A joint initiative of Ludwig-Maximilians University's Center for Economic Studies and the Ifo Institute for Economic Research

CESifo Area Conference on

Economics of Education

03 - 04 September 2010 CESifo Conference Centre, Munich

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Can there be too much school choice? School consolidation and pupil achievement in a universal voucher system[1]

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Preliminary draft

[1]This version: August 2010. We thank seminar participants in Amsterdam, Leuven and Paris for their helpful comments. De Haan and Oosterbeek are affiliated with the University of Amsterdam and the institute for evidence-based education research TIER. Leuven is affiliated with CREST (ENSAE), CEPR and IZA. Emails: moniquedehaan@uva.nl; edwin.leuven@ensae.fr; h.oosterbeek@uva.nl.

Abstract

Since 1917 the Netherlands has a unique system of free school choice. There are both publicly and privately run schools, which all receive funding from the government as long as the number of pupils is above the minimum school size rule and teaching satisfies certain minimum quality standards. In 1994 the minimum school size rules were changed, resulting in a large decline in the number of schools, mainly through mergers. Given a system of free school choice, this reduction in the supply of schools implies a reduction in school choice and competition. We exploit the fact that the changes in the minimum school size rules differed between municipalities and find a small positive impact of a substantial reduction in the supply of schools on pupil test scores. Economies of scale could explain our results, since for a given number of pupils less schools not only implies less choice but also bigger schools. Our findings indicate that there was too much school choice before the reform with the consequence that many schools were inefficiently small.

1 Introduction

In order to improve school quality, Friedman (1955) proposed a system in which the government would give a specified amount for each child that parents could spend at the school of their choice, publicly or privately operated, as long as the school met some minimum standards. Today many countries have a school system that is very different from the one proposed by Friedman. Despite attempts to increase school choice, for example by voucher programs, actual school choice is in most countries very limited. In contrast, the Netherlands has a system which is very similar to Friedman's ideal, and this has been in place since 1917.

A key principle of the Dutch education system is freedom of education. This consists of two components. The first is free school choice: parents can freely choose the school for their child irrespective of where they live and how much they earn. The second component is the freedom to found schools and to organize the teaching in schools. There are both public schools, which provide education on behalf of the state and private schools which are not set up by the state. There are no compulsory school fees, instead the government gives an amount to the school, publicly or privately operated, in which the parents choose to enroll their child. This nationwide voucher system offers a unique setting to investigate the effect of (changes in) school choice.

There is a vastly expanding literature on school choice, with most of the studies focusing on the United States. This literature is very diverse. There are studies investigating the effect of charter schools (Bettinger (2005), Bifulco and Ladd (2006), Hanushek et al. (2007), Imberman (2010)), studies that estimate the effect of voucher experiments (Rouse (1998), Peterson et al. (2003),Krueger and Zhu (2004)) and papers that investigate variation in the number of schools or districts between educational markets (Belfield and Levin (2002), Hoxby (2000), Rothstein (2007), Hoxby (2007)). Studies that do not focus on the US include among others Lavy (2009) who investigates a school choice program in Israel and Gibbons et al. (2008) who use discontinuities generated by admissions district boundaries to estimate the effects of school choice and competition in the UK.

The findings of these studies are mixed. In addition, it is unclear how informative these studies are about the effect of introducing a universal voucher system. Most studies focus on (a change in) choice between existing schools, but when countries that currently have little or no school choice introduce a nationwide voucher system it is likely that this will lead to a supply response; a change in the number of schools. In Chile and Sweden for example, the supply of private schools increased after the introduction of a universal voucher system, while the number of public schools hardly changed (Hsieh and Urquiola (2006), Böhlmark and Lindahl (2008)). Implementing a universal voucher system will thus lead to an increase in choice not only by increasing choice between existing schools

but also by an increase in the supply of schools.

As the Netherlands has had free school choice since 1917 we will not investigate the effect of an increase in school choice by the introduction of free choice among existing schools. Instead, this paper will focus on the effect of a change in the supply of schools, within a nationwide voucher system.

There is a lot of freedom within the educational system in the Netherlands but there are also some requirements. The first requirement comes in the form of quality standards, which are set by the government and which are checked by the educational inspectorate. The second requirement concerns the number of pupils at a school. A school only receives funding from the government if the number of pupils enrolled in a school exceeds a certain minimum.

In 1994 the rules determining the minimum required school size changed. Before 1994 these rules were based on the number of inhabitants within the municipality and after 1994 the rules were based on the pupil density of the municipality. For many municipalities the minimum required school size increased and many schools with a number of pupils above the old rule had a school size below the new rule. As a consequence the number of primary schools declined by about 15 %. This can be seen in Figure 1, which shows the number of primary schools in the Netherlands by year for the period 1990 to 2004.

By exploiting the fact that the changes in the minimum required school sizes and the resulting changes in the number of schools varied a lot across municipalities, we investigate the effect of a reduction in the supply of schools in a municipality on test scores of pupils at the end of primary school. The supply of schools in a municipality can be interpreted as a measure of school choice and competition at the municipality level. This is also the interpretation we will initially give to it. But as Figure 1 shows, a change in the number of schools at the municipality level necessarily also implies a change in average school size. In addition it might have an effect on school segregation. We will therefore not only present the results on the total effect of a reduction in the supply of schools on pupil test scores but we will also investigate the mechanism(s) that might be driving our results.

The remainder of the paper continues as follows. Section 2 provides information about the Dutch education system and Section 3 describes the reform. Section 4 introduces the data. Section 5 presents and discusses the results,and Section 6 summarizes and concludes.

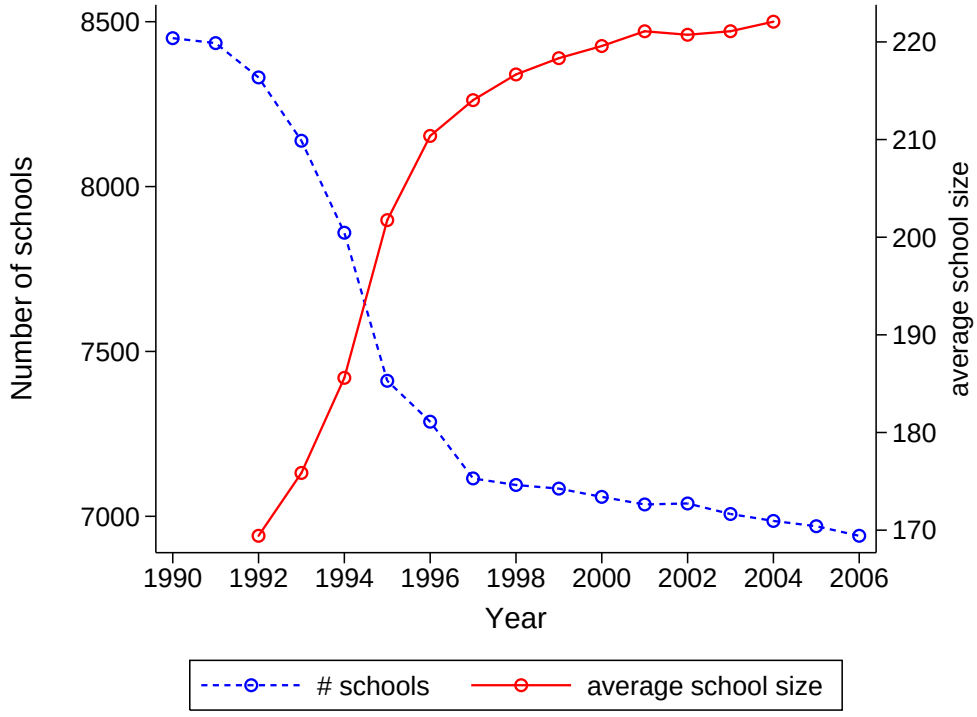

Figure 1. Number of primary schools and average school size in the Netherlands 1990–2004

2 Dutch education system

The development of the Dutch education system as we know it today began in the early 19th century. The Education Act of 1806 laid the foundation of public education. The law stated that primary schools should be open to everyone and imposed requirements on the teachers and the contents of the education. The law stated that pupils should be educated according to Christian and social virtues. Church schools (private schools) were not allowed. This last part led to resistance, especially Catholics and orthodox Protestants opposed the educational system and asked for private schools.

This opposition resulted in the establishment of freedom of education in the Constitution in 1848. From 1848 it was in principle free for everyone to provide education. The Education Act of 1857 arranged government subsidies for public schools and stated that these schools should provide neutral education. There were no government subsidies for private schools, which again led to resistance. This dispute about the educational system ended when equal financial treatment of public and private schools was established in the Constitution in 1917. This resulted in an enormous change in the composition of schools. In 1910 62 percent of pupils went to public schools and 38 percent was enrolled in private schools. In 1930 it was exactly the opposite, with only 38 percent of the pupils enrolled in

public schools and 62 percent enrolled in privately-run schools (Kemenade et al., 1986).

Nowadays the share of pupils enrolled in private schools is even larger with about 69 percent enrolled in a privately-run school. Most private schools provide education based on religious or philosophical beliefs; 28 percent of the pupils is enrolled in a Protestant school, 34 percent is enrolled in a Roman-Catholic school and 8 percent is enrolled in other types of private schools (CBS (2009)). Both public and private schools can provide education based on a particular pedagogical approach such as Montessori, Dalton, Freinet or Jena-plan.

Currently there are about 7000 primary schools in the Netherlands. For most pupils in the Netherlands the nearest primary school is within walking distance. For about 59 percent of the pupils the nearest school is less than 500 meters from their home and 89 percent of the pupils live less than 1 kilometer away from the nearest primary school (Bunschoten, 2008).

Since 1985 kindergarten is part of primary education. Children are allowed to start school at the age of four, but are obliged to go to school at the moment they turn five. Primary education consists of 8 grades and children leave primary school when they are about 11 or 12 years old. Parents can freely choose the school for their child. There are no compulsory school fees, since both public and private schools are funded by the government. This funding is based on the number of pupils attending the school. Schools are allowed to ask for a voluntary fee which is usually spend on extras, for example the yearly school trip.

In principle it is free for everyone to start a school and to organize the teaching in schools, but there are a number of government regulations. For example, the government sets a number of core objectives. These core objectives state what skills and knowledge pupils should have at the end of (primary) school. Whether these core objectives are achieved is checked by the educational inspectorate, which monitors schools for compliance with laws and regulations.

Next to regulations regarding the content of education there are minimum school size rules which put limits on the possibility to start a new school and on the continuation of existing schools. The requirement to start a new school is that within a specified period after the start-up the number of pupils enrolled in the school should be at least a high as the minimum school size rule (that applies for new schools). For existing schools a different set of minimum school size rules applies, which are in general lower than the rules for new schools. In order to be eligible for government funding an existing school should have a number of pupils which is above the minimum school size rule, that applies for the municipality in which the school is located. The minimum required school sizes are set by the central government but vary between municipalities, which will be described in

more detail in the next section.

3 The reform

3.1 Minimum school size rules for existing schools

As described in Section 3, primary schools in the Netherlands must comply with the minimum school size rules in order to be eligible for funding. These minimum school size rules are expressed as the minimum number of pupils that should be enrolled in a school. In the 1980's there were concerns about the size of the schools. There were many small schools and people worried about the ability of small schools to provide education of sufficient quality (Ministry of Education (1990)). In addition, the funding system was such that each school received a fixed amount plus an amount depending on the number of pupils. Many small schools were thus more expensive than a smaller number of bigger schools. For these reasons a project was started in the beginning of the 1990's, which resulted in an overall change in the minimum school size rules which were established in a law that took effect on January 1, 1994.

Before 1994 the funding of a school was ended on August 1 when during the previous three school years the school had fewer pupils than the number required under the Primary Education Act (Staatsblad 1986, 256, WBO).[1] The required numbers of the Primary Education Act were based on the number of inhabitants of the municipality in which the school was located. The minimum school size rules depended on the number of inhabitants in the following way:

$$\text{minimum school size} = \begin{cases} 50 & \text{if number of inhabitants} \in [0, 25000) \\ 75 & \text{if number of inhabitants} \in [25000, 50000) \\ 100 & \text{if number of inhabitants} \in [50000, 100000) \\ 125 & \text{if number of inhabitants} \in [100000, \infty) \end{cases}$$

So for example, if a school was located in a municipality with 30000 inhabitants and had less than 75 pupils for three consecutive years, the funding was stopped at the beginning of the next scholastic year in case of a privately-run school or was closed down in case of a publicly-run school.[2]

On July 11, 1992 the new minimum school size rules were published in the weekly magazine that is send to all schools. Although the new rules were published in 1992,

[1] A scholastic year starts on August 1 of a given year and ends on July 31 the following year.

[2] If a privately-run school stops receiving funding from the government this means in practice that it has to close down. The only source of funding is the funding of the government since schools are not allowed to charge school fees.

the old rules applied until January 1, 1994. The new minimum school size rules were no longer based on the number of inhabitants of the municipality, instead the new rules were based on the pupil density of the municipality according to the following formula:

$$\text{minimum school size} = \frac{d_m}{0.25 + 0.0045 * d_m}$$

whereby d_m is pupil density in municipality m defined as the number of inhabitants between 4 and 11 years old divided by the size of the municipality in square kilometers.

Figure 2 shows scatter plots of the old and new minimum school size rules. The first panel shows a scatter plot of the old and new rules against the number of inhabitants. The black circles connected by the black line show the old minimum school size rules, each circle represents a municipality. All municipalities with less than 25,000 inhabitants have a minimum school size rule of 50, at 25,000 there is a jump to 75, at 50,000 there is a jump to 100 and all municipalities with more than 100,000 inhabitants have a minimum school size rule of 125. The hollow red circles show the new minimum school size rules, these new rules range from 23 pupils to 200 pupils. As can be seen in the first panel there is a lot of variation in the new minimum school size rules between municipalities with the same number of inhabitants, and thus the same rule before the reform.

The second panel in Figure 2 shows the old and new rules by pupil density. The new minimum school size rules shown by the hollow circles show a clear relation with pupil density.[3] Municipalities with the same pupil density have the same minimum school size rule after the reform but as the black dots show, the old minimum school size rules could be very different for municipalities with the same pupil density.

The new rules were introduced in 1994 but no schools were forced to close down or stopped receiving funding in the scholastic years 1994/1995 and 1995/1996. Schools had two years to comply with the new rule, for example by merging with another school in the municipality. If a school had a number of pupils below the rule in the scholastic years 1994/1995 and 1995/1996 the school stopped receiving funding from August 1, 1996 in case of a private school or was closed down in case of a public school. From 1996 onward all schools with a number of pupils below the minimum school size rule for two scholastic years (either consecutive or with one year in between) were closed down/ stopped receiving funding from the beginning of the next scholastic year.

On average the minimum school size rules increased due to the reform. Figure 3 shows the average minimum school size rule by year as well as the average number of schools in a municipality by year. The vertical axis on the left shows the average number of schools and the vertical axis on the right shows the average minimum school size rule.

[3]There are some "outliers" which are due to the fact that if the pupil density was more that 500 it was set at 500 and when the size of the municipality was smaller than 10 km^2 it was set at 10.

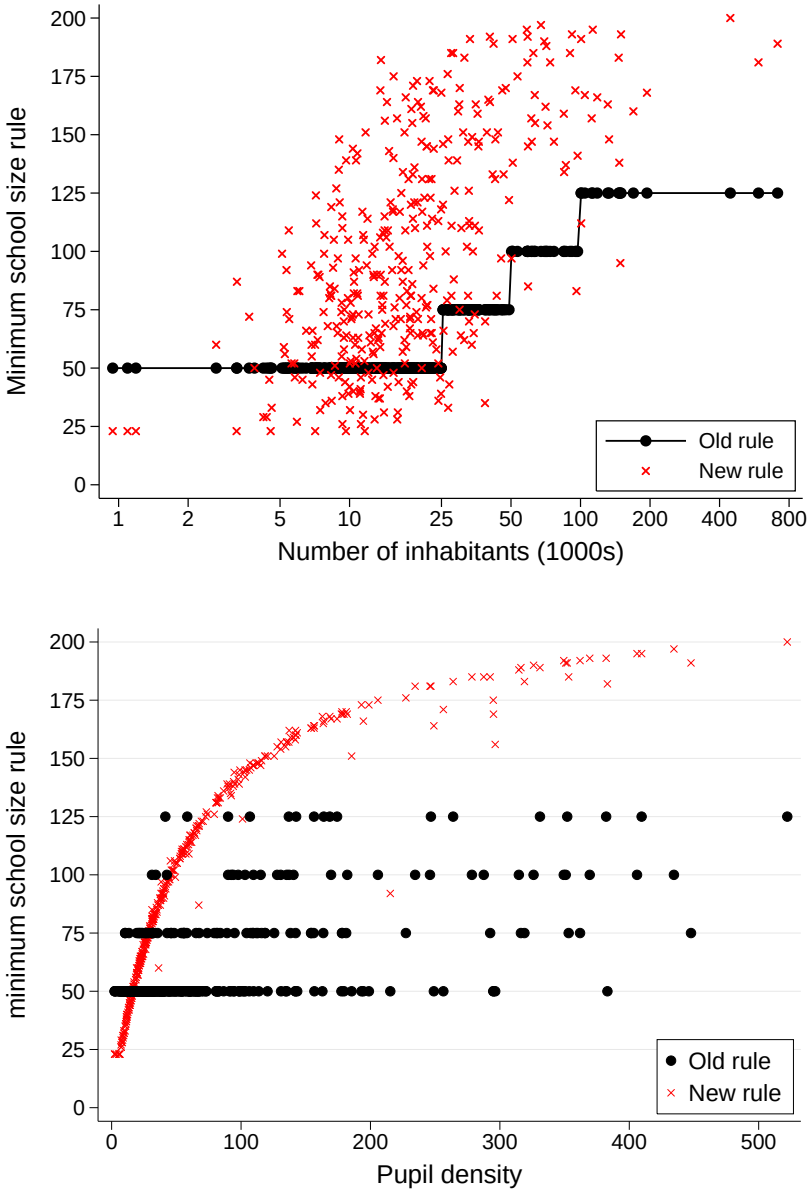

Figure 2. Old and new rules by number of inhabitants and pupil density

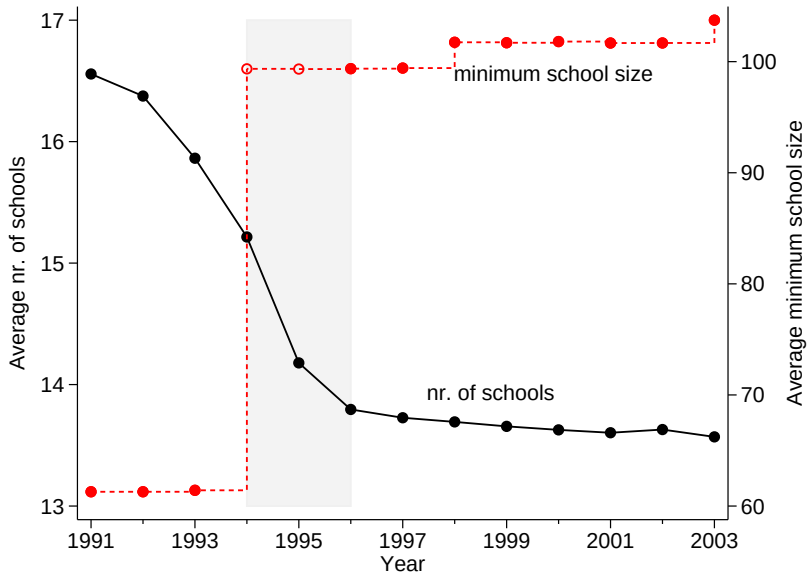

Figure 3. Average number of schools and minimum school size rules by year

Until 1993 the average minimum school size rule was just above 60 pupils. In 1994, after the implementation of the law, the average minimum school size rule jumped to about 100. At the same time the average number of schools declined. In 1991 municipalities had on average 16.5 schools, but after 1992 the number of schools started declining until 1997 when it stabilized around an average of 13.5 schools per municipality. In total the number of schools declined from 8362 schools in 1992 to 7100 schools in 1997, a decline of 15 % within a period of five years.[4]

After the implementation of the law in 1994 schools had two years to comply with the new minimum school size rules. As a consequence most schools that were below the new rule merged with another school instead of being closed down on August 1, 1996. Of the 8362 primary schools in 1992, 2293 schools were part of a merger in the five years between 1992 and 1997.

Although most municipalities experienced an increase in the minimum school size rule and a resulting decrease in the number of schools, the analysis in this paper will exploit the fact that these changes in rules and schools varied a lot between the municipalities. Figure 4 plots the new rule against the old rule and shows that there is a lot of variation in the new rule between municipalities which had the same rule before the reform.

[4]The reform affected private and public schools similarly. We do not have access to schools' denomination in our micro data, but from aggregate statistics we know that the share of public schools remained approximately constant between 1992 and 1997 35% vs. 33.5%).

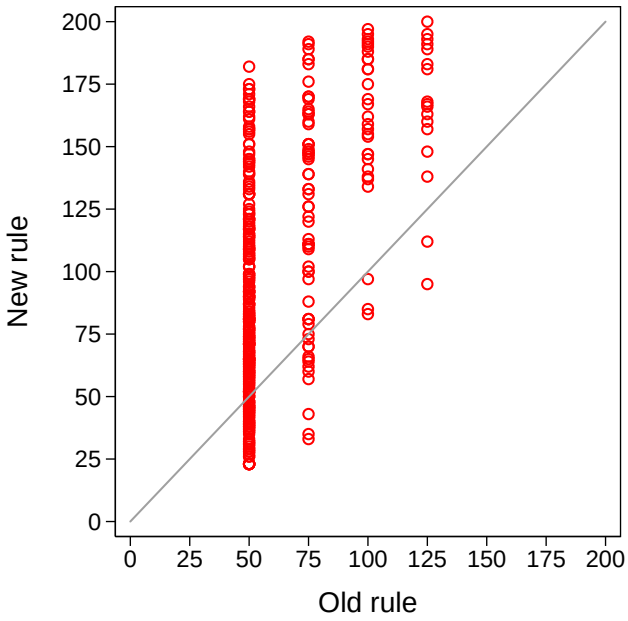

Figure 4. Old and new minimum school size rules

3.2 Minimum school size rules for new schools

The previous subsection discussed the change in the minimum school size rules for existing schools but also the minimum school size rules for new schools changed due to the reform. In order to start-up a new school and to receive funding from the government a school should be included in the plan of new schools of the municipality in which the school will be located. A school will only be taken up in the plan of new schools if it is plausible that the number of pupils that will enroll in the school is above the minimum school size rule that applies for new schools.[5] Before the reform these minimum school size rules for new schools were $\frac{8}{5}$ times the minimum school size rules for existing schools.

After the reform a new school was taken up in the plan of new schools if it was likely that the number of pupils enrolled in the new school would be above the (new) minimum school size rule within five years after the start-up and would remain above the rule for at least 15 years. The minimum school size rules after the reform no longer depended on the number of inhabitants but instead were $\frac{10}{6}$ times the minimum school size rules for existing schools with a minimum of 200. Figure 5 shows the old and new rules by number of inhabitants (panel A) and pupil density (panel B) just like Figure 2 but now showing the rules for new schools.

[5]There were a number of exceptions which made it possible for new schools to get funding even though it was unlikely that it would comply with the minimum school size rules.....

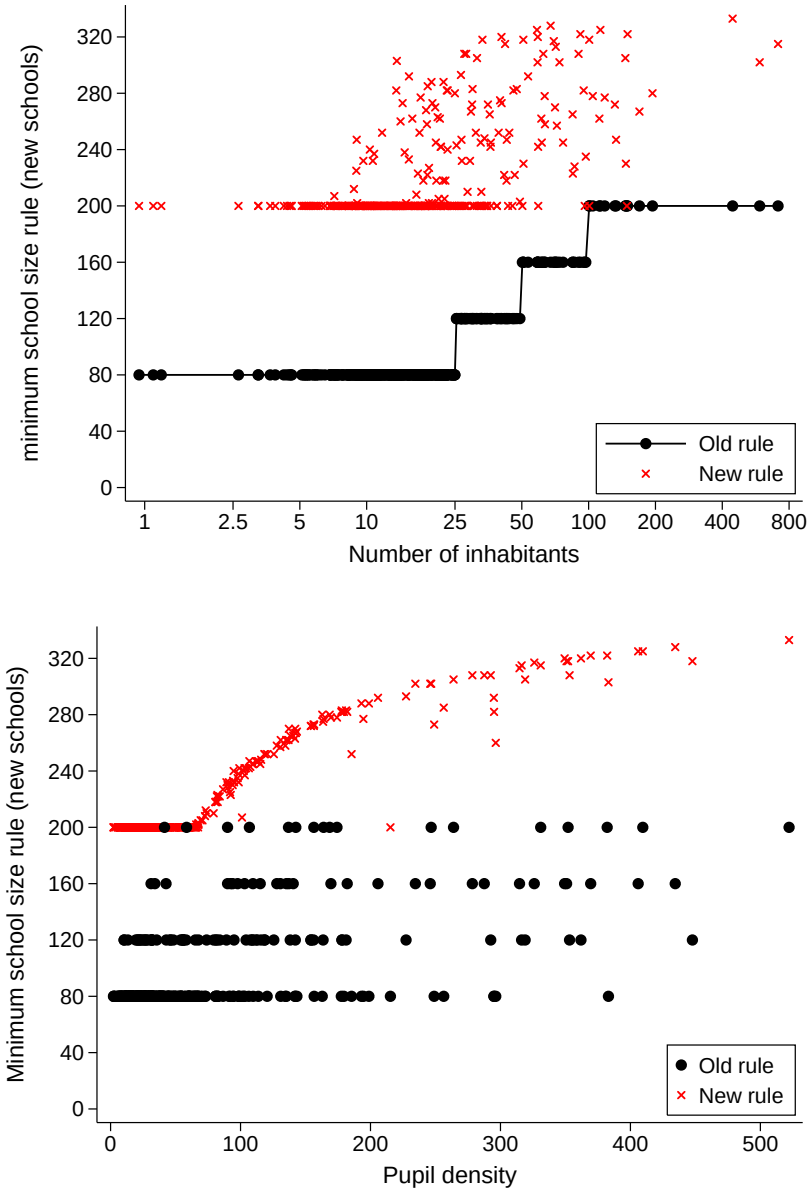

Figure 5. Old and new rules for new schools

4 Data

The data that are used in the analysis in this paper come from various sources. The outcome variable that will be used is standardized test scores. At the end of primary school pupils take a test called the Cito test. This test determines for a large part the type of secondary school a pupil will go to after primary school. Although the test is not compulsory for pupils, most pupils take the test. The Cito test consists of multiple choice questions that deal with language, arithmetic/mathematics, information processing and environmental studies (optional). The test is administered on three days in February and at the end of the last day the answer sheets are send to Cito, where they are marked. The results for each pupil are send back to the school. The standard score is a figure between 501 and 550, it is based on the number of correct answers for language, arithmetic/mathematics and information processing. For the analysis in this paper we will standardize these scores, such that results can be interpreted in terms of standard deviations.

Data at the school level for all primary schools in the Netherlands, such as information about school size and the share of minority pupils, are obtained from the DUO which is part of the Dutch Ministry of Education. Data at the municipality level are obtained from the Dutch Central Bureau of Statistics. The minimum school size rules are collected from Het Staatblad (1986 ,1993) that publishes (changes in) laws and from Gele Katern, a magazine for schools.

Not only schools merged in the 1990's but also municipalities merged. If two or more municipalities merged this had consequences for the minimum school size rules. In most cases there was one minimum school size rule after the merger that applied for all schools, but sometimes the differences between the pupil densities of the different municipalities were so large that different minimum school size rules applied for different schools after the merger of the municipalities. Since a merger between municipalities in general implied more changes in addition to the change in the minimum school size rules, the analysis in this paper will be based on the municipalities that were not part of a merger between 1992 and 2004[6]. About 20% of the municipalities in 2004 are a result of a merger, the analysis will thus be based on the remaining 80% of the municipalities.

In the analysis we will compare two cohorts of pupils; the cohort of pupils that finished primary school in 1992, before the change in the number of schools, and the cohort of pupils that enrolled in primary school after the large reduction in the number of schools, those who finished primary school in 2003. Table 1 shows summary statistics separately for the years 1992 and 2003.[7]

[6] We take 2004 as end date because the scholastic year 2003 starts in August 2003 but ends in June 2004

[7] The number of test-taking pupils increased between 1992 and 2003. This is not problematic for the analysis in this paper as long as the change in test-taking pupils is unrelated to the changes in the minimum

Table 1. Summary statistics

	1992		2003	
	mean	SD	mean	SD
Test scores				
Standardized Cito score	-0.02	1.01	-0.02	1.01
N	*71 283*		*111 226*	
Municipality Characteristics				
Number of schools	17.31	21.09	14.35	18.18
Minimum school size (existing schools)	62.25	21.06	101.07	47.57
Minimum school size (new schools)	99.59	33.70	221.34	36.29
Number of pupils ($\times$1000)	2.97	4.72	3.24	5.20
Number of inhabitants ($\times$1000)	31.89	59.92	34.22	62.47
Share minority pupils	0.05	0.06	0.06	0.07
N	*345*		*345*	

5 Results

To investigate the effect of school choice on pupil test scores, we will define choice as the number of schools parents can choose from. Since there is free school choice in the Netherlands, parents can in principle choose between all primary schools located in the Netherlands. Of course parents working and living in the north of the Netherlands will not consider schools in the south and visa versa. Since almost all children attend a school located in the municipality in which they live we will consider the the number of schools in the municipality as the number of schools parents choose from.

Comparing municipalities with many schools to municipalities that have fewer schools is however problematic. Municipalities with many schools are likely very different from municipalities with a few schools; they have in general more inhabitants and also the characteristics of the inhabitants can be very different. We will therefore look at changes in the number of schools within a municipality over time.

Column 1 of Table 2 shows a regression of pupil test scores on the number of schools in the municipality including municipality and year fixed effects, thereby controlling for (unobserved) differences between municipalities that are constant over time and for changes over time that are constant across municipalities. Since the effect of a change in the number of schools by one is likely very different in a municipality with 4 schools than

school sizes rules. The results in Table A in the Appendix show that the change in the share of test-takers (ratio of test-takers to number of 11-year-olds in municipality) is not significantly related to the change in the minimum school size rule.

Table 2. Difference in Difference results

Dependent variable: Standardized test scores

	(1)		(2)		(3)	
ln(nr. schools in municipality)	-0.05	(0.08)	-0.08	(0.07)	-0.03	(0.07)
Year fixed effects	Yes		Yes		Yes	
Municipality fixed effects	Yes		Yes		Yes	
Control variables	-		Yes		Yes	
Allowing for different trends large and small municipalities	-		-		Yes	
Nr municipalities	345		345		345	
Nr observations	182509		182509		182509	

Note: Standard errors are clustered at the municipality level. Control variables: ln(nr. pupils), ln(nr. inhabitants) and share of ethnic minority pupils. Trend in test scores between 1992 and 2003 are allowed to differ between municipalities with number of inhabitants of respectively (0-25000), (25000- 50000), (50000- 100000) and (100000 or more)

in a municipality with 40 schools we include the logarithm of the number of schools as explanatory variable. The coefficient on the logarithm of the number of schools measures the impact of a 100% change in the number of schools on standardized Cito scores. The result in column 1 indicates that a 10% reduction in the number of schools is associated with an increase in Cito scores of about 0.5% of a standard deviation, which is very small and not significantly different from zero.

If changes in the number of schools are correlated to changes in other municipality characteristics affecting pupil test scores this will lead to omitted variables bias. Column 2 therefore shows the results when changes in the number of inhabitants, changes in the number of pupils and changes in the share of minority pupils in the municipality are included as control variables. The coefficient in column 2 is negative and a bit larger in absolute value than the coefficient in column 1 but also not significantly different from zero.

The estimates in column 1 and column 2 come from regressions including municipality and year fixed effects (difference-in-differences) and a necessary assumption that one has to make to give it a causal interpretation is the common trend assumption: Municipalities with a large change in the number of schools should have the same trend in test scores as municipalities facing a small or zero change in the number of schools, in absence of variation in the number of schools. Since changes in the number of schools varied between small and big municipalities, the common trend assumption will be violated if trends in test scores are different between small and large municipalities (in absence of a

change in the number of schools). To see whether this is indeed an issue, column 3 shows results whereby trends in test scores between 1992 and 2003 are allowed to differ between municipalities with a different number of inhabitants.[8] The coefficient in column 3 is a bit smaller in absolute value compared to the estimates in columns 1 and 2 but still negative, small and not significantly different from zero.

On the basis of the results in Table 1 we would conclude that changes in school choice due to a change in the number of schools has no significant impact on pupil test scores. Changes in the number of schools within a municipality over time might however be due to changes in unobserved municipality characteristics. For example, a change in the composition of the population of the municipality might change the demand for schools, and in addition have a direct impact on pupil test scores, leading to omitted variable bias in the coefficient estimates in Table 1. In the next section we will therefore use in instrumental variable approach whereby the change in the minimum school size rules is used as an instrument for the change in the number of schools.

5.1 Instrumental variable estimates

Since the results in Table 2 might suffer from endogeneity problems we want to isolate the change in the number of schools which is due to the reform, by using the change in minimum school size rules as instrument. In order to avoid weak instrument problems the effect of the change in rules on the change in schools should be sufficiently strong. Figure 6 shows a scatter plot of the percentage change in the number of schools against the percentage change in the minimum school size rule. On average the reduction in the number of schools was 15%, but as Figure 6 shows there was quite some variation in the change in the number of schools. Some municipalities had no change in number of schools while other municipalities faced a reduction in the number of schools of 50%.

Figure 6 also shows a local polynomial smooth of the change in schools on the change in rules. There seems to be a strong negative relation. This is confirmed in column 1 of Table 3, which shows the result of a regression of the logarithm of the number of schools on the logarithm of the minimum school size rule including municipality and year fixed effects and controlling for a number of municipality characteristics. The results in column 1 show that a 100% increase in the minimum school size rule leads on average to a reduction in the number of schools of 19% which is significant at the 1 percent level and has a partial F-statistic of 86.07.

The first column of Table 4 shows the 2SLS results using the minimum school size rule

[8]Municipalities are divided into 4 categories based on the number of inhabitants: (0-25000), (25000-50000), (50000- 100000) and (100000 or more). Trends in test scores are allowed to differ between these four categories.

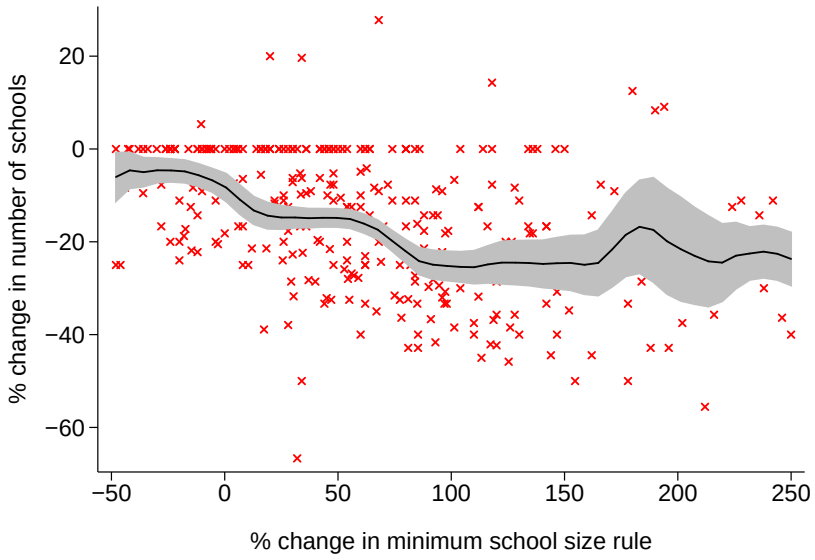

Figure 6. Change in rules and schools

Table 3. First stage: effect minimum school size on number of schools

Dependent variable: ln(nr. schools in municipality)

	(1)	(2)	(3)	(4)
ln(minimum school size)	-0.19***	-0.18***	-0.14***	-0.19***
	(0.02)	(0.02)	(0.02)	(0.02)
ln(minimum school size new schools)			-0.19**	
			(0.10)	
Partial F-statistic	86.07	94.27	56.74	85.52
Excluding biggest 20 municipalities	-	Yes	-	-
Controlling for school size	-	-	-	Yes
Nr municipalities	345	325	345	345
Nr observations	182509	130097	182509	182509

Note: Standard errors are clustered at the municipality level. ** significant at the 5% level, *** significant at the 1% level. All regression include municipality fixed effects, year fixed effect, control variables: ln(nr. pupils), ln(nr. inhabitants), share of ethnic minority pupils and trends are allowed to differ between municipalities with number of inhabitants of respectively (0-25000), (25000- 50000), (50000- 100000) and (100000 or more)

Table 4. Instrumental variable estimates of effect of number of schools on test scores

Dependent variable: Standardized test scores

	(1)	(2)	(3)	(4)
ln(number of schools)	-0.28**	-0.26*	-0.32**	-0.11
	(0.13)	(0.14)	(0.14)	(0.14)
school size ($\times$100)				0.09***
				(0.01)
school size ($\times$100) squared				-0.01***
				(0.00)
Excluding biggest 20 municipalities	-	Yes	-	-
Using minimum school size for existing and new schools as instruments	-	-	Yes	-
Nr municipalities	345	325	345	345
Nr observations	182509	130097	182509	182509

Note: Standard errors are clustered at the municipality level. * significant at 10*% level,** significant at the 5% level, *** significant at the 1% level. All regression include municipality fixed effects, year fixed effect, control variables: ln(nr. pupils), ln(nr. inhabitants), share of ethnic minority pupils and trends are allowed to differ between municipalities with number of inhabitants of respectively (0-25000), (25000-50000), (50000- 100000) and (100000 or more)

as instrument for the number of schools. Compared to the results in Table 2 the coefficient estimate in column 1 of Table 4 is larger in absolute value and significantly different from zero at a 5 percent significance level. The results show that a 10% reduction in the number of schools increases Cito scores on average by 3% of a standard deviation.

Columns 2 and 3 of Tables 3 and 4 show results for two somewhat different specifications. The second column in Tables 3 and 4 show the first stage and second stage results when the 20 biggest municipalities (those with more than 100 000 inhabitants) are excluded from the analysis. Since we don't know what the actual choice set of parents is it might be that taking the municipality as the choice set is a bit too large in the case of big municipalities. We therefore perform the same analysis but then excluding the biggest 20 municipalities, but as the results in the second column of Tables 3 and 4 show this does not affect our findings.

As described in Section 3 not only the minimum school size rules for existing schools changed but also the rules for new schools changed due to the reform. Columns 3 in Tables 3 and 4 show the results when we use both the minimum school size rules for existing schools and the rules for new schools as instruments. Due to the fact that these rules are strongly correlated this does not lead to a stronger first stage nor does lead to different findings regarding the effect of school choice on pupil test scores.

The results in Table 4 show that a reduction in choice due to a reduction in the supply of schools has a small positive impact on pupil performance. This is not what we would expect on the basis of arguments given by supporters of school choice: With more school choice it should be easier for parents to find the school that matches their preferences and the needs of their child. In addition more schools should lead to more competition between schools and a resulting increase in school quality. On the basis of these two mechanisms we would expect that a decrease in the supply of school would have a negative impact on pupil performance.

There are two potential explanations for our findings. The first is often discussed in the school choice literature: More school choice could lead to more sorting with potential adverse effects on school performance of (some) pupils. The second potential explanation concerns economies of scale in education, something which is rather underexposed in the literature on school choice. More school choice in the form of more schools will for a given number of pupils always imply smaller schools and if there are economies of scale this might adversely affect pupil performance.

5.2 Segregation

In order to investigate whether sorting could explain our findings we can investigate whether the decline in the supply of schools, due to the reform, affected sorting of pupils

among schools. For each primary school we know not only the number of pupils attending the school but also the number of pupils in each of the following three categories; 1. pupils with low educated migrant parents, 2. pupils with low educated Dutch parents and 3. all pupils that do not fall in the first two categories. Given this division of pupils by socioeconomic status we can calculate a relative heterogeneity index as in Urquiola (2005). Urquiola (2005) investigates the effect of school choice on sorting by investigating the impact of the number of school districts on the (racial/educational) heterogeneity of a school district relative to the heterogeneity of the metropolitan area in which the district is located. The measure of heterogeneity is defined as $H = 1 - \sum_{r=1}^{R} S_r^2$ whereby R is the number of groups and S_r is the share of group r in the population.

On the basis of the division into the groups defined above we can calculate the heterogeneity index for each school and for the municipality in which the school is located. By taking the ratio of the two we obtain a measure of relative heterogeneity. There is one issue though which is that the definition of the second category changed between 1992 and 2003. In 1992 all children with at least one parent that had at most the lowest level of secondary education were included in the second category. In 2003 pupils were only included in the second category when both parents had at most the lowest level of secondary education. Since this change in the definition of the second category applied for all schools in all municipalities in the Netherlands this should be captured by the year fixed effect and therefore not affect the results. As an additional robustness check we calculate the (relative) heterogeneity index on the basis of two groups; 1) pupils with low educated migrant parents and 2) all other pupils. The index based on this division is not affected by the change in the definition of the second category.

Table 5 shows 2SLS results of the effect of the number of schools on the two measures of relative heterogeneity, using the minimum school size rule as instrument. The result shows that there is no significant impact of the change in the supply of schools on sorting of pupils in terms of socioeconomic status. The estimates are small and not significantly different from zero. This indicates that sorting cannot explain our findings.

5.3 Economies of scale

While sorting of pupils across schools was not significantly affected by the change in the supply of schools, school size was clearly affected as is shown in Figure 7, which shows kernel densities of school size for the years 1992 and 2003. Average school size increased from 169 pupils in 1992 to about 221 pupils per school in 2003.

Many papers that investigate school choice focus on the effect of the number of schools or number of school districts on pupil performance (Belfield and Levin, 2002; Hoxby, 2000). For a given population size, more schools (districts) will however always

Table 5. Instrumental variable estimates of the effect of the number of schools on sorting

Dependent variable: School heterogeneity (relative to municipality heterogeneity)

	# Groups in Heterogeneity Index			
	3		2	
Summary statistics	*Mean*	*S.D.*	*Mean*	*S.D.*
Heterogeneity index school	0.36	0.20	0.12	0.15
Heterogeneity index municipality	0.44	0.14	0.17	0.14
Relative heterogeneity index	0.84	0.57	0.86	1.23
Results				
ln(number of schools)	-0.08		0.14	
	(0.09)		(0.15)	
Partial F-statistic first stage	105.02		104.64	
Nr. observations (schools)	11 403		11 391	

Note: Standard errors are clustered at the municipality level. All regression include municipality fixed effects, year fixed effect, control variables: ln(nr. pupils), ln(nr. inhabitants), and trends are allowed to differ between municipalities with number of inhabitants of respectively (0-25000), (25000- 50000), (50000-100000) and (100000 or more)

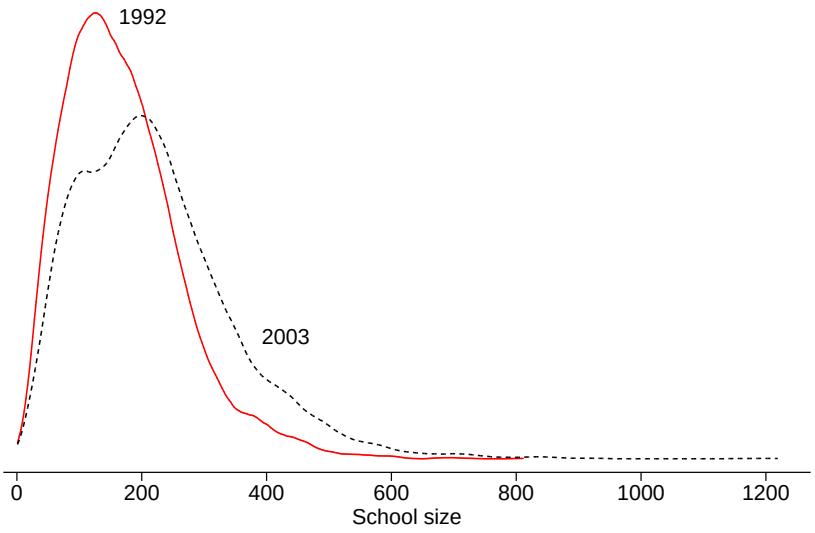

Figure 7. Kernel density of school size in 1992 and 2003

imply smaller schools (districts). It is therefore puzzling why potential effects of school size / district size are hardly ever mentioned in the school choice literature. Larger schools may come with economies or diseconomies of scale. There are a number of reasons why we could expect economies of scale. In small schools it is often the case that the principal has to teach, while in a bigger school the principal can be a full time director. In small schools children of different grades are often combined into one class, while in bigger schools this is not necessary and there will be more scope for an optimal grouping of pupils into classes. In addition it might be easier to smooth teacher absence in bigger school and to offer more curricular diversity.

Although it is not possible to disentangle the effect of the change in school choice and the change school size due to the reform, we can investigate whether the coefficient on the logarithm of the number of schools is sensitive to the inclusion of a polynomial in school size. Columns 4 in Tables 3 and 4 show the results when school size and school size squared are included in the specification. The results are indeed sensitive to the inclusion of controls for school size. The coefficient on the logarithm of the number of schools is reduced to almost a third of its original value and is no longer significantly different from zero. The coefficients on the school size variables are both significantly different from zero and indicate that test scores increase with school size but at a decreasing rate. Although we don't want to give a causal interpretation to these results they are consistent with the reasoning that our findings could be explained by positive effects of an increase in school size due to the decrease in the supply of schools.

6 Conclusion

In this paper we have analyzed the impact of variation in the number of schools in a municipality on pupils' achievement. Variation in the number of schools in a municipality causes variation in school choice and competition. The setting of our analysis is primary education in the Netherlands. This setting is very different from the settings of previous papers that looked at the impact of school choice on achievement. While in most countries school choice is very limited, primary education in the Netherlands is characterized by a large amount of choice. Parents can freely choose the school of their children and all primary schools are publicly funded through a system in which money follows pupils.

We exploit variation in the number of schools at the level of municipalities induced by a change in the minimum school size rule. Before the change the minimum school size in a municipality was determined by the population size, after the change it was determined by pupil density. Some municipalities were more affected by this change than others. We find a strong effect of the change in the minimum school size on the number of schools in

a municipality.

Somewhat to our surprise, we find a significantly *negative* effect of the number of schools in a municipality on pupils' achievement. A reduction in the number of schools of 10 percent increases test scores on average by 3 percent of a standard deviation. Hence, more school choice and competition are – in the setting of primary education in the Netherlands – detrimental for achievement. Our preferred explantion for this counter-intuitive result is that a reduction of the number of schools in a municipality also implies an increase in average school size. The reform reduced the number of very small primary schools in the Netherlands. If we include average school size in a municipality in the achievement equation, the negative effect on the number of schools is smaller and no longer statistically significant.

Our results call attention to a trade-off that is usually ignored in the school choice and competition literature. If more choice and competition is induced by an increase in the number of suppliers, and if the size of the market is fixed, each supplier will on average serve fewer pupils. The case that we examined in this paper bears some resemblance with the discussion in elementary textbooks about the distinction between perfect competition and monopolistic competition. Under monopolistic competition firms operate at a point of their average cost curve tangent to their demand curve. At this point the firm's supply is lower than the amount at which average costs are minimized. The below minimum average costs are usually interpreted as the price customers have to pay for increased product variety. In our setting, pupils paid in the form of lower achievement to attend a smaller school, on average located closer to where they live.

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Appendix

Table A: Change in minimum school size rule and the change in share test-takers

Dependent variable: ratio of Cito participants and the number of 11 year-olds in municipality

	(1)		(2)		(3)	
ln(minimum school size rule)	0.006	(0.029)	0.008	(0.029)	0.008	(0.029)
Year fixed effects	Yes		Yes		Yes	
Municipality fixed effects	Yes		Yes		Yes	
Control variables	-		Yes		Yes	
Allowing for different trends large and small municipalities	-		-		Yes	
Nr municipalities	345		345		345	
Nr observations	690		690		690	

Note: Standard errors are clustered at the municipality level. Control variables: ln(nr. pupils), ln(nr. inhabitants) and share of ethnic minority pupils.Trend in test scores between 1992 and 2003 are allowed to differ between municipalities with number of inhabitants of respectively (0-25000), (25000- 50000), (50000- 100000) and (100000 or more)