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July 2009

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MPRA Paper No. 31547, posted 14 Jun 2011 14:35 UTC

Can ethnic diversity have a positive effect on school achievement?

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First version: July 2009

This version: April 2011

Abstract

While the share of non-native students in a class is supposed to have a non positive effect on school achievement, little is said about the heterogeneity of the ethnic minority make-up. Ethnic diversity can stimulate the creativity of students, can push them to be proficient in the instructional language, can reduce the scope of ethnic identification with all its possible drawbacks, but it may also worsen social interactions among pupils and make the job of teachers more difficult. I exploit the within school cohort variation in ethnic diversity of a rich data-set about primary education in the Netherlands to investigate whether ethnic diversity matters for school achievement, for whom it matters and which can be the mechanisms it may generate. I find that ethnic diversity has a positive impact on the test scores of minority students, in particular for language skills. I also find some evidence of a negative relationship between ethnic diversity and school social interaction among pupils.

Keywords: ethnic diversity; education; peer effects

JEL classification: I21; I28; J15

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1 Introduction

A recent experiment in a US high school group together students by race, gender and language for few minutes a day in an effort to boost academic scores. According to the promoters of this experiment, this program creates strong bonds between same group students and help them to improve their grades and self-esteem. Opposants argue whether it would be more desirable to reduce the predictive power of race and gender on student performance and engagement (CNN¹) This experiment is cast in a wide debate over the education of migrants and on the effect of migrant students' share on native achievement. The "white flight" from predominantly "black" schools has received considerable attention by both policy makers and academics².

A stream of the economics of education literature deals with the role played by the ethnic share of classes on pupils' achievement. This literature agrees on that part of the effect of the share of ethnic minorities on test scores is driven by the selection and self-selection of students into schools. The pure effect of having schools with more ethnic minority students is generally found to be negative (Hoxby , 2000; Hanushek *et al.* , 2002), though in some studies it does not seem to be significant, especially in experimental settings (Card and Rothstein , 2007; Angrist and Lang , 2004). Further, there is an overall consensus on that the proportion of ethnic minority students mainly affects ethnic minority pupils themselves, while the effect is relatively modest on native children (Hoxby , 2000; Angrist and Lang , 2004; Card and Rothstein , 2007; Gould *et al.* , 2004; Hanushek *et al.* , 2002). In particular, for the US the effect is stronger for the proportion of Afro-Americans on Afro-Americans themselves (Hoxby , 2000). There is no evidence that, if any, the effect of the ethnic minorities' share is stronger for language skills than for mathematical abilities.

The natural policy consequence of a negative and significant effect of the ethnic share, together with the asymmetry of this effect between the ethnic majority and the ethnic minority group (less or non relevant for the first) is to mix the two groups of students. Nonetheless, incentives to mix students are weakly implementable and more radical policies would be at

¹CNN article at:

http://articles.cnn.com/2011-01-27/us/pennsylvania.segregation_1.segregation-neighborhood-schools-system-students?_s=PM:US.

²See for instance Nusche (2009) and Gramberg (2007).

odds with the popular realization of free school choice systems.

In this paper I consider features of the school ethnic composition, whose "manipulation" could be compatible in a context of free school choice system, and I analyze whether these other features have an impact on the test score gap between natives and non natives. More specifically, I examine the role played by the ethnic diversity in the education and other social aspects of the life of young students.

Ethnic diversity is generally proved to have a negative effect on trust and social solidarity (Putnam , 2007), on conflict (O'Reilly *et al.* , 1997) and on the provision of public goods (Alesina and La Ferrara , 2005). In the context of schools, ethnic diversity may worsen the social interaction of children and make the job of teachers more difficult. On the other hand, ethnic diversity can stimulate the creativity of students, can increase the incentive to adopt the instructional language and culture and can reduce the feeling of ethnic identification and the consequences it may generate. The contribution of this paper is to investigate whether ethnic diversity matters for school achievement, for whom it matters and which can be the mechanisms it may generate.

I use a rich data-set about primary school education in the Netherlands, that allows us to exploit the within school cohort variation in ethnic diversity in order to estimate the effect of diversity on test scores. I find that ethnic diversity has an overall positive impact on test scores, especially for language skills. This effect is significant for minority students. On the other hand, I find a negative effect of ethnic diversity on the school social integration of pupils. To conclude, I suggest that ethnic diversity stimulates language proficiency and, perhaps, the provoked reduced social interactions among children translates into more time devoted to studying. I do not find a strong evidence that an ethnically heterogeneous composition of the classes significantly worsens the relationship between teachers and pupils.

The paper is organized as follows. Section 1 explains why ethnic diversity can play a role in school achievement, drawing from existing studies. Section 2.1 illustrates some hypothesis on the effect of ethnic diversity on school performance. In Section 3 I explain the empirical strategy I adopts for the estimation of the causal effect of ethnic diversity on test scores and some refinements of the analysis. Section 4 introduces the primary school data I use in this study and presents some descriptive statistics. Section 5 presents

the results of the analysis on test scores, socio-educational outcomes and provides some intuitions about the mechanisms that ethnic diversity may generate. Finally, Section 6 draws some conclusive comments.

2 Ethnic diversity

Previous studies suggest both negative and positive consequences of ethnic diversity. On the one hand, the empirical literature about ethnic diversity suggests an overall negative effect, on the other the theoretical literature abounds of positive effects. In a recent article Putnam (2007) shows that, in the US, more ethnically diverse communities have a lower level of social solidarity and social capital. The individuals living in these communities seem to withdraw from community life and have both a lower level of inter-racial and intra-racial trust. Similarly, Alesina and La Ferrara (2005) argue that the provision of public goods is lower in more fragmented societies: since different ethnic groups have different preferences over the public good to provide, a higher heterogeneity reduces the utility they can draw from public goods. O'Reilly *et al.* (1997) find that diversity is associated with an increase in conflict and that conflict has a negative impact on firm performance. Nonetheless, they find that ethnic diversity has a positive effect on group performance but this effect occurs independently from conflict, not because of it. Recently, Dronkers (2010) finds a negative effect of ethnic diversity on test scores of 15 year-old students in a set of OECD countries. Fryer and Torelli (2005) demonstrate that there are large racial differences in the relationship between the students' popularity and their academic achievement, corresponding to the notion known as "acting white". Blacks are found to have a considerable more pronounced negative correlation between popularity and achievement than Whites. Interestingly, Fryer and Torelli (2005) find that the "acting white" behaviour is almost non existent in predominantly black schools and in schools where interracial contact is low. They suggest that racial differences in the relationship between social status and academic achievement arise and are exacerbated in environments with more interracial contacts.

Overall, ethnic diversity may increase or reduce ethnocentrism (Putnam, 2007) with its (possibly) associated negatives consequences, such as "acting White" and "oppositional culture". For instance, Akerlof and Kranton

(2000) introduce the concept of identity in the utility function to explain apparently non-rational economic behaviours. They explicitly associate identity and self-image. In their model identification with the dominant group and its associated prescribed behaviour depends on three factors. First, on the extent of the social exclusion imposed by the dominant culture. Second, on the loss in economic returns for individuals of the non-dominant culture for adopting the behaviour prescribed for the dominant group. Finally, identification depends on the negative externality imposed by the non-dominant group on the peers of their group who choose the activity associated with the dominant culture. Some reasonable values of these factors generate a mixed equilibrium in which some individuals of the non-dominant culture adopt the self-destructive behaviour known as “oppositional identity”. With special reference to education, Akerlof and Kranton (2002) describe the utility function of a student as composed by two parts: one follows standard economic theory (ability and effort) and the other follows the concept of identity. The second part of the utility function is maximized by the student by choosing a social category (for instance, “burnout”) in order to balance the social status corresponding to that category with “fitting in”, that in turn depends on the characteristics of the student (for instance, ability and look).

On the other side, diversity can enrich students. A seminal paper of Lazear (1998) argues that as long as the ethnic minority culture is relevant, not overlapping with that of the majority group and understandable it enriches the majority group and *viceversa*. He argues that diversity may enrich the environment where individuals live and trade and may contribute to greater creativity. From a more pragmatic point of view, the value of assimilation is larger for small ethnic minority groups. As common culture and common language facilitate trade between individuals a small ethnic minority group has a bigger incentive to adopt the majority culture or skills as a mean for interaction (Lazear , 1999).

2.1 Hypothesis on the effect of ethnic diversity in the context of schools

Following the existing literature on ethnicity and diversity one can expect different effects of ethnic diversity on different outcomes and formulate various hypotheses on the mechanisms prompted by ethnic diversity.

Ethnic diversity can reduce the efficiency of teaching. This hy-

pothesis follows the inverse relationship between heterogeneity and the provision of public goods in Alesina and La Ferrara (2005). Teachers represent a quasi-public good in the domain of schooling. It can be easier for teachers to deal with a homogeneous ethnic minority group. For instance, teachers can devote some instructional time for the language problems of one particular ethnic minority. The action of teachers can become more problematic if teachers have to target specific instructional time to multiple ethnic groups. Evidence in favor of this consideration is found in a study of racial shares in Texan primary schools (Hoxby, 2000), where a share of Hispanic between 66% and 100% has a positive effect on test scores of Hispanic students, while a smaller share does not.

Ethnic diversity stimulate the interest of students, as a corollary of the "diversity enriching" idea proposed by Lazear (1998).

Ethnic diversity reduces social interaction, ethnic identification and increases performance? This hypothesis follows from the findings and theory in Putnam (2007), O'Reilly *et al.* (1997), Fryer and Torelli (2005), Akerlof and Kranton (2000) and Akerlof and Kranton (2002). By applying the idea of Akerlof and Kranton (2000) to the school context, diversity can enter the utility function in the process generating ethnic identification and its associated behaviour. If pupils consider as a reference group the students of their own ethnicity and not the wider group of non-native pupils and if the negative externality imposed by the reference group is an increasing function of the distribution of their ethnic group in the class, then ethnic diversity can generate equilibria with more non-native pupils adopting the dominant identity and behaviour. Similarly, in the model of Akerlof and Kranton (2000) ethnic diversity can have an effect on the choice of a "positive" social category if the weight associated to the identity part of the utility function is a decreasing function of diversity. If ethnic diversity deteriorates somehow the social interaction of pupils as shown in Fryer and Torelli (2005), it may have, on the other side, beneficial effects on achievement.

Ethnic diversity boosts language assimilation. Indeed, Lazear (1999) suggests that small ethnic minorities have stronger incentives to adopt the majority *culture*. In the school context, this incentive could lead to achievement gains as instructional language and culture is set by the majority group and teachers are mostly from the ethnic majority group. As

long as diversity entails smaller shares of the ethnic groups and a decline of dominant minority groups, one may expect ethnic diversity to have an effect on school achievement and, in particular, on language scores.

3 Methodology

3.1 Ethnic diversity index

I refer to ethnic diversity as an heterogeneous pool of minority students, where ethnicity is defined on the basis of the country of origin of the parents. Ethnic diversity is measured with a continuous index that takes into account both the share and the number of ethnic minorities in the non-native group. The measure is the inverted Hirschman-Herfindahl index:

$$D_{gst} = 1 - \sum_{k=1}^K m_{kgst}^2 \quad (1)$$

$$\text{if } K = 1 \Rightarrow D = 0$$

$$\lim_{K \rightarrow \infty} D = 1$$

where m is the share of ethnic minority k within the non-native group, in grade g , schools s and year t . The more groups and the more dispersed the groups, the higher the index D . When D is equal to zero it corresponds to full homogeneity of the ethnic minority group. I do not consider the native ethnicity into this measure of ethnic diversity, as I want to disentangle the effect of the share of native students from that of the ethnic diversity of the minority group. Higher values of D corresponds to a rise in the number of ethnic groups and to a lower variance of the ethnic groups' shares.

3.2 Empirical strategy

I use a first difference model within the same school and grade. The model allows to get rid of the unobservable characteristics that sort students into schools. The unit of analysis is cohort j in grade g , school s and year t . Cohorts averages allow to avoid the selection into classes within a cohort in a given school. I consider separate learning functions for natives and

non-natives³. The model is:

$$\begin{aligned} \bar{y}_{jgst} - \bar{y}_{jgst-1} = & \\ \beta_j(M_{gst} - M_{gst-1}) + \gamma_j(D_{gst} - D_{gst-1}) + \delta_j(Z_{gst} - Z_{gst-1}) + \zeta_j X_{gt-1} & \quad (2) \\ + \varepsilon_{jgst} - \varepsilon_{jgst-1} & \\ \forall j & \end{aligned}$$

where \bar{y}_{jst} is the average test score (in language, mathematics and reading understanding) of ethnic group j (natives, non-natives, ethnic group), in grade g , school s and year t ; Z is a set of control variables; X includes controls for grade and year; M is the share of non-native children in the cohort, D is the measure of ethnic diversity, β and γ are ethnic specific coefficients for the effect of ethnic share and ethnic diversity and ε is the error term. Error terms are clustered at school and cohort level. Since I consider average values, the model is weighted by the average size of each group in two consecutive cohorts, where larger weights designate more accurately measured observations.

The interpretation of γ as the causal effect of ethnic diversity on test scores is based on the assumption that changes in ethnic diversity between two subsequent cohorts within the same school are not correlated with pupils' unobservable characteristics that may be relevant in the learning function.

I extend equation 2 to socio-educational outcomes, in order to shed some light on the mechanisms there may be behind the effect of ethnic diversity on test scores. The model is the same as in equation 2, where \bar{y}_{jgst} is replaced with the average quality of the relationship between teachers and pupils as perceived by the teacher, the average school self-esteem of the pupil, the (self-assessed) school well-being and social integration of the pupils in the school.

3.3 Robust model

I strengthen our baseline model by performing two additional checks. First, within the same school changes in the index of ethnic diversity from one year

³Previous literature on the effect of the ethnic share on test scores (see for instance Hoxby (2000)) suggests that the learning functions of natives and non-natives are different.

to the other can be endogenous. I instrument the ethnic diversity index with the residuals from the grade and school specific trend in the ethnic diversity index, as used in Hoxby (2000) for the share of minorities. The idea is that parents may know that a school is becoming increasingly "ethnically mixed" and adjust the decision of where to enroll their children accordingly. However, parents may not be able to forecast exactly the ethnic composition of a particular cohort of a school. Hence, I exploit the deviation of the actual ethnic composition from the one that could be expected on the basis of the previous trend as an "involuntary" school environment. The instrument for ethnic diversity D_{gst} is $\Delta\hat{u}$, where u derives from the following equation:

$$D_{gst} = \alpha_{gs} + \phi_{gst}t + u_{gs} \quad (3)$$

The identifying assumption is that school/grade time trends in the ethnic diversity ϕ_{gs} are well summarized by a linear time trend.

4 Data and descriptive statistics

4.1 The PRIMA data

I use the PRIMA-cohort dataset, a large-scale survey of primary education in the Netherlands. The data were gathered twice a year from 1994 to 2004 in a representative sample of about 450 schools and in a sample of 200 schools containing a relative large number of disadvantaged pupils. The PRIMA data contain information about students in grade 2, 4, 6 and 8 of primary school. The data include test scores in language (Dutch), maths and reading understanding, the extent to which teachers feel at ease with pupils, the degree of school well-being, self-confidence and social integration of pupils within the school and demographic characteristics of the pupils, such as parents' ethnic origin and level of education. In the Glossary I report the questions used by Driessen *et al.* (2006) to construct the socio-relational outcomes that I use in this study.

I pool all grades and I exploit the longitudinal feature of the data at the school level. I select the combinations school/cohort with at least one minority student that have been observed at least for two subsequent survey years. Indeed, the first differences approach requires at least two observations per combination school/cohort.

A random subsample of pupils in grade 6 and 8 was tested in reading understanding. The data include test scores in reading understanding starting from 1998. The questionnaires on the school atmosphere were submitted to a random subsample of students in grade 6 and 8. The question on the “social integration” of the pupils is available only starting from 1998. Teachers’ assessments of the relationship with the pupil are available for a random subsample of students. This subsample of students was drawn starting from 2000 for all grades. As a consequence, the sample size of the regressions with different outcomes is different. The difference in the sample size between natives and non-natives for the same outcome is due to classes with only non-native students.

I assign the ethnicity of the student, based on the ethnic origin of the mother or, if missing, that of the father⁴. I standardize test scores by grade and year.

4.2 Descriptive statistics

In the final sample native students account for about 61% of the total number of students, the four larger ethnic minority groups are Turkish, Moroccan and Surinamese with a share of 11%, 10% and 5%, respectively. The other ethnicities included in the sample are, in order of importance: from “other non specified countries” (9%), Antillean and ex-Yugoslavia (1%), Chinese, Vietnamese, Moluccan, Spanish, Portuguese, Greek and Italian (below 1%). Table 1 reports the descriptive statistics of the outcomes and selected explanatory variables, by native status. I only report the descriptive statistics of grade 8, however the tables for the other grades are very similar. Table 1 shows a considerable gap between the test scores of native and non-native students. Average values for non-natives at the school/cohort level, in particular for test scores, have a larger dispersion than those for natives. Furthermore, minority students have a slightly worse relationship with teachers and slightly lower self-esteem, a slightly higher level of school well-being and of social integration. With respect to the demographic characteristics, ethnic minority students are in classes with a slightly higher share of students with a low educational family background and in slightly smaller classes. Non-native students are in classes with a slightly higher share of minorities

⁴I exclude the combinations of schools/cohorts in which the share of students with missing ethnicity of both parents exceeds 10%.

and slightly more ethnically diverse, reasonably due to the presence in our sample of 100% non native classes.

Figure 1 shows the correlation between ethnic minority share and ethnic diversity. The figure shows that there is considerable independent variation of the two variables, that is cohort/school combinations with the same share of ethnic minority students have different values in the ethnic diversity index.

Figure 1: Percentage of ethnic share *versus* ethnic diversity index

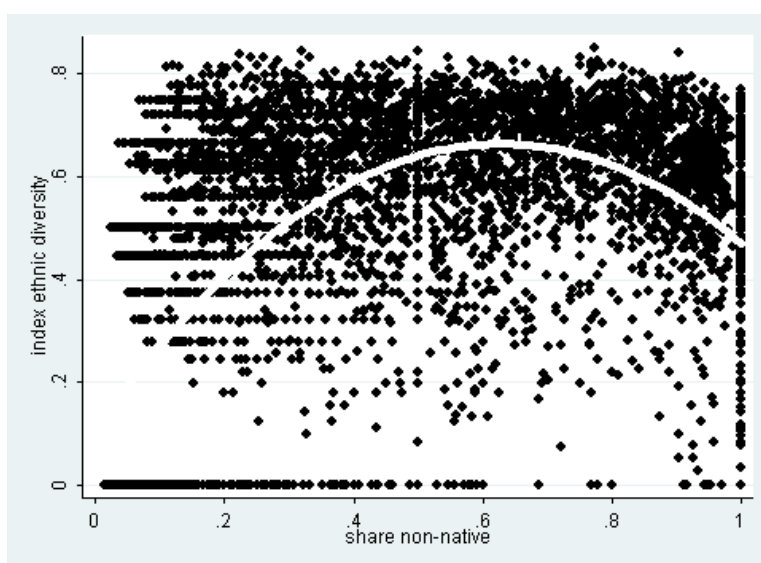
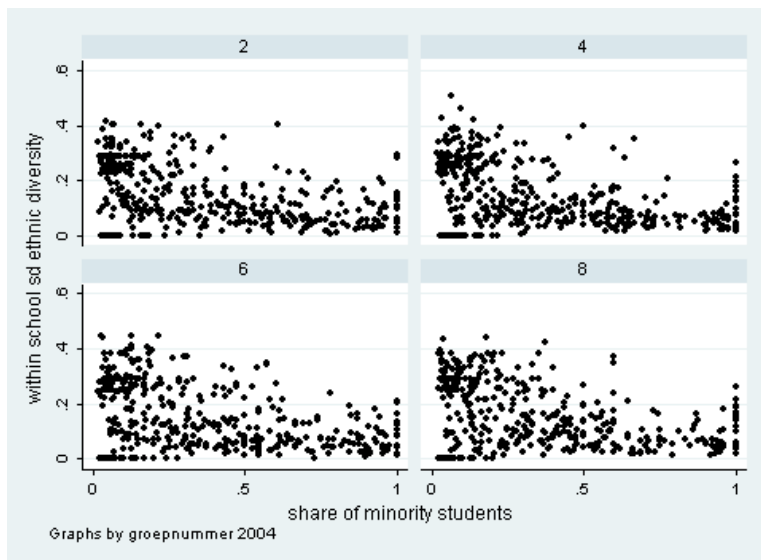


Table 2 shows that there is a considerable amount of within school variation in the ethnic diversity index, that explains about 30% of the total variance. Figure 2 plots the within school standard deviation of ethnic diversity: this variation holds at all levels of the share of minority students, though it is higher in schools with a smaller share.

5 Empirical findings

Table 3 shows the results for language test scores, for native (column 1, 2) and minority students (column 3, 4). Columns 2 and 4 add controls for the the share of each ethnic group (Surinamese, Antillean, Turkish, Morocco, from Mediterranean countries, ex-Yugoslavian, Asiatic and from other countries). Ethnic diversity does not have a significant impact on language test

Figure 2: Within school standard deviation of the ethnic diversity index



scores of natives. On the other hand, ethnic diversity increases the language performance of minority students, even after controlling for ethnic compositional and peers' effects. The comparison of columns 3 and 4 of Table 3 shows that part of the ethnic diversity effect can be explained by the average language score of particular ethnic minority groups. In addition, non-native students are more negatively and significantly affected by the share of non-native pupils than native pupils.

Table 4 reports the results for math test scores. Natives students' test scores are not significantly affected by ethnic diversity, but they are adversely affected by the share of non-native children. Nonetheless, I cannot generalize this finding to native children in schools with only native pupils. Column 3 and 4 of Table 4 show that the positive effect of ethnic diversity of minority pupils is explained by the strong positive compositional and peers' effect of particular ethnicities, namely Asian students (not reported in the Table).

Similarly, Table 5 reports no effect of ethnic diversity on natives' reading test scores, while the effect of ethnic diversity is positive and significant for minority students.

5.1 Socio-educational outcomes and ethnic diversity

As for the relationship between teacher and student, the first panel of Table 6 reports a negligible and non significant effect of ethnic diversity. The second and third panel of Table 6 point to small and non significant effects of ethnic diversity on school well-being and self-confidence both for natives and, on average, for the minority group. The bottom panel of Table 6 shows that ethnic diversity significantly reduces the social interaction of native pupils and, more importantly, that of minority students.

By taking into account both the results on the effect of ethnic diversity on test scores and on socio-educational outcomes I can provide some hints on the interpretation of the positive effect of diversity on test scores, in particular for language skills. I follow the hypotheses exposed in Section 2.1.

First, the positive effects of diversity on test scores and negative on school social integration may support the "identification" hypothesis. It can be that ethnic diversity deteriorates the moment of identity formation and all its possible (negative) consequences. Ethnic diversity seems to reduce social interaction and, probably, identification of pupils that, in turn, might reduce the scope of "acting white" and "oppositional cultures" of minority students.

Another hypothesis can be that the positive effect of ethnic diversity on test scores is mediated by poorer social interactions among children, as long as this leaves more time to pupils to study and less, cynically, to "hanging around" with peers.

The beneficial effect of ethnic diversity does not appear to be mediated by the work of teachers. As for the expected positive effects of ethnic diversity, I do not find a supporting evidence of the idea that diversity enriches the knowledge of students. Indeed, I find insignificant or negative effects of diversity on school well-being (that also includes a question about interest in school). Nonetheless, I do not have test scores in subject such as history or geography, that could better measure this aspect. Hence, I cannot completely discard the theory suggested by Lazear (1998).

Finally, the findings of this study support the hypothesis of "language proficiency incentives". Indeed, the favorable effect of ethnic diversity on school performance could be enacted by ethnic diversity, through a higher degree of language assimilation. The especially beneficial effect of ethnic

diversity on language test scores points in favor of this interpretation.

5.2 Robust results

Table 7 reports the results of the instrumental variable approach explained in Section 3.3 in comparison with the results obtained with the baseline model on the same sample. The sample includes combinations school/cohort that have been observed at least for three subsequent years⁵. Indeed, for the instrument presented in Section 3.3, we need at least three observations for each school in order to obtain the residuals from a linear time trend. The instrumented coefficients of ethnic diversity confirm and slightly strengthen the baseline results: a positive and significant effect of diversity on language and reading test scores (at the 5% and 10% level, respectively), a positive but non significant effect for math and a significantly negative effect (at the 10% level) on school social integration.

6 Final remarks

This paper shows that ethnic diversity does play a role in the learning function of primary school pupils, especially with respect to the acquisition of language skills for the group of minority students at large. The positive effect of ethnic diversity on test scores partially offsets the negative effect of the ethnic minority share. I find that ethnicity (both diversity and share) matters mostly for minority students. It can be that natives and minorities base their behaviour as two separate groups. Therefore, the within group heterogeneity of the minority group does not affect native pupils.

In Section 2 I suggest various hypotheses for the interpretation of the ethnic diversity's effect on test scores. The positive effect of diversity on test scores and the contemporaneous negative effect on school social integration can be consistent with the "ethnic identification hypothesis" that I propose in Section 2. The coexistence of negative and positive effects of ethnic diversity also be explained by a trade-off between leisure and time for studying. On the other hand, the "teachers' effectiveness" and the "diversity enriching" hypotheses are not supported by this work. As the positive

⁵The samples of schools observed at least three times and less than three times are not very different in terms of test scores and other characteristics. However, schools with more non-native students are oversampled in the "selected" sample, as deliberately intended by the PRIMA-cohort survey's design.

effect of ethnic diversity are concentrated on language test scores, I favor the "language proficiency" hypothesis as candidate explanation for this finding.

In conclusion, ethnic diversity may represent a factor to be taken into account in the policy options for (second generation) migrant students, in particular in contexts of free school choice where the "white flight" is difficult to be avoided without contradicting the idea of free school choice itself. However, it seems that ethnic diversity bears a trade-off between achievement and social life. It should be noted, however, that the effect of having low grades in primary school can fade away with age, but there can be more long-lasting behaviour towards school that can be developed during primary school. For example, a child's well-being at school can be a good indicator of how the child will form his idea of going to school⁶. Hence, in order to corroborate the idea of the beneficial effects of ethnic diversity in the school context, the importance of social *versus* early academic outcomes for migrant children should be further investigated.

⁶The importance of these aspects are confirmed, for instance, by Gibbons and Silva (2011).

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A Glossary

The outcome “school well-being” is based on evaluation of pupils (agree/disagree, 5 options) of the following statements:

- I get well along with teachers
- I think I learn interesting things in school
- I find the school annoying
- I feel at home in school
- I feel comfortable with teachers
- I think the pupils of my class are nice

The outcome “school self-confidence” is based on evaluation of pupils (agree/disagree, 5 options) of the following statements:

- I can learn well
- I am one of the best pupils in the class
- Most of the pupils of the class can learn better than me
- The teacher thinks that I can learn well
- I need little help in the class

The outcome “social integration in the class” is based on evaluation of pupils (agree/disagree, 5 options) of the following statements:

- Most pupils of the class get along better with each other than with me
- I have few friends in this class
- I get well along with my classmates
- I am often teased by the other children of my class
- I think is nice to stay with my classmates
- If I ask my classmates for help, there are enough that can do it

The outcome “teacher-pupil relationship” is based on evaluation of pupils (agree/disagree, 5 options) of the following statements:

- The student feels at ease with me
- The student does not feel comfortable in the school
- The student has a good relationship with me
- The student would preferably avoid the school
- The students has a difficult contact with me
- The student comes to school unwillingly

B Appendix

Table 1: Descriptive statistics, grade 8

fore	variable	mean	sd
natives	language	-0.069	0.456
	math	-0.0978	0.538
	reading	-0.104	0.512
	rel. with teacher	3.98	0.38
	well-being	3.75	0.349
	self-esteem	3.22	0.285
	social integration	4.1	0.31
	share imm	0.338	0.274
	ethnic diversity	0.427	0.28
	cohort size	25.1	12.2
	share low fa.backg.	0.172	0.203
	share male	0.5	0.132
non-natives	language	-0.593	0.653
	math	-0.309	0.679
	reading	-0.414	0.613
	rel. with teacher	3.94	0.423
	well-being	3.79	0.423
	self-esteem	3.18	0.396
	social integration	4.14	0.367
	share imm	0.381	0.304
	ethnic diversity	0.438	0.274
	cohort size	24.9	12.2
	share low fa.backg.	0.2	0.23
	share male	0.497	0.133

Mean of average values for school/cohort combinations, per group (native and non-native). Standard deviation in parenthesis.

Table 2: Decomposition of variance in the ethnic diversity index

Grade		Sum of squares	Share of total	DF
2	between school	106.13	70%	629
	within school	45.29	30%	1359
	total	151.42	100%	1988
4	between school	123.12	72%	655
	within school	47.25	28%	1491
	total	170.38	100%	2146
6	between school	112.82	69%	648
	within school	50.97	31%	1441
	total	163.79	100%	2089
8	between school	103.92	69%	621
	within school	46.96	31%	1336
	total	150.87	100%	1957

Table 3: Language test scores

	<i>native</i>	<i>native</i>	<i>ethnic m.</i>	<i>ethnic m.</i>
Δ low fam.back	-0.159† (0.064)	-0.139† (0.066)	-0.088† (0.053)	-0.039 (0.054)
Δ share male	-0.177** (0.043)	-0.176** (0.043)	-0.134** (0.048)	-0.114† (0.048)
Δ cohort size	-0.002** (0.001)	-0.002** (0.001)	-0.001 (0.001)	-0.000 (0.001)
Δ eth.diversity	0.016 (0.025)	0.028 (0.026)	0.234** (0.043)	0.131** (0.047)
Δ share imm	-0.012 (0.069)		-0.176† (0.068)	-0.149† (0.068)
ethnic shares	no	yes	no	yes
N	5015	5015	5173	5173

Notes: Other control variables included in the regressions are grade, year and the change in the share of pupils with missing ethnicity. Standard errors are clustered by school/cohort and are reported in parenthesis. † indicates significance at the 10% level; * indicates significance at the 5% level; ** indicates significance at the 1% level.

Table 4: Math test scores

	<i>native</i>	<i>native</i>	<i>ethnic m.</i>	<i>ethnic m.</i>
Δ low fam.back	-0.045 (0.069)	-0.040 (0.070)	-0.083 (0.068)	-0.051 (0.069)
Δ share male	0.059 (0.047)	0.058 (0.047)	0.182** (0.055)	0.189** (0.055)
Δ cohort size	-0.002† (0.001)	-0.002† (0.001)	-0.002† (0.001)	-0.002† (0.001)
Δ eth.diversity	0.015 (0.028)	0.031 (0.029)	0.128** (0.046)	0.048 (0.049)
Δ share imm	-0.128† (0.076)		-0.229** (0.074)	-0.194** (0.075)
ethnic shares	no	yes	no	yes
N	5015	5015	5173	5173

Notes: Other control variables included in the regressions are grade, year and the change in the share of pupils with missing ethnicity. Standard errors are clustered by school/cohort and are reported in parenthesis. † indicates significance at the 10% level; * indicates significance at the 5% level; ** indicates significance at the 1% level.

Table 5: Reading understanding test scores

	<i>native</i>	<i>native</i>	<i>ethnic m.</i>	<i>ethnic m.</i>
Δ low fam.back	-0.395** (0.132)	-0.346† (0.140)	-0.307** (0.097)	-0.253† (0.101)
Δ share male	-0.247** (0.079)	-0.250** (0.079)	-0.197† (0.083)	-0.208† (0.082)
Δ cohort size	0.001 (0.001)	0.002 (0.001)	-0.001 (0.002)	-0.000 (0.001)
Δ eth.diversity	-0.038 (0.044)	-0.047 (0.047)	0.256** (0.072)	0.162† (0.077)
Δ share imm	0.234† (0.139)		0.002 (0.119)	0.022 (0.117)
ethnic shares	no	yes	no	yes
\bar{N}	1476	1476	1522	1522

Notes: Other control variables included in the regressions are grade, year and the change in the share of pupils with missing ethnicity. Standard errors are clustered by school/cohort and are reported in parenthesis. † indicates significance at the 10% level; * indicates significance at the 5% level; ** indicates significance at the 1% level.

Table 6: Coefficient of ethnic diversity for socio-educational outcomes

	<i>native</i>	<i>ethnic m.</i>
relationship teacher/pupil	-0.004 (0.040)	-0.076 0.080
N	1770	1661
school well-being	-0.044 (0.032)	0.009 (0.052)
N	2449	2531
school self-confidence	-0.020 (0.021)	-0.042 (0.044)
N	2449	2531
social integration in the school	-0.053† (0.031)	-0.115† (0.064)
N	1486	1539

Notes: Control variables included in the regressions are the change in the share of pupils with a low family background, the change in the share of males, the change of class size, grade, year and the change in the share of pupils with missing ethnicity. Standard errors are clustered by school/cohort and are reported in parenthesis. † indicates significance at the 10% level; * indicates significance at the 5% level; ** indicates significance at the 1% level.

Table 7: Baseline and IV coefficients of ethnic diversity (3 waves sample)

	<i>native</i>		<i>ethnic m.</i>	
	baseline	IV	baseline	IV
on language	0.022 (0.029)	0.010 (0.032)	0.159** (0.050)	0.151** (0.054)
N	4218	4218	4387	4387
on math	0.034 (0.032)	0.030 (0.036)	0.071 (0.053)	0.087 (0.059)
N	4218	4218	4387	4387
on reading	-0.087† (0.051)	-0.081 (0.057)	0.108 (0.083)	0.172† (0.091)
N	1287	1287	1343	1343
on social integration	-0.062† (0.035)	-0.078† (0.039)	-0.133† (0.069)	-0.148† (0.078)
N	1299	1299	1361	1361

Notes: The Table reports the coefficients of ethnic diversity on different outcomes. Control variables included in the regressions are the change in the share of pupils with a low family background, the change in the share of males, the change of class size, grade, year and the change in the share of pupils with missing ethnicity. The sample used for this Table includes combinations of schools/cohorts with at least three consecutive observations. Standard errors are clustered by school/cohort and are reported in parenthesis. † indicates significance at the 10% level; * indicates significance at the 5% level; ** indicates significance at the 1% level.