportion of first generation pupils on the gap in grades, and U_{1j} is the random variation between schools in grade gaps. The corresponding holds for equation 4. A more intuitive way of understanding equations 3 and 4 is to conceive of them as estimating whether first- or second generation immigrants or those native-born with native-born parents are most affected by the proportion of immigrant students in their schools. Another way of looking at this modeling process is to treat each school as having its "own" regression equation with an intercept and a slope (or slopes) that in turn constitute the outcome(s) in the level-two models (Raudenbush et al. 2000).

$$B_{1j} = G_{10} + G_{11} * \%\text{FIRST} + U_{1j} \quad (3)$$

$$B_{2j} = G_{20} + G_{21} * \%\text{SECOND} + U_{2j} \quad (4)$$

In the models presented above, pupils' grades from last grade in compulsory school constitute the main outcome. The other indicator of school success we use (whether pupils' grades qualify for upper secondary school or not) is dichotomous and the method used is therefore multilevel logit. The modeling process is identical for both outcome variables.

Methodological issues

The processes behind the correlation between segregation and school achievement can be grouped into endogenous, or peer effects (when the action of some influences others), compositional (or contextual) effects (when an individual is influenced by the exogenous characteristics of peers and neighbors) and selection, or correlated effects (when individuals with similar characteristics tend to cluster in similar social environments) (Manski 1993, 2000). The

two first processes reflect causal effects and they are difficult to distinguish in the real world as they both primarily will be a function of social interaction between peers.[9] The third process is entirely different: If an outcome is connected with segregation simply because people with given characteristics end up in the same neighborhood, or school, then segregation is not a problem per se (for that particular outcome). Such selection is however of outmost importance to identify and control for in order to draw any conclusions about environmental effects at all. This problem of endogeneity, or population grouping, plagues studies of the influence of social environment (neighborhoods, schools) on individual outcomes (see Manski 2000 for a general discussion, Hanushek, Kain, Markman and Rivkin 2003 applied to school effects, and Dietz 2002 on neighborhood effects). Normally, it is assumed that endogeneity causes an upward bias in estimates of environmental effects. In the absence of experiments we can never be certain that pupils are randomly allocated to schools. However, in order for unmeasured characteristics of families or pupils (such as pupil ability or parents' level of ambition) to bias our estimates of ethnic density, these characteristics must (1) be related to this predictor but (2) not strongly related to our measures of family background, (3) influence school results, and (4) serve as a sorting instrument of children to schools. Because a set of empirically crucial and well measured variables indicating individual pupils' background are held constant in our models we believe that the problem of selection is substantially reduced, though not eliminated.

Bias may also result from omitted variables at school-level. If minority pupils tend to cluster in schools with characteristics that have an impact on school achievements, we may mistake such a selection effect for an effect of immigrant density. This may occur, for example, if schools in neighborhoods where many immigrants live face obstacles with the recruitment and retention of qualified teachers, which in turn leads to less efficient teaching. We deal with this problem in three ways. First, we control for the proportion of children with parents receiving social assistance[10] and the proportion of children with academic background, which should strongly

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[9] Though it is beyond the scope of this paper, it should be noted that one difference between the types of effect is that educational policy aiming at improving the situation for a disadvantaged sub-group (e.g., through remedial education) may have social multiplier effects because peers have an impact on each other. To change exogenous effects requires different types of policy, such as increasing employment opportunities in disadvantaged areas.

[10] We also checked with proportion unemployed, which did not change any conclusion.

reduce variation in school quality that is related to general socioeconomic factors.[11] Second, we believe that the problem of bias in the interaction between the proportion of immigrants in the school and the dummy variable indicating the individual student's immigrant status (Model 3 and 4) in a model that includes the main effects of schools, is relatively small. Third, we also addressed the problem of unobserved school heterogeneity by applying a fixed effects model with dummies for schools. By doing this, we control for all characteristics of the school and of the pupils that do not vary across pupils within the school. Because a fixed effects model of this type implies the inclusion of dummies for the schools, we cannot estimate the main effect of immigrant density or any other school attribute that do not vary between pupils in the same school. However, we are able to estimate the interaction effects between ethnic density and individual immigrant status. This analysis gave further strength to our interpretation of the interaction term (estimated by equations 3 and 4 above) as a social interaction effect within schools.[12]

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[11] Besides controlling for observables, there are three ways that researchers have tried to come to grip with problems of population grouping. One is using instrumental variables, re-estimating school-level variables via a measured variable that is strongly related to these but unrelated to the error term. The problem is finding such an instrument. Incidentally, in a much referred study Evans, Gates and Schwab (1992) use almost exactly the school-level variables that we control for in our analysis of between-school variation (but while these are clearly strongly correlated with our key predictor, the proportion of immigrant pupils in the school (Table A1), it is difficult to see that they should be uncorrelated with the likely omitted variables, such as parental aspiration). The second way to try to resolve the selection problem is via individual and school-fixed effect models (Hanushek et al 2002; 2003), which however put a lot of demand on data quite aside from interpretative problems. A third strategy is to use experiments and quasi-experiments (e.g. the Tennessee-experiment and residential relocation experiments [see Durlauf 2004 for a critical review], as well as local quasi-experiments such as Winston and Zimmerman 2003). These studies are important but likely to be exceptions. Experiments also have limitations: one of our basic results, that the negative effect of ethnic density occurs at high levels of immigrant concentration, could hardly have been reached that way (because ethical reasons would have prevented researchers from experimenting with such high proportions of immigrants in one school).

[12] Our strategies do not solve the problem of unmeasured school heterogeneity if there is an unobserved variable that is correlated only with the immigrant group (or the native). For example, if a low quality of schools and teachers have a more negative impact on the school results of minority pupils than of other pupils this will bias the estimate of the interaction effect between proportion of immigrant children and individual immigrant status.

While the estimation problems due to population grouping and other sources of unobserved heterogeneity are likely to bias estimates of immigrant density upwards, there is also a risk that the attempts to solve these problems through the use of control variables introduce a downward bias in estimates. This is because the control variables are endogenous to the extent that ethnic segregation also impact on parents' and households' resources (cf. Duncan, Connell and Klebanov 1997). For example, if residential segregation means that immigrants have less opportunities of getting a job and avoiding poverty (by mechanisms outlined by Wilson 1987, for example), then controlling for (parental and school-level) social benefits and unemployment will lead to an underestimation of the influence of ethnic segregation. It is also likely that the school-fixed-effect models partial out differences between schools that are consequences of ethnic segregation (e.g., if the most qualified teachers avoid certain schools because of their high concentration of immigrant pupils). While these controls will tend towards conservative estimates of segregation effects and thus counterbalance the assumed upward bias introduced by population sorting, the intuition is that the "net bias" in estimates will rather be upward.

RESULTS

Descriptive statistics

Table 2 presents descriptive statistics for pupils and schools. As can be seen in the upper panel, the average sum of grades in the population studied is about 199 points and the average admittance rate is about 90 per cent. The proportion of the pupils who are first generation immigrant is 7.5 per cent and 4.5 per cent are second generation immigrants. About 23 per cent of the pupils have at least one parent who has experienced unemployment during the year analyzed.[13] The corresponding figure regarding parents' experience of social welfare is eleven

[13] This is a high figure compared to the average unemployment rate which was around ten per cent at that time (it is now, in 2004, around five per cent). The reasons are partly that most children have two parents and thus an elevated probability that at least one of them has experienced unemployment, and probably partly that it was common with shorter spells of unemployment.

per cent. About 66 per cent of pupils live in nuclear families with two biological (or adoptive) parents and about one out of four lives with a single parent (mostly with the mother).

Table 2 about here

As can be seen in the lower panel of Table 2, there is a great deal of variation between schools regarding pupils' results as well as their social background. In 74 (out of 1,043) schools, there are no pupils with immigrant background. In one school, all pupils are immigrants. The maximum share of first generation immigrants in a school is 87 per cent and 62 per cent of second generation immigrants. The distribution of native and immigrant students across schools are depicted in Figures 1 and 2, where it can be seen that few native students (around 15 per cent) go to schools with more than 20 per cent immigrants, while a majority of immigrant children are found in such schools.

Figure 1-2 about here

Table 2 also shows that there are some schools in which seven out of ten pupils have at least one parent with university degree. There is also one school in which only one out of hundred pupils has such educational background. Also the proportion of pupils with at least one parent with experience of social welfare varies strongly between schools. The lowest average grades in a school are about 121 points, while the highest value is 253 points. The average share of pupils eligible for secondary education is about 90 per cent. In one school, the proportion of eligible students is somewhat lower than 50 per cent and in eleven schools all pupils are qualified for (upper) secondary education. In sum, these descriptive statistics show clearly that ethnic and socioeconomic segregation in Swedish schools is a reality. The zero-order correlations between the level-two variables are given in Table A1 in Appendix. There is a strong negative correlation between the proportion of children with no Swedish-born parent and the average results in the school, which is stronger for the first- than for the second-generation immigrants. The ethnic

density variables are also strongly and positively correlated with the proportion of pupils who have at least one parent who received social welfare the current year.

Multilevel analyses of average grades

Table 3 gives results from three hierarchical linear models, estimating the effects of the proportion of pupils with no Swedish-born parent in the school on average grades. In this first analysis, both first- and second-generation immigrants are classified in the same category (whereas in Table 4 we will study them separately). The first model in Table 3a is the baseline model that gives the "ethnic gap" in average grades between those with Swedish-born parents and others, as well as the variance between schools in average grades. In Model 2, ethnic density is introduced as a predictor. In the final model (Model 3), individual-level variables indicating pupils' sex and family background are added, as well as school-level variables measuring the proportion of children coming from families with experience of social welfare and the proportion of children with at least one parent having a university degree. In this model, we analyze whether the effects of ethnic density on average school grades are due to the selection of pupils from poor social conditions to those schools that immigrant pupils and pupils with immigrant parents attend.

Table 3a about here

Model 1 in Table 3a shows that the average gap in grades between those with foreign-born parents and Swedish-born is about 20 points – that is, ten per cent, or a third of a standard deviation. Model 2 shows that the impact of immigrant density is negative and relatively strong. Average grades are estimated to be about 29 points lower in schools where no pupil is of Swedish origin than in schools where all are.[14] The inclusion of the ethnic density measure reduces the between-school variance in grades with about eight per cent.[15] In Model 3 we add individuals'

[14] It should be noted that we calculate out of the range of the data. There is no school in which all pupils in the ninth grade are first- or second-generation immigrants.

[15] We obtained this value by calculating: $(U_{0j\ model\ 1} - U_{0j\ model\ 2})/ U_{0j\ model\ 1}$ (i.e., (159.18-146.516)/159.18).

social background (level-one) and schools' social composition (level-two) in the analysis. The effects of these variables are in line with results from previous research. Having parents who have low qualifications, are unemployed, or on social welfare are characteristics that all are associated with lower grades; also men and those with many siblings have lower grades. Also when these variables are accounted for, average grades are relatively low in schools with a fairly high proportion of pupils with poor educational background among parents. This indicates that school results are not only influenced by the pupil's socioeconomic origin, but also by that of his/her schoolmates, supporting the general idea of peer effects and positive externalities of parental educational resources.[16] What is of crucial interest in Model 3 is that the ethnic gap in grades is substantially reduced by the inclusion of the abovementioned controls. The remaining gap is rather small, around four points. Also the main effect of ethnic density on average school results is reduced with this model specification. However, average grades are estimated to be around 15 points (one standard deviation) higher in schools with only pupils of Swedish origin as compared to schools with none.

Is the effect of ethnic density on the school results non-linear, so there is some threshold value where it emerges? We address this question by replacing the metric measure of proportion of pupils with no Swedish-born parent with dummy variables. The result, displayed in Table 3b, shows that there is indeed a threshold: The effect of ethnic density on grades is marginal in schools with less than 70 per cent children of non-Swedish origin but strong in schools where immigrant concentration is higher. This rather extreme form of segregation applies to 20 schools or two per cent of all schools in our data, and very few pupils with Swedish-born parents go to such schools (Figure 2). However, it is not such an uncommon experience for immigrant pupils: in fact, around thirteen per cent of all immigrant pupils go to such segregated schools (Figure 1).

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[16] In an additional analysis we fitted Model 3 for only those students who live in nuclear families (results not shown). The reason for this is that the influence of both parents' resources on children's school progress may be less important when one of the parents does not live together with the child. Moreover, we fitted Model 3 separately for ninth graders in 1998 and 1999. This extension is motivated by the fact that the social composition of ninth graders in the previous year may be less important for the results pertaining to those studying one year later. The results of these additional analyses confirm the conclusions reached on the basis of the estimates presented in Table 3a.

Table 3b about here

The main conclusion from the analyses presented in Table 3a is that individual pupils' family background and schools' social composition account for a large part of the gap in school results between pupils with Swedish-born parents and pupils who either immigrated themselves or whose parents did. These social factors also account for a part of the effect of ethnic density on average grades. Ethnic density is, however, even after these extensive controls, strongly related to pupils' grades in schools with high concentration of pupils with no Swedish ancestry.

Next, we ask whether the disadvantages associated with high ethnic density in schools are particularly pronounced for immigrant students. Table 4a gives results from analyses conducted separately for first- and second-generation immigrants. The analytic strategy is the same as in Table 3a, except that in Model 4 in Table 4a, an interaction term between ethnic density and immigrant status is added.

Table 4a about here

Model 1 in Table 4a shows that the ethnic gap in average grades is substantially higher for first-generation Swedish pupils (about 24 points, or 12 per cent) than for second-generation immigrants (about eleven points, or six per cent). Model 2 analyses the effect on average grades of the proportion of first- and second-generation immigrant pupils, respectively. Average grades are almost 33 points lower in schools in which all pupils are immigrants than in schools with none. The corresponding figure for the proportion of second-generation immigrants is 22 points. The inclusion of the compositional variables indicating immigrant density in the school reduces the between-school variance in grades with around eight per cent.

In Model 3, we ask whether the effects reported in Model 2 can be accounted for by individual pupils' social background and the social composition of schools. When comparing Model 2 and Model 3, it turns out that these factors account for the whole individual-level gap in grades between second-generation immigrants and pupils with Swedish-born parents. They also account for the entire effect of the density of second-generation immigrant pupils on average grades in

schools. For those who immigrated themselves the results are different. First, the ethnic gap in grades, though strongly reduced, is still significant after controls. Second, the main effect on average grades of the proportion of immigrant pupils is somewhat reduced, but still relatively strong with this model specification (25 points).

In the final model (Model 4) in Table 4a, we add interaction terms in order to study whether the ethnic gaps in grades are influenced by the ethnic density in schools. For immigrant pupils, the interaction term is negative and significant, indicating that the ethnic gap in school results increases with the density of immigrant pupils in school. For second-generation immigrants the corresponding interaction term is positive but not significant at conventional levels. This means that grades for these pupils are rather similar to the grades for pupils with Swedish-born parents (given individuals' social background and the composition of the schools they attend), irrespective of the proportion of second-generation immigrant pupils in schools.

An additional analysis of the interaction terms (Table 4b), applying fixed effect models with dummy variables for schools, gives further support to the results in Model 4 of Table 4a. Even in this analysis, first generation immigrants lose in terms of grades if they attend schools with a high concentration of pupils from their own group; and the school results of second-generation immigrants do not seem to be influenced by their concentration to certain schools.

Table 4b here

The findings presented in this section indicate that the ethnic composition of schools matters for pupils' school success. The higher the proportion of immigrant pupils in a school, the poorer the results of its pupils – both native and immigrant. Thus, there appears to be a general prize to be paid for segregation. However, the main losers of ethnic segregation in schools are first generation immigrant children. Not only are their school grades significantly worse than that of their school-mates with Swedish-born parents, controlling for individual differences in social background and for the social composition of schools: the grade gap widens with the proportion of immigrant pupils in their school. For second-generation immigrants, the conclusion is different. True, there exists an initial gap in school results to those with Swedish-born parents, and there is a negative effect also of the proportion of second-generation immigrant pupils on

average grades in schools. However, both these results are driven by the social background of these pupils and the social composition of the schools they attend. Given these variables, the proportion of second-generation immigrant pupils in a school appears to play only a limited role for school results. Thus, what matters is the proportion of pupils who were not born in Sweden themselves.

Multilevel analyses of eligibility to secondary education

Table 5 gives results from three hierarchical logit models, estimating the log odds of eligibility for academic secondary education. The analyses are set out in the same manner as those displayed in Table 3a. The first model estimates that the gap between pupils with Swedish-born parents and those without is about ten per cent.[17] Model 2 shows how the ethnic density in school influences eligibility and to what degree the variation in eligibility between schools can be attributed to their ethnic composition. The effect of the proportion of pupils with no Swedish-born parent is negative, suggesting that the proportion of pupils who are eligible for upper secondary education decreases with the ethnic density in schools. On the basis of the results we estimate that around 19 per cent of the variance in eligibility between schools can be explained by ethnic density. In Model 3, the social background of individual pupils and the social composition of schools are added. Controlling for these variables clearly reduces the effect of ethnic density, although the negative effect remains significant.

In an additional analysis (not shown) we examined whether the effect of ethnic density on eligibility is non-linear. Including dummy variables to represent banded proportions of pupils with no Swedish-born parent revealed a rather unsystematic pattern. The negative effect of ethnic density on eligibility is relatively strong in the lower band of the distribution; the effect is close to zero, or even positive in the middle of the distribution; and becomes negative again in the higher band.

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[17] This figure is based on calculations of the proportion from the two groups who are eligible for secondary education and cannot be seen directly from the table. For those with Swedish-born parents, the figure is: $e^{2.47}/1+e^{2.47} = 0.92$. For the group of non-Swedish origin, the corresponding figure is $e^{2.47-0.93}/(1+e^{2.47-0.93}) = 0.82$.

Table 5 about here

In Table 6, first- and second-generation immigrant pupils are analyzed separately. On the basis of Model 1, it can be concluded that the difference in eligibility to upper secondary education between immigrant pupils and the reference group with Swedish-born parents is about 13 per cent. The corresponding figure for second-generation immigrants is only four per cent.[18] Model 2 indicates that the proportion of first-generation immigrant pupils in a school has a more negative impact on eligibility than has the proportion of second-generation immigrants, a result in line with the results for average grades in Table 4a. Adding indicators of social background of individual pupils and the social composition of schools reduces the effects of both types of ethnic density. However, the results in Model 3 in Table 6 differ from the corresponding results in Table 4a in that the remaining effects are significant for both indicators of ethnic density. Thus, the effect of the proportion of second-generation immigrants in the school on eligibility is not entirely accounted for by differences in social conditions. This is consistent with previous results showing that ethnic disadvantage is concentrated at the lower end of the achievement scale; dropping out is a worse problem for ethnic minorities than not getting a university degree (Erikson and Jonsson 1993).[19] Finally, adding interaction terms to the analysis (Model 4) does not influence the results significantly. The gap in eligibility between those with Swedish-born parents and first- and second-generation immigrant pupils, respectively, is not related to the ethnic density of schools.

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[18] These results are based on following calculations: The value of eligibility for pupils with native-born parents is $e^{2.44}/1+e^{2.44}=0.92$. The value for immigrant students is $e^{2.44-1.12}/(1+\exp^{2.44-1.12})=0.79$; and for second-generation Swedes $e^{2.44-0.46}/(1+\exp^{2.44-0.46})=0.88$.

[19] In an additional analysis we fitted Model 3 for only those students who live in nuclear families (results not shown). In this analysis the effect of proportion immigrants turned out to be more or less the same as in the Table 6 while the effect of proportion second-generation Swedes became weaker (and insignificant). Moreover, we fitted Model 3 separately for ninth graders in 1998 and 1999, which gave results very similar to those in Table 6.

Table 6 about here

CONCLUSIONS

We addressed the question whether ethnic segregation is associated with depressed educational achievements among those in the final grade in Swedish comprehensive schools, employing two measures of school achievement: teacher-assigned school grades and eligibility to upper secondary education. We contrasted Swedish-born pupils having Swedish-born parents with immigrant pupils and with Swedish-born pupils having immigrant parents (second generation immigrants). Multilevel analyses on a large data-set, comprising almost two entire cohorts of 16-year old Swedish pupils graduating from the ninth grade in 1998 and 1999 showed clearly that schools with a larger percentage of immigrant pupils have lower average grades. Ethnic density has a strong negative effect on grades for schools with more than 70 per cent immigrant pupils, thus affecting thirteen per cent of immigrant children (no such threshold effect was found for eligibility). The negative effect of ethnic density is not confined to, but most preponderant for immigrant pupils. The grade disadvantage for second-generation immigrants, which is much less, is entirely accounted for by the poorer socioeconomic resources in their family of origin and in their schools. Our analyses of the eligibility for the secondary education rendered more ambiguous results. We find a general negative effect of ethnic density on eligibility, especially marked for immigrant pupils, though present also for second-generation immigrants. The empirical outcomes are, however, at least to some extent, sensitive to model specifications. Moreover, there are no interaction effects between ethnic density at the school-level and individual pupils' immigrant status on eligibility in the data. In sum, our results suggest that there is both a general cost of ethnic segregation in terms of lower average achievement and a specific cost for immigrant children, resulting in both less school efficiency and greater educational inequality.

Our results are in line with theories stressing pupil interaction effects and externalities of parental resources. Insofar as peers learn from each other and aspirations and parental skills and aspirations are disseminated between school-mates, the clustering of families with more and less

resources in different schools will lead to increased inequality in educational outcomes. In the Swedish case, where immigration during the 1990s mostly came from non-teutonic language areas, it is also possible that immigrant density creates problems of instruction in schools with a large proportion of pupils lacking skills in Swedish. Although our results appear theoretically plausible and concurrent with results from the few previous studies made, we must be cautious when making causal inferences from our analyses. Though we have benefited from a large data-set, including detailed and well measured indicators of family background as controls, three types of estimation problems do exist. First, we cannot rule out the risk that our results are contaminated with effects of population sorting. If families concerned with (and/or skilful in) promoting their children's school success choose neighborhoods and schools with few immigrants, what we see as an effect of ethnic density might in fact reflect selection into schools. Even though we may reasonably believe that unmeasured variables such as parental aspirations are captured by crucial family variables that we do include (as in Duncan, Connell and Klebanov 1997), there is a risk that our negative estimates of segregation effects are overstated (Hanushek et al. 2002; 2003).

The second estimation problem is that of omitted variable bias at school-level. In particular, ethnic density in a school may proxy for school quality, for example because the best teachers avoid or leave schools in immigrant areas. This problem we believe we have dealt with successfully, however, partly by having better-than-average control variables, including the composition of social welfare benefits and parental education at school-level. School quality also does not vary much in Sweden as there are fairly strict central regulations about minimum school quality (such as the teacher-to-pupil ratio). Furthermore, in the public school system – in practice totally dominating – more resources are given to schools with a greater proportion of immigrants. Finally, we fitted school fixed effect models (thus removing all influence on educational outcomes that are shared by pupils within a school), which did not change our conclusions.[20]

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[20] Hanushek et al (2002) also argue that, in their case, the fact that the negative effect of racial composition vary across minority groups suggests that differences in school quality are not responsible for their results. We could well make the same argument, though it is certainly not water-proof: it is, for example, quite possible that poor school quality affects those with less human capital and other resources in their family of origin.

Third, however, it must be remembered that in our attempts to control for selection, we also include in our models variables that may be endogeneous, for example parental unemployment and poverty, both of which may partly be affected by living in a segregated neighbourhood. This means that some of the negative impact of ethnic density is unaccounted for. This tends to bias this estimate downward, thus reducing (but probably not overcoming) the problems with population sorting.

It is not straight-forward to draw policy-relevant conclusions from studies like this, given the estimation problems involved. Provided that our results hold, one conclusion is that desegregation policies would lead to more efficient schools and less educational inequality; and that counter-acting the most extreme forms of segregation would probably be enough to see positive results. As the negative effects of ethnic density primarily concern pupils who immigrated themselves (rather than those whose parents did), it may be a wise policy to avoid directing newly arrived immigrant families with children to immigrant neighbourhoods (suggesting the need for a radicalized housing policy).[21] Finally, to put our estimates of segregation effects in perspective, it is important to note that only five per cent of the individual-level variation in school grades in Swedish comprehensive schools can be attributed to between-school differences: If we want to raise overall standards and reduce inequality between children of immigrant and Swedish origin in school grades, improving the employment and economic situation of immigrant families appear to be the most efficient strategy.

[21] Of course, this is contingent on other effects of segregation. Recent research on Swedish data suggests that ethnic concentration may have some positive effects on wages for those with low education (Edin, Fredriksson and Åslund (2003).

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TABLE 1. Selected Statistics on Immigration to Sweden 1960-2000. Source: Statistics Sweden.

	2000	**1990**	**1980**	**1970**	**1960**
Population 31 dec.	8 882 792	8 590 630	8 317 937	8 081 229	7 497 967
Not born in Sweden	1 003 798	790 445	626 953	537 585	299 879
Not born in Sweden %	11,3	9,2	7,5	6,7	4,0
Number of immigrants*	58 659	60 048	39 426	77 326	26 143
Immigration "surplus"*	24 568	34 852	9 587	48 673	11 005

Note:

* The numbers relate to the year in question.

TABLE 2: Descriptive Statistics for Individual-level and School-level Variables.

		Mean	*Std. deviation*	*Min. value*	*Max. value*	*N*
Individual-level variables:						
Grades		199.369	60.17	0	320	188724
Qualified to secondary education		0.909	0.29	0	1	188724
Immigrant		0.125	0.33	0	1	188617
First generation		0.078	0.27	0	1	188617
Second generation		0.046	0.21	0	1	188617
Women		0.486	0.50	0	1	188724
Number of siblings		2.087	1.44	0	17	188724
Experience unemployment		0.230	0.42	0	1	188283
Experience social assistance		0.110	0.31	0	1	188278
Parents'	Short compulsory	0.030	0.17	0	1	187743
Education	Compulsory	0.084	0.28	0	1	
	Short secondary	0.333	0.47	0	1	
	Secondary	0.137	0.34	0	1	
	Lower tertiary	0.193	0.39	0	1	
	University degree	0.208	0.41	0	1	
	Postgraduate	0.016	0.13	0	1	
Family	Whole family	0.661	0.47	0	1	188724
Type	Reconstructed family	0.072	0.26	0	1	
	Single parent	0.251	0.43	0	1	
	Alone, institution or other adults	0.016	0.12	0	1	
School-level variables:						
% First generation immigrants		7.5	0.10	0	0.87	1043
% Second generation immmigrants		4.5	0.07	0	0.62	1043
% First- plus second generation imm		12.0	0.15	0	1	1043
% Parent having university degree		20.9	0.12	0.01	0.79	1043
% Parents on social welfare		11.0	0.08	0.00	0.79	1043
Average grade of the school		198.88	15.03	121.26	253.41	1043
Average proportion qualified		0.907	0.07	0.48	1	1043

TABLE 3a. Random Coefficient Models of School Grades: The Impact of Ethnic Density. Robust standard errors in parentheses.

		Model 1	Model 2	Model 3
SCHOOL LEVEL				
Intercept		201.39 (0.424)	204.69 (0.541)	176.12 (1.294)
Ethnic gap 1+2: Non Swed origin vs. Swede origin		-19.67 (0.717)	-18.79 (0.731)	-4.48 (0.641)
Proportion non-Sw parents			-28.68 (4.140)	-15.33 (0.973)
Proportion university degree				10.58 (2.664)
Proportion social assistance				-3.23 (7.974)
LEVEL-1 FIXED COEFFICIENTS				
Sex (women)				22.39 (0.339)
Number of siblings				-2.96 (0.120)
Experience of unemployment				-5.10 (0.341)
Experience of social assistance				-24.94 (0.635)
Parents' Education	Short compulsory			Ref.
	Compulsory			-1.72 (0.990)
	Short secondary			8.30 (0.944)
	Secondary			22.38 (0.974)
	Lower tertiary			32.92 (0.966)
	University degree			47.24 (0.961)
	Postgraduate			61.25 (0.287)
Family type	Whole family			Ref.
	Reconstructed family			-14.47 (0.548)
	Single parent			-16.70 (0.345)
	Alone, institution or other adults			-36.02 (0.544)
RANDOM EFFECTS				
Variance in intercepts U_{0j}		159.180	146.516	75.729
Variance in ethnic grade gap U_{1j}		221.289	218.240	167.367
Individual level variance Rij		3376.996	3376.750	2691.943
Number of individuals		188 724	188 724	188 724
Number of schools		1043	1043	1043

Note: Ethnic gap 1+2 is the difference in school-grades between first- plus second-generation Swedish pupils and pupils with Swedish-born parents.

TABLE 3b. Random Coefficient Models of School Grades: The Impact of Ethnic Density (density variable transformed to a series of dummy variables). Robust standard errors in parentheses.

	Model 1	
SCHOOL LEVEL	B-coefficient	Standard error
Intercept	182.03	(1.338)
Immigrant /Swede gap	-4.46	(0.640)
Proportion immigrants (0-10)	Ref.	
Proportion immigrants (11-20)	-2.73	(0.783)
Proportion immigrants (21-30)	-4.86	(1.338)
Proportion immigrants (31-40)	-3.62	(2.289)
Proportion immigrants (41-50)	0.57	(3.314)
Proportion immigrants (51-60)	5.48	(3.453)
Proportion immigrants (61-70)	-2.75	(5.141)
Proportion immigrants (71-80)	-16.39	(5.977)
Proportion immigrants (81-90)	-22.98	(8.160)
Proportion immigrants (91-100)	-22.59	(12.683)
Proportion university degree	11.02	(2.647)
Proportion social assistance	-5.96	(7.424)
LEVEL-1 FIXED COEFFICIENTS SAME AS IN TABLE 3a		
Variance in intercepts U_{0j}	74.160	
Variance in immig./Swede U_{1j}	165.425	
Individual level variance Rij	2691.929	
Number of individuals	188 724	
Number of schools	1043	

TABLE 4a. Random Coefficient Models of School Grades: The Impact of Ethnic Density (proportion first- and second generation separately). Robust standard errors in parentheses.

		Model 1	Model 2	Model 3	Model 4
SCHOOL LEVEL					
Intercept		201.38 (0.424)	204.70 (0.533)	175.72 (1.361)	175.63 (1.366)
Ethnic gap 1: First generation vs. Swedish origin		-23.77 (0.923)	-22.89 (0.934)	-7.40 (0.880)	-5.75 (1.160)
Proportion first generation			-32.59 (6.995)	-24.97 (9.382)	-22.96 (9.528)
Proportion first generation * Ethnic gap 1					-14.03 (7.146)
Ethnic gap 2: Second generation vs. Swedish origin		-11.43 (0.862)	-10.40 (0.888)	0.53 (0.763)	-0.36 (1.029)
Proportion second generation			-22.01 (10.187)	-8.67 (8.293)	-9.99 (8.352)
Proportion second generation * Ethnic gap 2					8.31 (7.361)
Proportion university degree				11.66 (2.642)	11.60 (2.647)
Proportion social assistance				3.847 (9.757)	3.93 (9.818)
LEVEL-1 FIXED COEFFICIENTS					
Sex (female)				22.38 (0.340)	22.38 (0.340)
Number of siblings				-3.02 (0.119)	-3.02 (0.119)
Experience unemployment				-5.12 (0.340)	-5.13 (0.339)
Experience social assistance				-23.62 (0.649)	-23.60 (0.650)
Parents'	Short compulsory			Ref.	Ref.
Education	Compulsory			-2.10 (0.996)	-2.09 (0.996)
	Short secondary			7.92 (0.951)	7.93 (0.952)
	Secondary			22.30 (0.980)	22.31 (0.980)
	Lower tertiary			32.77 (0.970)	32.78 (0.971)
	University degree			47.15 (0.962)	47.16 (0.963)
	Postgraduate			61.34 (1.284)	61.35 (1.284)
Family	Whole family			Ref.	Ref.
type	Reconstructed family			-14.30 (0.543)	-14.31 (0.543)
	Single parent			-16.87 (0.344)	-16.88 (0.344)
	Alone, institution or other adults			-35.77 (1.530)	-35.79 (1.529)
RANDOM EFFECTS					
Variance in intercepts U_{0j}		159.619	146.408	75.438	75.497
Variance in ethnic gap 1 U_{1j}		375.188	374.614	316.739	313.956
Variance in ethnic gap 2 U_{2j}		146.215	142.885	104.349	104.504
Individual level variance Rij		3361.934	3361.746	2681.124	2681.130
Number of individuals		188724	188724	188724	188724
Number of schools		1043	1043	1043	1043

TABLE 4b. Fixed Effects Model of School Grades. The Impact of Ethnic Density (proportion first- and second generation immigrants separately) on Ethnic Gap in Grades. Robust standard errors in parentheses.

	Model 1
SCHOOL LEVEL	
Intercept	181.76 (0.786)
Ethnic gap 1: First generation vs. Swedish origin	-4.65 (0.770)
Proportion first generation * Ethnic gap 1	-11.46 (3.622)
Ethnic gap 2: Second generation vs. Swedish origin	-0.21 (0.874)
Proportion second generation * Ethnic gap 2	5.75 (5.467)
LEVEL-1 INDIVIDUAL COEFFICIENTS SAME AS IN TABLE 4a	
Number of individuals	188 724
Number of schools	1043

TABLE 5. Random Coefficient (logistic) Models of Qualification for Secondary School: The Impact of Ethnic Density. Robust standard errors in parentheses.

		Model 1	Model 2	Model 3
SCHOOL LEVEL				
Intercept		2.47 (0.018)	2.67 (0.020)	2.03 (0.055)
Ethnic gap 1+2: Non Swed origin vs. Swede origin		-0.93 (0.027)	-0.86 (0.028)	-0.48 (0.029)
Proportion non-Sw parents			-1.497 (0.107)	-0.75 (0.177)
Proportion university degree				0.67 (0.132)
Proportion social assistance				-0.87 (0.314)
LEVEL-1 FIXED COEFFICIENTS				
Sex (female)				0.48 (0.019)
Number of siblings				-0.10 (0.005)
Experience of unemployment				-0.06 (0.018)
Experience of social assistance				-0.84 (0.025)
Parents' Education	Short compulsory			Ref.
	Compulsory			0.03 (0.040)
	Short secondary			0.34 (0.038)
	Secondary			0.80 (0.041)
	Lower tertiary			1.24 (0.044)
	University degree			1.59 (0.048)
	Postgraduate			1.84 (0.104)
Family type	Whole family			Ref.
	Reconstructed family			-0.45 (0.030)
	Single parent			-0.52 (0.019)
	Alone, institution or other adults			-1.01 (0.052)
RANDOM EFFECTS				
Variance in intercepts U_{0j}		0.341	0.279	0.200
Variance in immig./Swede U_{1j}		0.244	0.258	0.237
Number of individuals		188724	188724	188724
Number of schools		1043	1043	1043

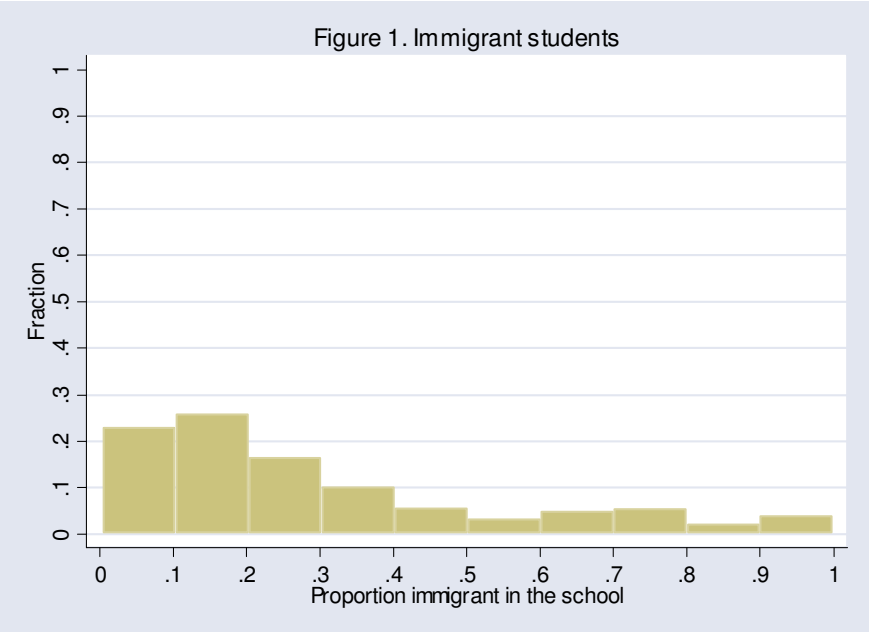
Note: Ethnic gap 1+2 is the difference in school-grades between first- plus second-generation Swedish pupils and pupils with Swedish-born parents.

TABLE 6. Random Coefficient (logistic) Models of Qualification for Secondary School: The impact of Ethnic Density (proportion first- and second generation separately). Robust standard errors in parentheses.

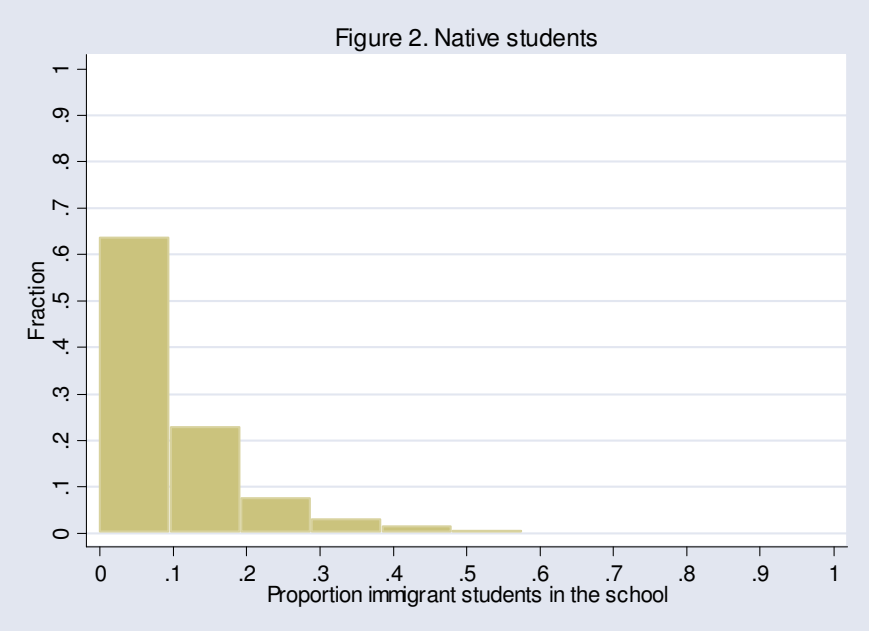
		Model 1	Model 2	Model 3	Model 4
SCHOOL LEVEL					
Intercept		2.44 (0.017)	2.65 (0.019)	2.01 (0.056)	2.01 (0.056)
Ethnic gap 1: First generation vs. Swedish origin		-1.12 (0.029)	-1.05 (0.031)	-0.67 (0.034)	-0.68 (0.045)
Proportion first generation			-1.86 (0.178)	-1.14 (0.320)	-1.15 (0.338)
Proportion first generation * Ethnic gap 1					0.03 (0.213)
Ethnic gap 2: Second generation vs. Swedish origin		-0.46 (0.034)	-0.39 (0.031)	-0.11 (0.033)	-0.11 (0.048)
Proportion second generation			-0.94 (0.245)	-0.63 (0.245)	-0.63 (0.247)
Proportion second generation * Ethnic gap 2					-0.01 (0.230)
Proportion university degree				0.71 (0.126)	0.71 (0.126)
Proportion social assistance				-0.52 (0.369)	-0.52 (0.368)
LEVEL-1 FIXED COEFFICIENTS					
Sex (female)				0.48 (0.018)	0.48 (0.018)
Number of siblings				-0.10 (0.005)	-0.10 (0.005)
Experience of unemployment				-0.06 (0.019)	-0.06 (0.019)
Experience of social assistance				-0.76 (0.024)	-0.76 (0.024)
Parents'	Short compulsory			Ref.	Ref.
Education	Compulsory			0.01 (0.040)	0.01 (0.040)
	Short secondary			0.30 (0.037)	0.30 (0.037)
	Secondary			0.80 (0.040)	0.80 (0.040)
	Lower tertiary			1.22 (0.042)	1.22 (0.043)
	University degree			1.57 (0.045)	1.57 (0.045)
	Postgraduate			1.84 (0.094)	1.84 (0.094)
Family	Whole family			Ref.	Ref.
type	Reconstructed family			-0.44 (0.028)	-0.44 (0.028)
	Single parent			-0.54 (0.018)	-0.54 (0.018)
	Alone, institution or other adults			-1.02 (0.050)	-1.02 (0.050)
RANDOM EFFECTS					
Variance in intercepts U_{0j}		0.343	0.279	0.199	0.199
Variance in ethnic gap 1 U_{1j}		0.302	0.318	0.323	0.324
Variance in ethnic gap 2 U_{2j}		0.064	0.065	0.054	0.052
Number of individuals		188724	188724	188724	188724
Number of schools		1043	1043	1043	1043

TABLE A1. Bivariate correlations (Pearson's r) between ethnic density (proportion of first-generation Swedes, second generation Swedes, and these together) and mean grades, proportion of qualified to secondary education, proportion parents on social welfare and with university degree.

	Correlation with average grades	Correlation with proportion qualified	Correlation with proportion with University degree	Correlation with proportion on social welfare	Correlation with proportion unemployed
Proportion first generation Swedes	-0.466	-0.677	-0.055	0.852	0.031
Proportion second generation Swedes	-0.372	-0.507	-0.117	0.517	0.025
Proportion first-plus second	-0.477	-0.678	-0.090	0.798	0.032
N	1043	1043	1043	1043	1043



The proportion of immigrant students (having no Swedish-born parent) found in schools with different immigrant densities.



The proportion of "native" students (Swedish-born with Swedish-born parents) found in schools with different immigrant densities.