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Comparing teachers' assessments and national test results
– evidence from Sweden

Erica Lindahl

WORKING PAPER 2007:24

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Postal address: P O Box 513, 751 20 Uppsala
Visiting address: Kyrkogårdsgatan 6, Uppsala
Phone: +46 18 471 70 70
Fax: +46 18 471 70 71
ifau@ifau.uu.se
www.ifau.se

ISSN 1651-1166

Comparing teachers' assessments and national test results – evidence from Sweden[♣]

by

Erica Lindahl[*]

October 16, 2007

Abstract

This study compares results on national tests with teachers' assessment of student performance, by using Swedish data of grade 9 students (16 years old). I examine whether there are systematic differences correlated with gender and ethnic background. That is, if the relationship between school leaving certificates and national test results differs between girls and boys or between natives and non-natives. The results show that girls are more generously rewarded in teachers' assessment compared to test results in all three subjects studied. Non-native students are more generously rewarded in teachers' assessment compared to test results in two out of three subjects studied.

Keywords: School performance, gender, race
JEL-codes: I21

[♣] This paper has benefited from useful comments from Per Johansson, Peter Fredriksson, Andreas Westermark, Tuomas Pekkarinen and Helena Holmlund. The author also thank Patrik Hesselius for inspiring discussions about the gender difference between school leaving certificates and test results, as well as seminar participants at the Department of Economics, Uppsala University, participants at the First Summer School of the Marie Curie Research Training Network, Padova, 16-18 June 2006 and participants at the COST meeting in Essen, 19-20 October 2006. The financial support from the Swedish council for working life and social research FAS (dnr 2004-1212) is acknowledged.
[*] Department of Economics, Uppsala University, e-mail: erica.lindahl@nek.uu.se.

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1 Introduction

The Swedish educational system relies heavily on school leaving certificates. They are used as selection instrument for application to higher education as well as in job applications. The teacher alone is responsible for assigning school leaving certificates. When doing this, all available information should be taken into consideration. In many other countries, for example England and France, certificates or qualifications provided by national examination boards play a corresponding role.[1] An argument for using teacher evaluations is that they are based on more information about the student than tests are able to capture. On the other hand, nationally provided tests are likely to be more objective, minimizing the risk of conscious or unconscious discrimination.

In Sweden, national tests are performed in order to enable equivalent and fair school leaving grades across the country. That is, the test results shall serve as a guideline for the teachers when they assign school leaving certificates. The national tests are graded according to nationally stated correcting instructions. Students' skills are tested in the three core subjects Swedish, English and Mathematics.

This paper investigates if there are systematic differences between school leaving certificates and national tests results. Specifically, the aim is to investigate if the relationship between school leaving certificates and national test results differs between girls and boys or between natives and non-natives.

The analysis is based on Swedish data on grade 9 students (16 years old). For each student, information is available about gender and country of birth as well as test results and school leaving certificates in Swedish, English and Mathematics. The results show that girls are more generously rewarded in school leaving certificates compared to test results than boys in all three subjects studied. Non-native students are more generously rewarded in Swedish and Mathematics but no statistically significant difference is found in English.

[1] For example the General Certificate of Secondary Education (GCSE) in Britain and "le baccalauréat" in France.

2 Related literature

There are persistent differences in school performance between the genders and ethnic groups. International studies show that girls, on average, outperform boys in Reading while the opposite is true in Mathematics (NAEP 2004; PISA 2003). In US, white students, on average, outperform black and Hispanic students (NAEP 2004) and in most European countries native students outperform non-native students (PISA 2003). In Sweden, according to school leaving certificates, girls outperform boys in almost all subjects (including Mathematics (Skolverket, 2006). The difference in school leaving certificates between non-natives and natives is also striking: 77 percent of the non-native students are qualified to Secondary school while the corresponding share for the natives is 91 percent (Skolverket 2005).

Studies from different countries show that, in comparison with test results, teachers assess girls' performance higher than boys' (Emanuelsson and Fischbein, 1986). A suggested explanation to this observation is that the school environment might be adapted to traditionally female behaviour.[2]

Skolverket (2006) and Nycander (2006) have analyzed in a descriptive way both school leaving certificates and national test results of grade 9 students in Sweden from a gender perspective. They conclude that the gender difference in favour of girls, observed on tests, is reinforced in school leaving certificates. That is, the gender gap is larger with respect to school leaving certificates compared to test results in Swedish, English and Mathematics. However, the gender difference in the difference between school leaving certificates and test results has not been tested in a formal setting including robust checks.

Exploring a natural experiment, Lavy (2005) presents evidence on discrimination against boys when teachers correct exams. The extent of the discrimination varies by subjects and type of tests and ranges from 5 to 25 percent of the standard deviation of the test score distribution. Regardless of the discrimination, girls outperform boys in most subjects but the gender gap in test results is reinforced by teachers' discrimination.

Although ethnic minorities or non-natives are often discussed in the context of discrimination, teacher assessments and test results have previously, to my knowledge, not been rigourously compared across ethnic groups.

[2] See Emanuelsson and Fischbein for a more extensive review of this literature.

3 The Swedish school system

The Swedish National Agency for Education formulates the criteria for different grade steps. In the latest curriculum for the Compulsory School System (Lpo, 94) it is stated that school leaving certificates should reflect skills and knowledge in the subject in accordance to the goals stated in the course syllabi. That is, school leaving certificates should not reflect attention in the classroom, diligence, ambition, home work and work during lesson, as long as it is not a prerequisite for attaining the goals (as in the case of laboratory work).

National tests are performed during the spring semester in ninth grade. The tests in languages (Swedish and English) measure writing and reading abilities as well as listening comprehension and verbal interaction. The tests in Mathematics include analysis and algebra and an oral part testing Mathematical reasoning. The tests are corrected at the school level but are graded according to nationally stated correcting instructions. Teachers are encouraged to not correct their own students' exams, but they are allowed to do so.

Teachers *shall* use the nationally approved examinations when assigning the school leaving certificate (Skolverket 2004). However, in the individual case, the teacher is allowed to assign the school leaving certificate differently from the test result. The reason is that the student might be low performing on the test day due to occasional conditions. Further, the teacher should take into consideration all available information about the student's knowledge and ability in the subject. The tests are not guaranteed to capture *all* goals stated in the course syllabi, although the aim of the tests is to measure, as comprehensively as possible, the student's ability and knowledge in the subject. However, it is clear from the national directives that the tests should form an important basis for the school leaving certificates.

Both school leaving certificates and test results are assessed according to the same ordinal metrics: Fail (F), Pass (P), Pass with Distinction (PD) and Pass with Special Distinction (PSD). The aim of the Swedish school is that all students should attain at least "Pass". To be qualified to upper secondary school, the student has to attain at least "Pass" in the three core subjects: Swedish, English and Mathematics.

4 Data

4.1 Data sources

The main data source used is a register, provided by the Swedish Agency for Education (SAE), of school leaving certificates for all students in grade 9 in Sweden (årskurs-9-registret). From this register we also know the gender of the student, which year and which school the student attended in grade 9. To this register I have added information about test results, collected by SAE. Test results are available from 2001 up to 2005.[3] Between 2001 and 2002, test results from a random sample of 150 schools were collected. From 2003 and onwards, all schools were aimed to be collected. However, all subjects were not collected all years. Swedish and English were not collected in 2002 and 2003 and Mathematics is missing for year 2001. Since the availability of test results differs between the three different subjects, I construct one sample for each subject. These samples are restricted to include all covariates of interest (no missing value of any covariate). All results presented are based on these restricted samples. The sample sizes used for the gender analysis are 112,648 in Swedish, 114,468 in English and 271,150 in Mathematics.

For the analysis of non-native students versus natives, an additional register (Louise) is used from Statistics Sweden on the country of birth. At present, this information is available for all students younger than 17 years of age in 2003. Students in Sweden are expected to reach the age of 16 in grade 9. Thus, country of birth is only available for students 2001 to 2004. This fact implies that exploring country of birth in the analysis reduces the samples further. The samples used in this case are: 9,492 in Swedish, 9,748 in English and 70,233 in Mathematics.

4.2 Variable definitions

In Sweden many individuals are born in another Nordic country than Sweden. These individuals speak Swedish well, look Swedish and know the country well. Non-natives are therefore defined as those born in a non-Nordic country.

For students with another mother language than Swedish and who are assessed to not be able to follow the ordinary course in Swedish, a special

[3] A stratified sample of test results was collected between 1998 and 2001.

course is offered: *Swedish 2*. The *Swedish 2* course has about the same course syllabus as the ordinary course in Swedish but the teaching is adapted for students with another mother tongue than Swedish. Since 2001 the national test is the same for the course *Swedish 2* as for the ordinary course in Swedish. In this paper *Swedish 2* and Swedish are treated as one subject.[4] The focus is on the difference between school leaving certificates and test result and the type of course the student has taken within the subject should be of less importance.

The Swedish National Agency for Education summarizes the school leaving certificate (all final course grades) into a total Grade Point Average (GPA). This GPA is the instrument used for application to higher education. The values used for transforming the ordinal scale to a numerical scale in order to calculate the GPA are: 0, 10, 15 and 20; that is, Fail equals 0, Pass equals 10 and Pass with distinction and Pass with special distinction equals 15 and 20, respectively. All results presented in this study are based on grades transformed to these numerical values.

4.3 Sample selection

Test results are only available for a selected group of students. That is, if test results from the school are reported to SAE and if the student has completed all parts of the test. Test results *shall* be reported to SAE by the school and all students are requested to complete all parts of the test. Although these requests, we may have a selection of schools and/or students within schools. The Appendix presents descriptive statistics on school leaving certificates for unrestricted and restricted samples for each subject. The mean in school leaving certificates is somewhat higher in the restricted samples. A plausible explanation is that those students who did not complete all parts of the test, on average perform worse than those who did.

The conclusion is that this analysis is based on students who on average perform slightly above the average in Sweden.

[4] Controlling for Swedish 2 does not affect any of the interaction estimates presented in this paper.

5 Descriptive statistics

Table 1a and *Table 1b* show the differences between the average test results and the school leaving certificates for all students and for girls and boys separately (*Table 1a*) and for non-native- and native students separately (*Table 1b*). *Figure 1a-f* shows the distribution of school leaving certificates and test results for these sub-groups.

Girls outperform boys in Swedish and English according to test results as well as school leaving certificates (*Table 1a*). In Mathematics there is no difference between the genders according to test results but girls perform better according to school leaving certificates. Non-native students under perform native-students in all subjects according to both test results and school leaving certificates.

With respect to all students, school leaving certificates are, on average, significantly higher than test results in all three subjects. Thus, it seems that teachers overall are more generous compared to test results when assigning school leaving certificates, with the largest differences in Mathematics. For example in Mathematics, 11 percent of the students fail on the test, but only 4 percent fail according to school leaving certificates (*Figure 1e*).

The difference between school leaving certificates and test results is larger for girls and non-natives than for boys and natives, respectively. For example, in English, 15 percent of the boys qualified for PSD according to the test and also 15 percent received the highest school leaving certificates (*Figure 1b*). In contrast, 16 percent of the girls qualified for the highest grade according to test results, but 20 percent received the highest school leaving certificate (*Figure 1b*). Among non-natives in Swedish, 14 percent score fail on the test but only 9 percent receive fail according to school leaving certificates (*Figure 1b*). The corresponding shares for native students in Swedish are 4 and 3 percent, respectively (*Figure 1a*).

Descriptive statistics show gender and ethnic differences between school leaving certificates and test results. However, in order to estimate the difference between school leaving certificates and test results across sub-groups, we need a formal model.

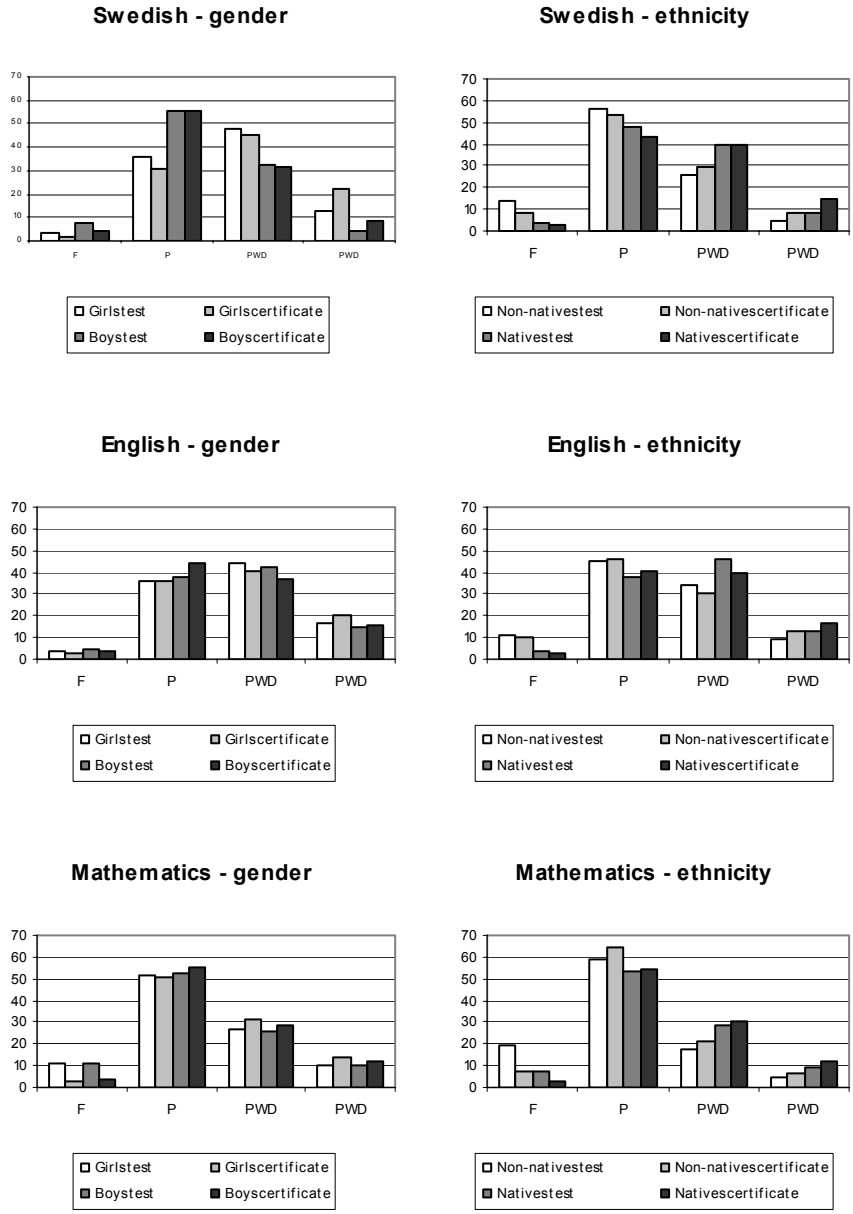
Table 1a Test grade versus school leaving certificates, girls versus boys

Subject and group of students	*Number of observations*	*School leaving certificates*	*Test grade*	*Difference*
		Mean (*St dev)*	Mean (*St dev)*	Mean (*St dev)*
Swedish:				
All students	112,648	13.11	12.32	0.80
		4.25	*4.35*	*0.02*
Girls	55,288	14.28	13.38	0.90
		4.12	*4.10*	*0.02*
Boys	57,360	11.99	11.29	0.70
		4.06	*4.34*	*0.02*
English:				
All students	114,468	13.34	13.29	0.05
		4.44	*4.44*	*0.02*
Girls	56,139	13.76	13.47	0.29
		4.38	*4.35*	*0.03*
Boys	58,329	12.93	13.11	-0.18
		4.45	*4.52*	*0.03*
Mathematics:				
All students	271,150	12.50	11.28	1.22
		4.24	*5.16*	*0.01*
Girls	132,878	12.70	11.30	1.40
		4.24	*5.17*	*0.02*
Boys	138,272	12.31	11.26	1.05
		4.23	*5.15*	*0.02*

Table 1b Test grade versus school leaving certificates, non-natives versus natives

Subject and group of students	*Number of observations*	*School leaving certificates*	*Test grade*	*Difference*
		Mean (*St dev)*	Mean (*St dev)*	Mean (*St dev)*
Swedish:				
All students[1]	9,492	13.00	12.23	0.77
		4.18	*4.17*	*0.06*
Non-natives	847	11.42	10.35	1.06
		4.69	*4.94*	*0.23*
Natives	8,645	13.16	12.41	0.74
		4.09	*4.04*	*0.06*
English:				
All students	9,748	13.23	13.04	0.19
		4.39	*4.31*	*0.06*
Non-natives	857	11.81	11.52	0.30
		5.29	*5.20*	*0.25*
Natives	8,891	13.37	13.19	0.18
		4.27	*4.18*	*0.06*
Mathematics:				
All students	70,233	12.38	11.45	0.93
		4.08	*4.76*	*0.02*
Non-natives	5,873	10.98	9.35	1.63
		4.32	*5.28*	*0.09*
Natives	64,360	12.51	11.64	0.87
		4.03	*4.67*	*0.02*

[1] Note that this table is based on a different sample set than *Table 1a*.



Figures 1a-f Distribution of test results and school leaving certificates, divided into girls and boys and non-native and native-students for the different subjects

6 Estimating the difference across groups

The grade steps in Sweden are ordinal. This fact suggests an *ordered probit* or an *ordered logit* model. However, I choose to estimate linear regression models. The reason is that the focus is on the average marginal effects of gender and ethnic background, respectively. Since numerical values exist for the ordinal scale and marginal effects are easily obtained from linear regressions, the following model is estimated with ordinary least squares.

$$Y_{ijt} = \beta_0 + \beta_1 S_{ijt} + \beta_2 T_{ijt} + \beta_3 (S*T)_{ijt} + \eta_t + \varepsilon_{ijt}$$

where Y_{ijt} is individual *i*'s type of grade *j* (school leaving certificate or test result) in year *t*. S_{ijt} is a dummy variable that equals 1 if the student is a girl and 0 if a boy. *T* is a dummy for the type of grade. *T* equals 1 if the grade corresponds to the school leaving certificate and 0 if the grade is the test result. The interaction term (*S***T*) consists of the gender- and the grade type dummy. Year-effects[5] are captured by η_t and finally ε_{ist} is assumed to be an idiosyncratic error term. The set-up of the equation above is analogous when natives and non-natives are compared. The only difference is that S_{ijt} equals 1 when the student is non-native.

With a difference in differences strategy we first remove student group fixed effects in the subject, as long as they have the same effect on school leaving certificates and test grades. Second, we remove the average difference between school leaving certificates and test result. This means that the interaction term captures the additional generosity associated with school leaving certificates and the fact that the student is a girls or non-native, respectively.

However, this interpretation of the interaction term does not hold if girls or non-native born students choose to attend certain schools *because* these schools are extraordinary generous with respect to school leaving certificates, more

[5] I estimate a static linear panel data model. However, the sample covers several years and some schools are observed several times. A year specific dummy is therefore also included to capture which year the individual is observed. Including year dummies imply that we do not have to bother about changes in grade policy (grade inflation) over time. Wikstrom and Wikstrom (2004) claim that grade inflation occurs in Sweden during the 1990s.

than their respective reference groups. If this scenario is true, the parameter in front of the interaction term captures this selection. In order to remedy this potential selection problem, we extend the model by including school dummies. School dummies capture school specific generosity in school leaving certificates.

When including school dummies, we explore the variation within schools over time. In those estimations we have to assume that the error term should not be correlated with the explanatory variables across time periods, in order to receive consistent estimates. This assumption is violated if, for example, the school, conditional on all covariates (including school dummies), assigns extraordinary high grades in year *t* and this in turn affect students' choices of school the following year. This could be a real problem if students choose to attend a particular school because this school had generous school leaving certificates, in comparison to test results, the previous year. However, it seems realistic to assume that school choice is based on average results from several years.

In order to increase the precision of the estimate of interest we also include the share of girls (non-natives) among the students at the school, the student's month of birth and, in the regressions comparing non-natives and natives, the gender of the student.[6] The parameter estimates of these additional covariates are not presented below.

In all model specifications, the inference presented is based on standard errors that allow for a common variance component at the school level. This is appropriate since the sampling unit with respect to test results is schools.

7 Results

The parameter estimates shown in *Table 2a* and *Table 2b* confirm some of the patterns discerned from the descriptive statistics. Conditional on the type of grade, girls outperform boys in all subjects, except in Mathematics. Non-native students, on the other hand, exhibit lower performance than native students in all subjects. The coefficient in front of the type of grade dummy is positive in

[6] The reason for *not* including the non-native dummy in the gender case is that this information would reduce the sample size. It is reasonable to assume that, β_3 in the gender case is orthogonal to the information about the student's country of birth. Thus, the country of birth information would not affect the parameter estimate, only the precision of the estimate.

almost all cases. The interpretation is that teachers are in general more generous when assigning school leaving certificates than justified by test results. An exception is in English, where boys on average get a lower school leaving certificate than test result. However, non-native students, on average, perform below average in all subjects *and* they are more generously rewarded in school leaving certificates.

The estimates of the interaction terms are statistically significant in all subjects with respect to gender. The interpretation is that, conditional on test results, girls are better rewarded than boys in terms of school leaving certificates. With respect to ethnic background, the estimates in front of the interaction terms are positive and statistical significant in Swedish and Mathematics, but not in English. In English it is almost zero and statistically insignificant. In Swedish and Mathematics, the interpretation is that teachers in general are more generous to non-natives than to others when assigning school leaving certificates, conditional on test results.

The results presented in this section seem robust. Adding school dummies and additional covariates (column 2) change neither the coefficients nor the precision substantially in any estimated model.

The effect sizes vary between subjects. In the gender case, the effect is largest in English and smallest in Swedish. In Mathematics, with respect to gender, the effect corresponds to 11 percent of the standard deviation of the grade difference distribution. Remember that the highest grade, "PSD", is given 20 points. The steps from "P" to "PS" and from "PS" to "PSD" correspond to 5 credit points each. Roughly speaking, in a class with 30 students (half of them girls) four girls, but only three boys, get a higher school leaving certificate than test result (Pass with distinction instead of Pass).[7]

With respect to ethnic background, the effect sizes in Mathematics correspond to 23 percent of the standard deviation of the grade difference distribution.

[7] The average difference per individual between school leaving certificates and test scores is 1.045 (*Table 2a*). In a class with 15 boys (boys are the reference in the model) the total difference between school leaving certificates and test scores is 15.675 (1.045*15) for boys and 21 ((1.045+0.355)*15) for girls.

Table 2a Ordinary least squares estimation of the interaction between girl and type of grade, 1) basic 2) with school dummies and additional covariates

	Swedish		*English*		*Mathematics*	
	1	*2*	*1*	*2*	*1*	*2*
Female student (f)	2.089	2.071	0.362	0.323	0.034	-0.015
	(0.031) ***	(0.030) ***	(0.031) ***	(0.030) ***	(0.023)	(0.022)
Type of grade (T)	0.695	0.695	-0.179	-0.179	1.045	1.045
	(0.021) ***	(0.021) ***	(0.017	(0.017) ***	(0.019) ***	(0.019) ***
Interaction: f*T	0.206	0.206	0.469	0.469	0.355	0.355
	(0.021) ***	(0.021) ***	(0.016) ***	(0.016) ***	(0.014) ***	(0.014) ***
Constant	11.236	12.585	12.988	14.097	6.945	9.130
	(0.099) ***	(0.503) ***	(0.104) ***	(0.457) ***	(1.186) ***	(1.192) ***
Observations	225,296	225,296	228,936	228,936	542,300	542,300
R-squared	0.07	0.16	0.01	0.10	0.02	0.09

Standard errors in parentheses are clustered on schools, all models include year dummies, * significant at 10 %; ** significant at 5 %; *** significant at 1 %, the number of observations is twice the number of students since the dataset is stacked; for each student there are two grades: school leaving certificates and test grades.

Table 2b Ordinary least squares estimation of the interaction between non-native student and type of grade, 1) basic 2) with school dummies and additional covariates

	Swedish		*English*		*Mathematics*	
	1	*2*	*1*	*2*	*1*	*2*
Non-native student (n)	-1.871	-1.438	-1.371	-0.951	-1.618	-1.396
	(0.298) ***	(0.221) ***	(0.295) ***	(0.205) ***	(0.091) ***	(0.084) ***
Type of grade (T)	0.744	0.744	0.181	0.181	0.870	0.870
	(0.050) ***	(0.050) ***	(0.049) ***	(0.049) ***	(0.031) ***	(0.031) ***
Interaction: n*T	0.318	0.318	0.116	0.116	0.762	0.762
	(0.127) **	(0.127) **	(0.100)	(0.100)	(0.061) ***	(0.061) ***
Constant	12.429	13.554	13.206	14.703	7.541	9.078
	(0.100) ***	(0.255) ***	(0.103) ***	(0.377) ***	(1.201) ***	(1.335) ***
Observations	18,984	18,984	19,496	19,496	140,466	140,466
R-squared	0.03	0.12	0.02	0.12	0.05	0.12

Standard errors in parentheses are clustered on schools, all models include year dummies, * significant at 10 %; ** significant at 5 %; *** significant at 1 %, the number of observations is twice the number of students since the dataset is stacked; for each student there are two grades: school leaving certificates and test grades.

7.1 Discussion of results

When interpreting the results it is important to keep in mind that school leaving certificates and test results are two *different* measures of school performance. Different qualities are captured in the two grades. For example, a test situation could be associated with more pressure than performance during regular class, which is reflected in the school leaving certificates. Further, accounts of home works (reflected in school leaving certificates) involve preparation and self-studies in order to succeed, while students cannot prepare specifically for the national tests. These differences can *per se* differ across genders and between natives and non-native students.

Descriptive statistics shows that teachers in general are more generous with respect to school leaving certificates than justified by test results. This is true for all sub-groups in all subjects, except for in English with respect to boys[8]. The generosity in school leaving certificates is especially clear in Mathematics. In Mathematics, a large share of the students fail on the test while a significantly smaller share fail according to the school leaving certificates. Thus, teachers seem to be particularly generous toward students who fail on the test. If the share who fail on the test differs across sub-groups, the generosity towards students who fail on the test could explain, at least part of the interaction effects.

With respect to gender, a larger share of the boys fails on the test in Swedish and English (*Figures 1a-b*). In Mathematics, about the same share of the girls and the boys fail on the test (*Figure 1c*). Thus, in the gender case, this explanation seems not to hold. However, among non-natives, a significantly larger share of the students fail on the test compared to native students. This is true in all there subjects studied. Thus, in this case, the results could, at least partly, be explained by the fact that teachers are particularly generous toward students who fail on the test.

8 Conclusion

School performance could be measured in several ways. The Swedish school system relies heavily on teachers' assessment of student performance. In other countries, national tests play the corresponding role. This paper confirms earlier results that, in comparison to national tests, girls are better rewarded than boys in teachers' assessments. In addition, this paper shows, again in comparison to national tests, that non-native students are more generously rewarded than native students in teachers' assessments. With respect to gender, the result holds in all three subjects studied. In the non-native versus native case, the result holds in two out of three subjects studied.

Among non-natives, the results could partly be explained by the fact that teachers in general are more generous with respect to school leaving certificates towards students who fail on the test. In the gender case, a corresponding

[8] In this case, the opposite is actually true; boys receive on average a lower grade according to school leaving certificates than according to the test result.

explanation does not seem to hold. Thus, the results raise a question for future research: why does the grade difference vary between sub groups of students? Does the school environment itself benefit certain groups of students or do teachers discriminate when assigning grades? Both non-native students and girls are often discussed in the context of discrimination. One possible explanation for why teachers are more generous to these two groups of students could be that teachers are *afraid* to discriminate them. As a consequence teachers perhaps over-compensate girls and non-native students when assigning school leaving certificates.

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Appendix

Table 1a School leaving certificates in respective subject for unrestricted and restricted samples, the gender case

Subject	*Unrestricted*			*Restricted*		
	Mean	St dev	Obs	Mean	St dev	Obs
Swedish	12.84	4.49	546,536	13.11	4.25	112,648
English	12.90	4.81	546,536	13.34	4.44	114,468
Mathematics	11.95	4.65	546,536	12.50	4.24	271,150

Table 1b School leaving certificates in respective subject for unrestricted and restricted samples, the ethnic case

Subject	*Unrestricted*			*Restricted*		
	Mean	St dev	Obs	Mean	St dev	Obs
Swedish	12.84	4.49	546,536	13.00	4.18	9,492
English	12.90	4.81	546,536	13.23	4.39	9,748
Mathematics	11.95	4.65	546,536	12.38	4.08	70,233

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