The Effects of School Choice on Academic Achievement in the Netherlands [a]

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Abstract

Nationwide school choice and fixed per-student governmental funding provide incentives for Dutch schools to perform well. Employing data from the Inspectorate of Education, I find a positive link between competition intensity and academic achievement in Dutch pre-university education *(VWO)*. Roughly one third of *VWO*- schools are of catholic denomination. Acknowledging this widely available opportunity of opting out of the public school system, I consider the effect of catholic competition on non-catholic school performance. In addition to raising academic achievement, competition also exerts a restraining effect on per student spending, yet it does not precipitate grade inflation. These findings are robust to a variety of competition measures from geographic proximity to standard indices such as the Herfindahl index. Instrumenting for the possible endogeneity of catholic competition to public school quality further substantiates the above results.

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1 Introduction

The possibly beneficial effects of competition in the market for education are by no means a new discovery. Friedman (1955) argued that school choice in the form of vouchers would exert competitive pressure on school authorities which in turn would lead them to provide higher school quality. On the downside, increased choice can lead to increased sorting by ability. Concurrently, negative peer effects may be experienced by the less able students left behind in the public sector.

1.1 The Link between School Quality and Competition

In the United States, a considerable percentage of the population relocates each year and secondary education is traditionally funded to a considerable degree by means of local property taxes. This makes educational policies and their effects on households' locational decisions a standard example of Tiebout's (1956) idea of voting with the feet. A large part of the literature on competition in education relies heavily on this idea which implies higher school quality being capitalised in house prices. Indeed, there has been a whole strand of literature that has shown that households do take school quality into account when choosing their place of residence and are willing to pay a premium for it. Aside from the empirical evidence, the fact that many realtors provide their customers with information on local schools' test scores confirms the importance of school quality.[1]

Whether school quality reacts to parents exercising the *exit*-option (or the threat thereof) has been at the center of another strand of research. Predominantly, school quality is measured in terms of academic achievement, i.e. test scores and graduation rates, mostly due to the quantitative nature of these measures.[2] The main exogenous variable is the intensity of competition in the relevant market. A reasonable indicator of competition seems to be the number of schools or school districts that make up the choice set within a particular market. Alternatively, the Herfindahl index of concentration, which is closely related to the number of schools or districts (Martinez-Vazquez and Seaman 1985, Hoxby 2000) can be used. The percentage of students attending private schools (Hoxby 1994) or the number of private schools is also often employed, as these schools provide the real outside option to public schools, which may be too similar to actually induce competitive pressure upon one another. Evidently, these measure are all the more powerful when education markets are clearly defined geographically, determening a household's choice set.

[1] Obviously, in a larger geographical context, there are many other variables such as job availability which influence residential patterns. Within a metro area, however, school quality has been shown to be closely linked to house prices. See Black (1999), Weimer and Wolkoff (2001), Barrow (2002) and Bayer, Ferreira and McMillan (2005). For evidence that these effects can also be found outside the United States, see Cheshire and Sheppard (2003).

[2] Whether grades and the likes are a good measure of school quality is disputable. The discussion is beyond the focus of this paper and I will not engage in it.

When employing competition measures, endogeneity issues need to be taken into account. Picture a school district whose schools perform poorly. This district will be especially prone to the initiation of private schools, as there are more students who are unhappy with the school they presently attend and add to the demand for alternatives. Failure to acknowledge this mechanism may lead to an underestimation of the impact of choice on achievement. In a similar fashion, the number of school districts may be a function of school quality. Even though the endogeneity of competition has recently been contested by Brasington (2005) and Rothstein (forthcoming), accounting for the possible endogeneity through use of instrumental variables seems in order.

Empirical Evidence for the United States. Even though school choice continues to be promoted as a means of ensuring that students receive a better education and voucher programs are introduced or extended in the United States, the scientific evidence on the effects of competition are far from being unambiguous. Using data from the UTD Texas School Project, Hanushek and Rivkin (2003) define metropolitan areas as education markets. Competition is measured by a Herfindahl index, which shows no significant connection to school quality. Marlow (1999) on the other hand finds a positive impact on achievement in many of his specifications, when competition is operationalized through the use of a county-wide Herfindahl index. Earlier, Marlow (1997) had already stated positive effects of the number of available schools per student on SAT scores using state-level data.[3] Studies by Borland and Howsen (1993) and Zanzig (1997) only find effects up to a certain threshold level of competition. Geller, Sjoquist and Walker (2006) cannot identify a significant positive influence of competition by private schools on test scores in Georgia at all.

Most prominent in the public discourse are probably two studies by Hoxby (1994, 2000), using individual data. In the more recent paper she develops an index of competition based on the number of school districts in a metropolitan area. While she cannot identify a significant positive effect with OLS, the use of streams as an instrumental variable for the number of districts leads her to the conclusion of a positive influence of choice on achievement.[4] The earlier study also finds a positive effect, measuring competition as the percentage of students in the market attending private schools. Here, the instruments are the shares of the population associated with various religious denominations. An approach similar to Hoxby (1994) is used by Dee (1998), Jepsen (1999) and Sander (1999). Even though all three studies allow for endogeneity of competition, only Dee finds a significant positive link to levels of achievement. This lack of consensus is best summarized in an extensive survey of studies on school choice by Belfield and Levin (2002), who state that a mere third of the empirical analyses undertaken with US data find significantly positive effects of levels of competition on academic achievement.

[3]Schools per student is not a reasonable concept of competition when local education markets are studied. Simply imagine a local education market which harbors few students but only one school. This would imply high levels of competition when in fact the school is a local monopolist.

[4]The use of rivers as an instrument has recently been challenged by Rothstein (forthcoming), who claims that Hoxby's results cannot be replicated.

Empirical Evidence for Other Countries. Possibly due to the assumption that Tiebout-sorting is less prevalent in Europe, a large portion of the literature is concerned with North America. Moreover, in a European context, education isn't typically funded via local taxes, pointing to lower levels of Tiebout-style competition. However, there are countries which allow for school choice without changing residential location, i.e. these countries do not set up mandatory catchment areas. When the institutional feature of nationwide school choice is combined with fixed per-student governmental funding, the setup corresponds to an unrestricted nationwide system of school vouchers. A voucher system compares favorably to traditional Tiebout competition, as it enables low-income families who otherwise wouldn't be able to afford living in a good school district to exercise the *exit*-option. It provides a level playing field when it comes to making educational choices, at least on a financial level.

Outside Europe, Hsieh and Urquiola (2006) study the Chilean experience in the wake of the introduction of nationwide school vouchers in 1981. They find that not only did the voucher system fail in ameliorating educational outcomes but on top of that it led to increased sorting and cream-skimming, leaving the least able students behind in the public school system. Åhlin (2003) as well as Sandström and Bergström (2005) state that the abolition of catchment areas in Sweden and the installation of a voucher scheme in 1992 led to positive effects on achievement. Beneficial effects are also found by Bradley, Johnes and Millington (1999) for the United Kingdom and by Herczyñski and Herbst (undated) for Poland. Both these studies define competition as the number of schools in the education market. Using urban density as a proxy for school competition, Gibbons and Silva (2006) find that students in densely populated areas in the UK fare better academically.

When it comes to the Netherlands, the research on school choice has been largely descriptive (Patrinos (2000), De Vijlder (2000), Ritzen et al. (1997) and Dronkers (1995)). Levin (2004) and Dronkers (2004) examine the effect of attending a catholic school on academic performance. Both studies conclude that catholic schools generate superior educational outcomes. Clearly, this does not say anything about the impact of levels of competition on achievement. I will however take these results as ample evidence that the real outside option to attending a public school is transferring to a catholic school rather than choosing another public school.

All in all, the impact of school competition has been explored to a much lesser degree in Europe than in North America. Given the substantial institutional differences between the US and many European countries, further research is in order.

The remainder of the paper is organized as follows: part 2 explains in further detail the motivation for choosing the Netherlands as an object of examination. It gives a brief overview of the Dutch education system, which is characterized by centrally devised and graded school exit examinations and fixed per-student funding through the central government. In combination with school choice, this constitutes a system of nationwide quasi-vouchers. Data sources are described in section 3, along with the empirical strategy. Various measures of competition are introduced and instrumental variables correcting for

the possible endogeneity of school choice are discussed. Section 4 contains the empirical results. Beneficial effects of competition on academic achievement are found, no matter what measure of competition is employed. 2SLS estimations suggest that plain OLS underestimates the positive effect of competition. Section 5 concludes.

2 The Dutch Education System

In this section, a brief overview of the different types of schools in the Netherlands, the organization of school leaving examinations and centralized funding is given.

2.1 Types of secondary schools

Dutch compulsory education encompasses twelve school years and starts with primary education (*Basisschool*) at age five. Primary education lasts eight years and is in most cases completed with the taking of the *CITO* (*Central Institute for Test Development*) End of Primary School Test, a standardized test supposed to help parents determine the type of secondary education most suitable for their child.

Today, there are three types (*opleidingen*) of institutions in secondary education (*Voortgezet Onderwijs, VO*) among which parents may choose:

(i) Pre-vocational or middle level secondary education (*Voorbereidend middelbaar beroepsonderwijs, VMBO*) lasts four school years.

(ii) Senior or higher general secondary education (*Hoger Algemeen Voortgezet Onderwijs, HAVO*) amounts to five years of schooling.

(iii) Pre-university education (*Voorbereidend Wetenschappelijk Onderwijs, VWO*) encompasses six years of schooling and offers a choice of either the *"Atheneum"*, where neither Greek nor Latin is compulsory, or the *"Gymnasium"* which has obligatory Greek and Latin lessons. The goal of *VWO* education is to enable students to take up a university education; it is thus the highest form of secondary education in the Dutch education landscape.

Most Dutch schools offer more than one of these *opleidingen*, and often one school will provide access to all three sorts of secondary education. The analysis in this paper is restricted to the pre-university branch, because it is assumed that parents and students in higher branches make more use of the freedom to choose.[5]

[5]Denessen, Sleegers and Smit (2005) find that with higher socioeconomic status, proximity as a reason for a particular school choice becomes less important.

2.2 Mandatory School Leaving Exams

Dutch students end their secondary schooling careers with the taking of central examinations. These central exams (*centraal examen*) account for half the final grade. The other half is determined via decentralised testing (*schoolexamen*). The *centraal examen* are centrally arranged and graded by the testing agency *CITO*.[6] All students of the same *opleiding* are faced with identical questions and grading is done by *CITO* within 4 weeks' time. An official body, appointed by the Ministry of Education, *CEVO (Centrale examencommissie vaststelling opgaven)* establishes the norms for the central exams.[7]

2.3 School Choice and Centralized Funding

The demand side of the Dutch secondary education system is characterized by parents enjoying unrestricted nationwide school choice. There are no catchment areas whatsoever and schools can neither charge tuition nor easily decline students, thus leaving (at least theoretically) little room for cream-skimming.

Market entry barriers on the supply side are also low, as everyone in the Netherlands is granted the right to set up a school, if he so desires. The Dutch government is obliged to take care of school funding as soon as the number of enrolled students rises above a certain number, regardless of denomination or views held by the founders. A fixed annual transfer from the central government is then being triggered by every student enrolled in a particular institution of secondary education. Furthermore, if a school's enrolment drops below a certain level, it can be shut down. As a consequence of this institutional setup, 70% of Dutch secondary schools are non-public schools.

Even though Walford (2000) criticizes increasing interventions of the central government when it comes to curricula and the size of teaching staff, it is still obvious that this education system complies with conceptions of a competitive school system harbored by proponents of school choice. Hence, it makes for an interesting subject of studying the implications of school choice.

3 Empirical Strategy and Data Sources

This section describes the general estimation approach used in testing the theoretical prediction that schools which are exposed to higher levels of competition respond by providing superior school quality. It discusses various measures of school quality as well as competition. Furthermore, the possible endogeneity of the competition variable is addressed.

[6]For further information, go to: http://www.cito.nl/com_assess_ex/nat_final_ex/eind_fr.html

[7]In some subjects, no centralised testing occurs (e.g. physical education and arts). The analysis in this paper is limited to subjects where centralized testing is employed.

3.1 Estimation approach

Because the competition variables hardly vary over time and because of shortness of the time series (in essence, for lack of many control variables, only the years 2002 and 2003 can be used), I cannot estimate a fixed effects model. Rather, I am confined to cross-sectional analysis. Since the aim of this paper is to estimate the impact of competition on educational achievement and there is no theoretically backed assumption when it comes to what specification an education production function should have, the baseline estimation equation is linear OLS:

$$G_{ij} = \beta_0 + \beta_1 \cdot C_{ij} + \beta_2 \cdot x_i + \beta_3 \cdot z_j + \varepsilon_{ij}, \tag{1}$$

where i denotes the individual *VWO*-school and j education markets, G_{ij} is the average *centraal examen* grade at school-level, C_{ij} is the level of competition faced by school i in market j, x_i is a vector of control variables at the school level and z_j is a vector of control variables at the local geographic level. To allow for the possible correlation of ε_{ij} within geographic areas considered, the model is estimated with clustered standard errors.

3.2 Measuring Competition and Achievement

Two important questions have to be addressed before one can even estimate the OLS equation:

(i) Which outcome measure is to be employed?

(ii) How is competition to be measured?

Many dimensions spring to mind when (i) is considered. I choose the average grades in central exams. Even though quality of education involves so many more components than grades, these may well constitute the best available measure of educational output as they are considerably easier to grasp and measure than other aspects. These grades are determined by means of a central exam and central grading, administered by an independent institute (CITO). This practice renders them as close as one can get to an impartial measure of school quality. Since exams are mandatory, there is no worry about selection-bias, either. Other researchers have often used graduation rates as the outcome variable. In the Dutch setting this seems inappropriate, as half of the final grade and thus the graduation rate is determined via decentralised testing, making graduation standards in essence a choice variable of the individual school.[8]

Additionally, I examine the effects of competition on the level of grade inflation, as it is often argued that schools facing competitive pressure will try to attract students by

[8] On the setting of standards at the local level see Himmler and Schwager (2006).

inflating grades. The measure of grade inflation is $\Delta G_{ij} = G^s_{ij} - G^c_{ij}$, where G^c_{ij} denotes the average *centraal examen* grade and G^s_{ij} the average *schoolexamen* grade in school i in district j. The average grade G^c_{ij} is governed by the central standard defined by a committee of experts, whereas the school grade G^s_{ij} is governed by locally defined standards. Under coinciding central and school specific standards, one would expect $G^s_{ij} = G^c_{ij}$, because grading scales are identical in central and school exams. An upward deviation of G^s_{ij} from G^c_{ij} then constitutes a local standard that falls short of the central standard and is thus equivalent to grade inflation. The final outcome variable considered is per-student spending, which is expected to drop when schools are forced to operate efficiently under competition.

There are also numerous ways to capture the intensity of competition (ii). Probably most common is the use of the Herfindahl index, which measures the fragmentation of the student population within a given education market. The Herfindahl index that applies to a certain market j is calculated as:

$$H_j = \sum_{i=1}^{n} s^2_{ij}, \tag{2}$$

where s_{ij} is the share of *VWO*-school i's students in the total number of *VWO* students in market j.

A more straightforward measure is the number of *VWO*-schools within an education market, as choice ultimately is a question of the number of alternatives that are on offer.

Even in the presence of school districts, the problem with the above measures is that it is a priori unclear, what the geographical boundaries of an education market are. When Tiebout-sorting within a metro area is present, it is insufficient to consider only those schools within a school district as competition. Hence, it is common practice to count all schools within the metro as competitors. The Dutch system of free choice without the need to relocate aggravates the problem, as parents can theoretically reside in Amsterdam and send their offspring to a school in Maastricht. As attending a farther away school entails travel cost, it is reasonable to assume that there are limits in terms of distance when it comes to the choice of school.[9] Following Levin (2004), I assume that the Dutch *gemeenten*, roughly equivalent to US counties, constitute the boundaries to an education market and calculate the Herfindahl index as well as the number of *VWO*-schools at the *gemeente* level. I also use the number of *VWO*-schools within a 15km radius around the school in question as a robustness check.

One measure that does not carry with it the need to define education markets is simply the distance to the nearest *VWO*-school. Here, one would also expect the positive effects of competition to be larger in magnitude when proximity is high.

[9]Denessen, Driessena and Sleegers (2005) find that among 17 reasons parents cited contributing to the choice of their school, proximity ranked 5th. Quality of a school was found to be the most important reason for a particular choice. However, the definition of quality is by no means restricted to grades in their analysis.

In all of the above measures but the Herfindahl index, only catholic schools will be treated as competitors for the non-catholic schools. The reasoning is that when parents choose a school, the only real outside option is a catholic school rather than choosing another public school. As Levin (2004) and Dronkers (2004) have stated, catholic schools outperform other forms of schooling, making them all the more attractive. Furthermore, about 30% of all schools are catholic schools. This is a substantially higher share than in most other countries, making opting out a possibility that is widely available.

3.3 Endogeneity of Competition

Another issue that has to be dealt with, is the possible endogeneity of competition to local school quality. That is, in an area where public school quality is low, demand for alternative forms of schooling may be especially high, causing a downward bias in the competition coefficients estimated by OLS. Hence, 2SLS estimation is employed. The first (3) and second stage (4) equations are then:

$$C_{ij} = \gamma_0 + \gamma_1 \cdot I_j + \gamma_2 \cdot x_i + \gamma_3 \cdot z_j + \gamma_{ij}, \quad (3)$$

$$G_{ij} = \beta_0 + \beta_1 \cdot C_{ij} + \beta_2 \cdot x_i + \beta_3 \cdot z_j + \varepsilon_{ij}, \quad (4)$$

where the definitions are as in (1) and I_j is the set of instruments.

The first instrument is the number of catholics living in the education market.[10] As catholics tend to found and attend catholic schools, their number is obviously closely related to the number of catholic schools (and thus the Herfindahl index and the distance to the nearest catholic school) in a market. Exogeneity can be assumed because there is no reason to believe that catholics fare better on standardized tests. Moreover, geographical areas where catholics dominate are largely historically predetermined. Following Geller, Sjoquist and Walker (2006) as well as Hsieh and Urquiola (2006), the second instrument is the population of a *gemeente*. It is relevant, since the number of catholic schools is also related to the number of inhabitants within a certain market. The instrument is exogenous as population should neither have an effect on grades nor be affected by school quality.[11] Any urban/rural differences in achievement are tried to capture by controlling for population density at the market level. Local population size should not react to school quality, as it is not necessary to physically move to the vicinity of the school of choice.

[10] see Hoxby (1994) and many others.

[11] Gibbons and Olmo (2006) find that academic achievement is higher in urban areas of the UK. This could cast doubt on the assumption of exogeneity. However, they expressly attribute this effect to higher levels of competition.

3.4 Data Sources

The data employed in this analysis stems from six different sources. Data on catholic population was provided by the Institute for Applied Research on Religion (KASKI) of the Radboud University Nijmegen. School-level data concerning students' past and present performance along with personal traits such as social affiliation is taken from the *Kwaliteitskaart Voortgezet Onderwijs* (Quality Cards for Secondary Education), issues $2002-2004$. The *Kwaliteitskaarten* are published on a yearly basis by the Netherlands Inspectorate of Education and contain figures on examination results as well as efficiency measures for all Dutch secondary schools. They are being made available to parents and children via the internet in order to facilitate choosing an appropriate secondary school.

This dataset also provides school-level information on number of students, administrative form of the school (private/denominational/public), the school branches that can be attended at the school, average class sizes, subject-level average grades attained in school and central exams, the recommended type of secondary school based on students' performance in primary education (i.e. students' entrance levels of performance), the percentage of ethnic minority students, the percentage of pupils with a study cost allowance etc.

The dependent variable G_{ij} for the central exam is obtained directly from the dataset, whereas ΔG_{ij} for grade inflation is constructed from the performance data of the 2003 and 2004 *Kwaliteitskaarten*. As the original *Kwaliteitskaarten* file reports interdisciplinary average grades only on central grades, the average school specific (G^s_{ij}) and central (G^c_{ij}) grades covering all subjects are calculated by weighing the average school and central grades in each subject with the number of students that had actually taken part in the exams in that particular subject. Note that the empirical analysis will be restricted to the effect of catholic competition on the grades in non-catholic schools.

In order to minimize omitted variable bias, controls are added for factors that influence academic performance. The percentage of cultural minority ($CUMI$) students is defined as the share of students in a given school branch who have a non-Dutch background.[12] It is used along with the percentage of students receiving study cost allowance as a proxy for low social status. These proxies are used, as neither the Inspectorate nor the individual schools collect detailed data on parents' socioeconomic status. At the end of *basisschool* each student is given a non-binding advice by her teachers as to which school branch is deemed appropriate in secondary education. I add this advice as a control variable for the incoming students' skill level. Above advice denotes a student attending a more demanding branch than the one recommended. The percentage of students in ability-tracked classes in the second year of secondary education and the average class size from the *Kwaliteitskaarten* are also included.[13]

[12] Essentially, these are students whose parents were born in Eastern Europe or Third World countries.

[13] Ability-tracked in this context means that students attend classes with students from their chosen branch only, whereas non-tracked students attend classes together with students from other branches. After the second year of secondary education there are no mixed classes.

In addition to school level data, control variables which are available on a ZIP-code level only are used. Specifically, the *Statusscores postcodegebieden* are ZIP-code level data proxying for the students' social background. They are supplied by The Social and Cultural Planning Office of the Netherlands (SCP), a Dutch government agency. The status scores are calculated in 4 year intervals, taking into account variables such as mean education, mean income, average rents etc. Postcode areas that have a low social status are denoted with values greater than zero, areas of higher status receive negative values. These scores are matched with the schools' 4-digit postcodes taken from the *Kwaliteitskaarten*. More data on a postcode and *gemeente* level comes from the *Kerncijfers postcodegebieden 2003* as well as *Nederland regionaal*, published by the Dutch Office of Statistics (*CBS*).

Since school-level financial endowment as well as characteristics of the teaching staff might influence average grades and standard setting as well as per-student spending, data from the series *Onderwijs in Cijfers (OIC)* is used in the estimation, too. *Onderwijs in Cijfers* is published annually by the Dutch Ministry of Education and is intended to provide school managers with information on the above mentioned matters for all Dutch secondary schools.

(Table 1) displays descriptive statistics for the variables used in the estimation.

Table 1: Descriptive statistics

Variable	**N**	**Mean**	**Std. Dev.**	**Min**	**Max**
km to nearest cath. VWO school	588	12.093	17.272	0	78.070
km to nearest VWO school	588	2.326	3.233	0	17.281
No. cath. schools gemeente	588	0.969	1.319	0	5
No. cath. schools 15km radius	588	3.370	2.984	0	11
Herfindahl gemeente	588	0.424	0.321	0.059	1
Above advice %	558	22.437	17.796	0	100
Minority students %	588	4.502	7.710	0	76.433
Study cost %	588	27.514	11.148	8.673	93.877
Tracked %	564	61.959	35.557	0	100
Class size	569	25.441	2.573	17.2	31.666
Public dummy	588	0.445	0.497	0	1
No. Students (x1000)	588	1.159	0.459	0.153	2.849
Short term debt (share of balance)	548	0.320	0.114	0	0.868
Long term debt (share of balance)	548	0.030	0.063	0	0.401
Staff growth	572	0.035	0.052	-0.255	0.208
Students growth	572	0.016	0.048	-0.153	0.355
Part time teachers	572	0.378	0.098	0.149	0.729
Status score	588	0.035	1.102	-2.744	3.522
Mean income	568	13.916	2.738	9.705	27.676
School aged %	588	16.884	3.897	2.564	26.273
Population density	576	4538.796	3186.344	25	24098

4 Estimation Results

Descriptive statistics for the dependent variables G_{ij}, ΔG_{ij} and per student spending are shown in (Table 2) for the pooled classes of 2002 and 2003, split up by catholic schools and non-catholic schools. This distinction is made as I consider the impact of catholic competition on all non-catholic schools.[14] First of all, note that on average, grades awarded in central exams are slightly higher in catholic schools. The difference is not very large though, even for school-level averages.[15] Grade inflation on the other hand seems to be more prevalent in public schools. The average spending per student is also higher in public schools. As schools can gain additional funds from the government when they have a large share of minority students enrolled, no statements on efficiency can be made from this data.

Table 2: Summary statistics dependent variables

Variable	**N**	**Mean Cath.**	**Std. Dev**	**N**	**Mean non-cath**	**Std. Dev**
Central grade	180	64.518	2.145	585	63.993	2.926
Grade inflation	180	4.095	2.033	585	4.873	2.630
Per student spending	86	5797	1453	292	5971	1191

Estimation results when the central grade is used as the outcome variable are presented in (Table 3). The proxy for competition is displayed above the respective specifications. When distance to the nearest catholic school is the indicator for intensity of competition (1), the OLS coefficient shows the expected sign but is not significant. OLS coefficients for number of schools in the *gemeente* (3) and number of schools within a 15km radius (5) are significant at the one and ten percent level, respectively. If it is in fact true, that households mostly choose schools that are located within their own *gemeente*, then (3) is the appropriate specification, as (1) will sometimes be the distance to a school outside the school's *gemeente* and (5) will inevitably contain schools in other *gemeenten*. The larger coefficients of (3) in comparison to (5) may be a result of this household behavior, too. When instrument variable (IV) techniques are employed, all three specifications (2, 4 and 6) suggest that OLS heavily underestimates the effects of competition (All first-stage results suggest that the instruments are relevant and not weak.[16]).

The control variables mostly point in the theoretically expected direction. A high share of minority students and students whose advice after *basisschool* deemed *VWO* too demanding lead to lower average grades. The same goes for a high percentage of untracked students in the second year of *VWO*. Somewhat surprising is the highly significant positive coefficient of class size. This is mainly due to the fact that Dutch schools receive extra

[14] This includes non-public schools which are not affiliated with the catholic church, such as protestant schools.

[15] Keep in mind that while individual grades range from 0 to 100, school-level averages essentially only range from 60 to 70.

[16] First-stage results are not reported for the sake of space.

Table 3: Estimation results for central grades in pre-university education VWO

	(1) (Dist cat)		(2) (Dist cat IV)		(3) (C. Wts Gde)		(4) (C. Wts Gde IV)		(5) (15km C. Wts)		(6) (15km C. Wts IV)	
Competition	-0.010	(0.007)	-0.029*	(0.016)	0.277***	(0.114)	0.430***	(0.154)	0.075*	(0.045)	0.216*	(0.112)
Above advice %	-0.034***	(0.007)	-0.039***	(0.007)	-0.034***	(0.007)	-0.039***	(0.007)	-0.035***	(0.007)	-0.042***	(0.008)
Minority students %	-0.132***	(0.022)	-0.139***	(0.023)	-0.133***	(0.022)	-0.135***	(0.022)	-0.136***	(0.022)	-0.149***	(0.025)
Study cost %	-0.006	(0.014)	0.015	(0.016)	0.000	(0.014)	0.001	(0.014)	0.005	(0.014)	0.013	(0.015)
Tracked %	0.011***	(0.003)	0.010***	(0.003)	0.011***	(0.003)	0.010***	(0.003)	0.011***	(0.003)	0.012***	(0.003)
Avg. class size	0.143***	(0.052)	0.140***	(0.053)	0.133***	(0.052)	0.131***	(0.053)	0.143***	(0.052)	0.141***	(0.053)
Public dummy	-0.304	(0.248)	-0.306	(0.252)	-0.251	(0.248)	-0.224	(0.251)	-0.236	(0.252)	-0.131	(0.270)
No. of students	-0.307	(0.293)	-0.322	(0.296)	-0.312	(0.292)	-0.344	(0.292)	-0.278	(0.294)	-0.238	(0.302)
Short term debt	-1.647	(1.040)	-1.388	(1.065)	-1.531	(1.037)	-1.338	(1.045)	-1.478	(1.050)	-0.975	(1.116)
Long term debt	-2.464	(1.834)	-1.982	(1.859)	-2.113	(1.834)	-1.562	(1.847)	-2.398	(1.834)	-1.850	(1.867)
Staff growth	-2.138	(2.606)	-2.395	(2.645)	-2.133	(2.594)	-2.390	(2.614)	-2.174	(2.603)	-2.564	(2.650)
No. students growth	-0.677	(2.918)	-1.431	(3.044)	0.106	(2.888)	0.431	(2.902)	-0.569	(2.904)	-1.087	(2.989)
Part time staff %	0.807	(1.396)	0.918	(1.427)	0.474	(1.390)	0.262	(1.400)	0.527	(1.396)	0.014	(1.444)
Status ZIP	-0.256	(0.202)	-0.213	(0.205)	-0.347*	(0.204)	-0.370*	(0.206)	-0.292	(0.203)	-0.308	(0.207)
Avg. income ZIP	-0.105	(0.081)	-0.119	(0.085)	-0.126	(0.081)	-0.129	(0.082)	-0.117	(0.081)	-0.151*	(0.090)
Share school aged ZIP	-0.074*	(0.039)	-0.074*	(0.040)	-0.064*	(0.039)	-0.053	(0.039)	-0.070*	(0.039)	-0.065	(0.039)
Pop. density ZIP	-0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)
Year 2003	0.218	(0.235)	0.198	(0.239)	0.241	(0.234)	0.245	(0.235)	0.221	(0.235)	0.208	(0.239)
Intercept	64.651	(2.259)	65.066	(2.374)	64.913	(2.246)	64.841	(2.265)	64.362	(2.238)	64.276	(2.278)
N	467		461		467		461		467		461	
R^2	0.27		0.27		0.28		0.28		0.27		0.26	

Standard errors in parentheses.
*, **, *** designate significance at the ten, five, and one percent level respectively.

Table 4: Est. results for central grades (7,8), expenditure (9,10) and grade inflation (11,12) in VWO

	(7)		**(8)**		**(9)**		**(10)**		**(11)**		**(12)**	
	(Herf Gde)		**(Dist VWO)**		**(Dist Cat)**		**(Dist Cat IV)**		**(C. Wts Gde)**		**(C. Wts Gde IV)**	
Competition	-1.197***	(0.434)	-0.007	(0.041)	11.12***	(4.42)	30.34***	(10.68)	-0.206*	(0.105)	-0.273*	(0.143)
Above advice %	-0.032***	(0.007)	-0.033***	(0.007)	-9.06**	(4.22)	-7.86	(4.83)	0.031***	(0.006)	0.034***	(0.006)
Minority students %	-0.126***	(0.022)	-0.128***	(0.022)	14.90	(13.09)	-11.09	(11.41)	0.108***	(0.020)	0.108***	(0.020)
Study cost %	-0.000	(0.014)	0.002	(0.014)	-0.71	(9.58)	24.82*	(14.59)	0.002	(0.013)	-0.003	(0.013)
Tracked %	0.011***	(0.003)	0.011***	(0.003)	-3.69*	(2.19)	-3.57	(2.33)	-0.012***	(0.003)	-0.011***	(0.003)
Avg. class size	0.146***	(0.052)	0.147***	(0.052)	-80.85**	(34.19)	-77.04**	(36.13)	-0.087**	(0.049)	-0.086*	(0.049)
Public dummy	-0.352	(0.247)	-0.307	(0.249)	455.20***	(154.87)	449.20***	(163.84)	0.306	(0.230)	0.288	(0.232)
No. of students	-0.360	(0.292)	-0.317	(0.294)	-54.51	(176.76)	-83.71	(186.98)	0.487*	(0.270)	0.501*	(0.271)
Short term debt	-1.611	(1.032)	-1.776*	(1.044)	430.78	(654.69)	30.55	(722.14)	2.189**	(0.961)	2.133**	(0.968)
Long term debt	-1.958	(1.835)	-2.528	(1.862)	1213.07	(1064.95)	1122.76	(1125.10)	3.065*	(1.700)	2.723	(1.712)
Staff growth	-1.514	(2.600)	-2.113	(2.618)	-2470.16	(1805.64)	-2806.87	(1920.32)	1.664	(2.404)	1.945	(2.423)
No. students growth	-0.623	(2.884)	-0.239	(2.913)	-2211.52	(2154.58)	-1280.75	(2354.40)	-2.907	(2.676)	-3.071	(2.690)
Part time staff %	0.472	(1.387)	0.671	(1.400)	-2083.03**	(824.03)	-2347.81***	(881.78)	0.715	(1.288)	0.748	(1.298)
Status ZIP	-0.343*	(0.203)	-0.267	(0.203)	11.02	(122.59)	-13.41	(129.99)	0.231	(0.189)	0.238	(0.191)
Avg. income ZIP	-0.145*	(0.082)	-0.092	(0.080)	120.74**	(49.02)	150.02***	(53.41)	0.127*	(0.075)	0.124	(0.076)
Share school aged ZIP	-0.067*	(0.038)	-0.070*	(0.039)	-18.71	(24.17)	-12.33	(25.68)	0.045	(0.036)	0.039	(0.036)
Pop. density ZIP	-0.000	(0.000)	-0.000	(0.000)	0.11***	(0.02)	0.14***	(0.03)	0.000***	(0.000)	0.000**	(0.000)
Year 2003	0.238	(0.233)	0.226	(0.235)					-0.196	(0.217)	-0.201	(0.218)
Intercept	65.834	(2.299)	64.292	(2.268)	6908	(1454)	6372	(1553)	2.132	(2.082)	2.255	(2.100)
N	467		467		222		219		467		461	
R^2	0.28		0.27		0.22		0.14		0.27		0.27	

Standard errors in parentheses.
*, **, *** designate significance at the ten, five, and one percent level respectively.

funding for low ability students. These funds are mostly used to lower class size. In the end this means that smaller classes are a proxy of sorts for a high number of underachieving students. The public school dummy and the financial variables also have the expected signs, though they are not significant.

Columns (7) and (8) in (Table 4) employ two measures of competition which do not solely depend on catholic school competition. The first column shows results when the Herfindahl index is used. Evidently, higher concentration leads to lower average grades. Even though the Herfindahl index comprises the shares of all schools in a market, it is still heavily influenced by the number of catholic schools in the market. Thus, the significant coefficient does not stand against the hypothesis that catholic schools are the real competition. Quite the contrary, when distance to the nearest *VWO*-school regardless of denomination is used in specification (8), the competition effect vanishes. IV estimates for these two specifications are not reported, since they point in the same direction as the OLS results.

Turning to financial outcomes, specification (9) suggests that higher levels of competition (measured by lower distance to the nearest catholic school) lead to lower per-student spending. Also in line with theory is the fact that public schools spend more. IV results show that OLS results are downward biased.

Finally, specification (11) is concerned with the effect of competition on grade inflation. As stated above, theory suggests that under competitive pressure, schools will tend to award higher *schoolexamen*-grades in order to attract students. Somewhat puzzling is the fact that OLS as well as IV results (12) show that higher levels of competition actually induce lower levels of grade inflation. In fact, the IV coefficient suggests that OLS underestimated this beneficial effect of competition.

5 Conclusion

This paper analyzed the effect of competition on achievement in a setting that satisfies most of the criteria that are stipulated by school choice proponents. The Dutch empirical evidence is in line with theoretical predictions. All of the empirical results support the notion of competition in the educational sector yielding beneficial results. Competition in the Netherlands is driven by catholic schools while non-catholic alternatives do not lead to markedly higher educational attainment. So far, only competition in the pre-university branch of education has been considered. Hence, it will be interesting to see whether these effects carry over to the lower school branches.

A caveat is in order, though: If sorting by ability and consequently peer effects occur, it is unclear what is driving these results. Suppose that school choice leads to perfect segregation by ability, i.e. all high-ability students leave for a catholic competitor. Those students remaining in the public sector would then attain considerably lower grades than

the former mixed-ability student population. Then, using only non-catholic grades as the outcome variable could lead to the assumption that competition leads to lower achievement when this market is compared to one where no segregation occurs for lack of alternatives. Even when a rich set of controls is used, one couldn't completely disentangle the effect of sorting from the impact of competition. From the above results one could then hypothesize that in the Netherlands, the less able students leave for catholic schools. As a first test, the regressions were run using catholic-grades as outcome variables. Competition does not seem to affect catholic grades, thus the competition effect net of sorting is supposedly still positive. Following Hsieh and Urquiola (2006), in order to further address this problem, the competition effects will be estimated using *gemeente*-level aggregate grades of all schools regardless of denomination.

There is also a need to look deeper into the mechanisms that drive the setting of standards at the local level. This is even more true, as the effect this paper finds on grade inflation is beneficial, yet contradictory to what theory suggests.

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