Schumpeter School
of Business and Economics

SCHUMPETER DISCUSSION PAPERS

The effect of free primary school choice on ethnic groups – Evidence from a policy reform

Kerstin Schneider
Claudia Schuchart
Horst Weishaupt
Andrea Riedel

The Schumpeter Discussion Papers are a publication of the Schumpeter School of Business and Economics, University of Wuppertal, Germany
For editorial correspondence please contact SSBEEditor@wiwi.uni-wuppertal.de

SDP 2011-007
ISSN 1867-5352

Impressum
Bergische Universiät Wuppertal
Gaußstraße 20
42119 Wuppertal
www.uni-wuppertal.de

BERGISCHE
UNIVERSITÄT
WUPPERTAL

The effect of free primary school choice on ethnic groups – Evidence from a policy reform

Kerstin Schneider*†
University of Wuppertal and CESifo
schneider@wiwi.uni-wuppertal.de

Claudia Schuchart
University of Wuppertal
schuchart@uni-wuppertal.de

Horst Weishaupt
University of Wuppertal and DIPF
weishaupt@dipf.de

Andrea Riedel
University of Wuppertal and DIPF
riedel@wiwi.uni-wuppertal.de

February 2011

* Corresponding author: Kerstin Schneider, Department of Economics, University of Wuppertal, 42119 Wuppertal, Germany, e-mail: schneider@wiwi.uni-wuppertal.de, phone:+49(202)-439-2483, fax: +49(202)-439-3649

† Funding by the Deutsche Forschungsgemeinschaft (DFG) (SCHN 632/3-1) is gratefully acknowledged. The authors would like to thank the town council, the statistics department, the department of geological data, the supervisory school authority, and the principals of the primary schools in Wuppertal for their advice, encouragement, and patience, and for providing the data used in this research. The paper also benefited greatly from research assistance by Anna Makles.

Abstract: In 2008, school districts were abolished in North Rhine-Westphalia, the most populous German federal state. Critics have argued that free school choice will lead to increased segregation and educational disparities. The data used is from Wuppertal, a major city in NRW. Since the Turkish population is the largest minority in Germany, but also one of the least integrated, the focus of this paper is on the effect of the new school law on the school choice of Turkish (Muslim) versus non-Turkish (non-Muslim) families. Free school choice has led, in fact, to increased choice on the part of both advantaged and (to a lesser extent) disadvantaged families. Motives behind choice include proximity, the composition of the school, and the academic quality of the school. The effect of this increased choice on segregation is inconclusive.

Keywords: educational policy reform; school districts; school choice; segregation

JEL classification: I20; H75; J15

1. Introduction

Until recently, school choice has not been a prominent issue in educational policy in Germany. It is commonly thought that there is no choice at the primary school level, with the focus of research thus lying more on choice in secondary schooling (Dustmann, 2004). But school choice at the primary school level has gained more attention since one federal state, North Rhine-Westphalia (NRW), decided to abolish school districts in 2008 and to allow for parental choice. It is less known, however, that even before 2008 it was not uncommon to opt out of one's assigned primary school (Kristen, 2005; Riedel et al, 2010). Thus, it is quite surprising that no substantial research on primary school choice in Germany has been conducted. We intend to contribute to the literature on school choice by analyzing the effects of a far-reaching educational policy experiment, i.e. the abolition of school districts, on parental choice and ethnic segregation.

In the international literature, school choice has drawn considerable attention. Choice is thought to have a positive impact on competition between schools and might therefore increase the quality of schooling (Hoxby, 2003; Figlio & Hart, 2010). However, whether school choice does in fact increase student achievement remains a debated issue (Cullen, Jacob & Levitt, 2005). The main intention of increasing school choice by introducing charter school programs was to reduce racial and social segregation and to improve the educational opportunities of more disadvantaged groups (Hanushek, Kain, & Rivkin, 2009; Hastings & Weinstein, 2008; Fryer & Levitt, 2004). However, the results of many studies suggest the opposite, as increased school choice also has potentially negative effects (Lankfort & Wyckoff, 2001; Bifulco, Ladd & Ross, 2009). School choice tends to increase social and ethnic segregation rather than to decrease it (Burgess and Briggs, 2006). Walsh (2009) does not argue against these findings, but claims that even without choice, within-school heterogeneity is so low that cream-skimming of the remaining high-ability children would not have a sizable effect on those left behind. Urquiola (2005) points out that differences in the composition and distribution of students in public schools result not only from school choice, but also from the different number of school districts in any given metropolitan area. Increases in the number of districts in a metropolitan area result in a more homogenous school district population (i.e. increased Tiebout choice), hence reducing private enrollment.

As Bourdieu (1986) argues, school choice is less common in disadvantaged families due to limited economic, cultural, and social resources. Accordingly, a number of studies have shown that choice is practiced primarily by socioeconomically advantaged, better-educated individuals. Low-income families, in contrast, attach higher value to proximity when choosing schools, because of the importance of travel costs (O'Shaughnessy, 2007). Confirming the findings of international studies dealing with Germany, we show that disadvantaged students are less likely to opt out of their assigned school (Riedel et al., 2010). In these cases, choice depends on the student's ethnicity and distance from school, the academic quality of the school, and the socioeconomic composition of the school.

Preferences for the school's social composition, however, also depend on the parents' ethnic status. It has often been shown that white parents are more likely to opt out of their children's assigned school if they live in an attendance zone with a high percentage of black students (Lankfort & Wyckoff, 2001; Söderström & Uusitalo, 2010; Bifulco et al., 2009). Black parents are more likely to choose schools with a higher concentration of students with the same ethnic background, rather than their children's assigned school (Booker et al., 2005).

Only few studies address the effect of changes in educational policy on segregation. Söderström and Uusitalo (2010) analyze the change in the admission system of public upper secondary schools in Stockholm. Before 2000, proximity to school was the main criterion for being admitted to school. Since 2000, however, admission has been based on student ability. Söderström and Uusitalo's results indicate that school segregation based on family background as well as immigrant status has increased significantly. However, the study does not determine whether this increased segregation is caused by parental choice and/or by the admittance strategy of schools. Machin and Salvanes (2010) use evidence from a change in school choice policy in Oslo county to identify the impact of school quality on house prices. They confirm that parents, in fact, do value better-performing schools and are willing to pay higher prices for homes close to better schools. Once the system of rigid catchment areas was abandoned, however, the link between house prices and school performance was significantly weakened. Lavy (2010) evaluates a program in which inter-district busing integration was replaced by free school choice between schools within and outside of districts in Tel Aviv. Their findings suggest that free school choice has led to an improved matching of student to school, resulting in increased achievement.

This paper aims to understand the effects of introducing free primary school choice in North Rhine-Westphalia in 2008. While advantaged groups might enjoy the positive aspects

of increased choice, disadvantaged groups might not be able to fully benefit from the new rules. Hence, disadvantaged groups might suffer additional losses in terms of educational opportunity, resulting in further poverty (Fertig & Tamm, 2010). This supports the most frequently-cited argument against free school choice, namely the fear of increasing segregation and educational disparity in Germany. Since children of immigrant families are disadvantaged in the German education system, our focus is on analyzing differences in school choice behavior over time and between groups - particularly in regard to Turkish children, who belong to the largest and least-integrated ethnic group in Germany. Because information on ethnicity is not readily available in the official statistics, we make use of the children's citizenship and denomination to distinguish between those who belong to advantaged groups and those who belong to disadvantaged groups. As the aim is to understand the choice behavior of Turkish (or, more generally, Arab) families, the information whether a student is Muslim or not serves as a proxy variable.

Our analysis is twofold. First, we look at changes in school choice behavior in Wuppertal, a major city in NRW, before and after the new legislation was introduced, using data from official statistics, school statistics, and student records. The data used is readily available for all German communities. Hence, the study is easily replicable for other municipalities. Second, we analyze how the new school law has affected segregation, as the downside of increased choice might be a higher level of segregation. Our first finding is that school choice significantly increased after the reform was implemented. This applies to advantaged families as well as disadvantaged families. However, there are differences between the two groups. For instance, with regard to choice behavior, the two groups attach different levels of significance to composition and achievement characteristics. Using information about school size caps, we also discuss supply and demand effects on observed school choice. Interestingly, however, despite the increase in choice, the level of segregation did not significantly change in the first year after abolishing the school districts.

The remainder of the paper is organized as follows: In Section 2, we give information on the institutional details of school choice in NRW. The data used in this study is described in Section 3, and in Section 4 we explain our empirical strategy and present the results. We conclude in Section 5.

2. School choice in North Rhine-Westphalia: The situation before and after 2008

Before the 2008/2009 school year, choice in German primary schools appears to have been rather limited. Students were assigned to a public school (Gemeinschaftsgrundschule) in a school district. However, choice was not as limited as it initially appears to be.

First, parents could apply for permission to attend a different school (§39 SchulG-NRW [NRW School Law]). They had to present a convincing argument, such as the presence of a child care provider in another school district. Neither school quality nor the social composition of the school were accepted arguments. The parents' application was discussed by the principals of the chosen school and the principal of the assigned school in the school district of residency. The final decision was made by the school authorities. To our knowledge, there is no research conducted before 2008 that analyzes the authorities' granting and denying of permission to attend a public primary school other than the one assigned.

Second, there are public denominational schools (öffentliche Bekenntnisschulen). Public schools and public denominational schools do not charge tuition and are fully publicly funded. In the following, we simply label them public schools and denominational schools. In addition to the public and denominational schools, there is a rather small number of private primary schools, which will, however, be disregarded in this study. Private schools might charge a school fee and are often Waldorf schools, Montessori schools or private denominational schools with a strong focus on religious education. Private denominational schools are partially funded by the church, which is not the case with public denominational schools in NRW. Children in NRW have the right to attend a denominational school in their community or a neighboring community if the child belongs to that denomination (§26 SchulG-NRW). A child might also be admitted to a denominational school even if that child does not belong to the school's denomination, in cases where the parents wish their child to be educated according to that denomination. This is clearly a soft condition which is not verifiable and leaves room for interpretation. Moreover, children of a different denomination might be admitted to a denominational school if there is no school of the child's denomination within a reasonable distance from the child's home.

Since the 2008/09 school year, school districts for primary schools have been abolished in NRW. Theoretically, this should give parents free choice of school; in practice, however, this is not the case. First, the amount of information given to parents is limited. Parents of school-age children receive a letter from the local school authority informing them that they have to enroll their child, and they are given the address of the nearest school. Most, but not all, primary schools have a homepage with information about the school; however,

indicators of the achievement level of the schools are not published at all. Second, the schools are given fairly strict legal guidelines on how to determine admission, with distance to the chosen school being the most important restriction. It is explicitly stated in the school law that students have the right to be admitted to the closest school of the chosen school type (public or denominational) if the capacity of the school permits (§ 46 SchulG). Interestingly – and this is not a result of the school reform – the NRW constitution explicitly rules out family background as a criterion for admission to a school (Art. 10 LV NRW). A third point to note is that, due to demographic change, the number of school children is decreasing in NRW, leaving more room for choice and also for increased competition between schools.

3. The description of the data and summary statistics

The present paper analyzes school choice in Wuppertal, one of the ten biggest cities in NRW. Wuppertal has about 350,000 inhabitants and 48 public primary schools, 11 public Catholic schools, and 2 public Protestant schools (cf. Figure 1). In addition to the public schools, Wuppertal has two Waldorf schools, one Catholic private school, one Greek primary school, and one private primary school. Since the private school sector is rather irrelevant, it has been disregarded in the following analysis.

Wuppertal used to be a rich industrial city and is, like many such cities in NRW, now experiencing structural change and suffering from severe economic problems. The unemployment rate in 2007 was 12.6 percent and the welfare dependency rate was 16.5 percent, which is higher than both the 2007 national and regional averages. As Figure 1 illustrates, Wuppertal is a city with a great deal of socioeconomic diversity, which makes it an interesting city in which to study the effects of school choice. The immigrants are not equally distributed among the school districts, but are concentrated in the central (east-west) axis of the city around the Wuppertaler Schwebebahn (suspension railway), the city's best-known landmark and the most important element of its public transportation. The proportion of immigrants drops considerably if one moves away from the central axis in the valley to the outer, mountainous regions of Wuppertal. A similar pattern occurs when looking at the distribution of welfare dependency rates and unemployment rates. Furthermore, the parts of Wuppertal close to the axis are also more densely populated when compared to the outer city regions, which is also reflected by the distribution of primary schools. The density of schools is much higher in the valley than in the outer parts of the city. Note that the Wupper river is a

fairly narrow, unnavigable river with a large number of bridges crossing the river in Wuppertal. Hence, the river is not a natural boundary concerning school choice decisions.

The data used in this analysis is collected from different sources. We are able to combine data from official statistics with the school statistics and information on the student level. Furthermore, the data is available for 2007 and 2008[1] and is summarized in Table 1. Significant differences in the sample means are bold. In columns (1) and (2), we summarize the data for all schools in the sample, and in (3) and (4) only public schools are included.

Since we are interested in understanding the school choice of different ethnic groups in Germany, we pursue two alternative strategies. First, we distinguish between the German and Turkish populations, since Turkish people constitute the largest group of immigrants in Germany[2]. The Turkish population in Germany is not only the largest group of immigrants in Germany, but also the least integrated of the major ethnic minorities (Berlin Institut für Bevölkerung und Entwicklung, 2009). Moreover, differences in the economic situations of ethnic Germans and first and second generation immigrants from Turkey are stunning (Algan et.al., 2010). To further integration, the participation of minorities in education is essential. One problem with the data is that the Turkish population, Turkish children in particular, are hard to identify from the official statistics and from the school statistics. The data refers to the child's first citizenship, but children of immigrant families born after January 1st, 2000, whose parents have been living legally in Germany for at least eight years, are automatically granted German citizenship. This problem is even worse in the school statistics, as this information is provided by parents and not cross-checked.

Because there is no reliable information on a given individual student's ethnic background in the school statistics, we use information on the city block level to describe the ethnic composition of the students' local neighborhood. In our sample, the amount of Turkish people per city block is less than five percent, which is less than the size of the Turkish population in Wuppertal. The information is nevertheless useful, as it also describes the percentage of Turkish people in a neighborhood relative to other neighborhoods. In the regression analysis, the absolute level is less important than the information on the relative magnitudes. Hence, the percentage of Turkish people in the neighborhood might reflect the

[1] Data from the official statistics is only available for 2007.

[2] In 2008, the number of Turkish people living in Germany was about 1.7 million. This amounts to 24 percent of all immigrants in Germany.

student's background even better than his/her own citizenship. The ethnic composition of the school district is described by the percentage of Turkish people in the school district.

As noted above, citizenship has become an increasingly less reliable indicator when it comes to issues of ethnicity. Hence, we follow a second strategy to identify disadvantaged students by using information about student denomination, particularly whether the student is Muslim or not. One remaining problem with that definition is the heterogeneity of the non-Muslim group, which includes other disadvantaged ethnic groups which are not well-integrated, such as immigrants from Eastern European or Southern European countries. To deal with this problem, we have only kept German, non-Muslim children and Muslim children (with and without German citizenship) in the sample.

–- about here Table 1 –

Participation in this study was voluntary for the schools, and not every school provided data on its students' denomination and citizenship. Moreover, some schools were about to be closed or did not have enough applications in 2008 to form a first grade. The final data comprises only schools that supplied citizenship and denomination information in 2007 and 2008, which is true for 42 schools (33 public, 8 Catholic, 1 Protestant).[3]

The number of students in the sample is 8991. There are 7012 students in 2007, which includes all students in grades 1 to 4, i.e., all students enrolled in primary school at that time. Hence, the figures in 2007 are a four-year average. For 2008, the first year with free school choice, we use data on 1979 first-graders only. Restricting the sample to public schools reduces the number of students to 5583 in 2007 and 1574 in 2008. The remaining students attended a denominational school at these times. The percentage of students at denominational schools drops slightly from 2007 (20.7 percent) to 2008 (19 percent).

The percentage of Muslim students in our sample increases from 21 percent (2007) to 23 percent (2008); moreover, there are some other differences between 2007 and 2008. For instance, the percentage of Turkish people in the neighborhood as well as in the school district increases from 2007 (the average of the four grades) to 2008 (the first grade). This also applies to the welfare dependency rate, which goes up from 16 percent in 2007 to 17.8 percent

[3] We also conducted the analysis using data on schools that supplied data for only one year. The qualitative results did not change.

in 2008. Moreover, the average transfer rate to academic track schools at the chosen school is significantly lower in 2008. While the change in the average transfer rate at the chosen school might be the effect of increased choice, the changing ethnic composition of the school district and the neighborhood is the result of changes in the structure of the school-age population, which is common in larger cities in NRW.

Since we have information about the students' addresses, we also know their assigned public school. Using the address information, we calculated the Euclidian distance from the students' home to their assigned school.[4] Here we report the distance to his/her assigned public school. In 2008, the distance to the assigned school was about 633 m, which does not differ significantly from 2007 (642 m).

The data also provides information on the availability of alternatives and their costs, as measured by the distance to an alternative school. Our measure of the density of schools close to the student's home is simply the number of schools within a radius of 1 and 2 km. In 2007, for instance, the average number of schools within a radius of 1 km was 2.4, while the average number of schools within a radius of 2 km was 7. Note that the number of alternative schools increases slightly when compared to 2007. This is not due to new schools in the city, but rather to a shift in the school-age population to the more densely populated and less wealthy parts of Wuppertal. Assuming that the composition of socially advantaged and disadvantaged students is an indicator of school quality, a variable measuring distance to the next school with a more favorable composition can be constructed. Here, we use distance to the next school where the proportion of students with non-German ethnic backgrounds is at least five percentage points lower than that of the assigned school[5]. The average distance to a school with a more favorable composition in 2007 is 2.5 km for the total sample and 2.9 km for children who attend a public school.

While the ethnic composition of a school might be one factor behind school choice, the level of academic achievement (i.e. school quality) might be equally important. School quality is clearly hard to assess: while student achievement, one possible indicator of school quality, is measured and published in other countries, Germany lacks comparable information. Hence, we follow a different strategy to gather information on academic achievement, namely

[4] Burgess et al. (2006) discuss the use of various measures of distance and conclude that, despite some drawbacks, the Euclidian distance is reasonably accurate.

[5] If there was no school with a rate of immigrants five percentage points lower, the distance to the school with the lowest percentage of immigrants was chosen.

using schools' transfer rates to the academic track. After primary school, German students receive a (more or less binding) teacher recommendation for a secondary school. In NRW, the alternatives consist of a basic track school, an intermediate track school, an academic track school, and a comprehensive school, which has an internal streaming system. The most prestigious of these tracks is the academic track school. After graduating from an academic track school (Abitur), academic track students are entitled to study at a university.

Schools in Wuppertal vary widely with respect to the percentage of students transferring to the academic track. The average transfer rate per school in Wuppertal between 2003 and 2006 ranges from 10.6 percent to 66.8 percent. Protestant schools have the highest average transfer rates, whereas Catholic schools in Wuppertal only exhibit average performance. In our sample, the average transfer rate is 35.2 percent in 2007. Note that the transfer rate at assigned schools could be used as an alternative measure of quality. However, the transfer rate at assigned schools is highly correlated with the social composition of the school district, thus resulting in collinearity; therefore, it is hard to disentangle the effects of quality and social composition. To calculate a proxy variable for the availability of a higher quality school, we use the distance to the next school where the transfer rate to the academic track is five percentage points higher.[6] In our sample of 2007 data, the average distance to a higher quality school is about 1.5 km in the sample of all schools, and about 1.7 km in the sample of public schools.

-- about here Table 2

Table 2 summarizes the data by denomination. Muslims live in school districts with a substantially higher percentage of Turkish people, which is expected. This difference is even more striking when looking at the city blocks, i.e., the neighborhoods where the students live. We also see remarkable differences in welfare dependency rates between the two groups. Muslim families live in neighborhoods with about 27 percent welfare dependency rates, compared to 14 percent for the non-Muslim sample. The data also shows that Muslims tend to live in school districts with lower achievement levels (not reported). If Muslim families exercise school choice, the difference between the transfer rates to the assigned and chosen schools is not as large as it is for non-Muslim families. The average transfer rate at attended schools is about 26 percent for Muslim students and about 37 percent for non-Muslim

[6] If there was no school with an academic track transfer rate which is five percentage points higher, the distance to the school with the highest transfer rate is chosen.

students. Thus, either academic achievement is a weaker motive for school choice in Muslim families, academic achievement is assessed differently in Muslim families than in non-Muslim families, or Muslim families simply do not have access to higher quality schools. Finally, Muslim children live closer to their assigned schools, as well as to alternative schools with less non-native Germans. Moreover, they have more alternative schools within a radius of 1 or 2 km. This is due to the higher density of schools in the parts of Wuppertal close to the axis, which are more densely populated and which are inhabited by a larger proportion of economically disadvantaged families (cf. Figure 1).

In Table 3 we summarize the percentages of choosing families by denomination and year. As Table 3 shows, choice was already substantial in 2007 and does, in fact, increase further in 2008. In 2007, 34 percent of all primary school students attend a school other than the one assigned. This number rises to 40 percent in 2008. However, public and denominational schools are not equally affected by the new legislation. Within the sample of public schools, the percentage of students who opt out of their assigned school rises from 15 percent to 24 percent. This is a substantial increase, and one which basically accounts for practically all of the overall increase in school choice. The denominational schools did not benefit from increased school choice.

–- about here Table 3

In column (2) and (3) we compare Muslim and non-Muslim families. In 2007, 34 percent of non-Muslim students attended a school other than the one assigned. Only 28 percent of all Muslim families chose a non-assigned school. After abolishing school districts, Muslims and non-Muslims alike more frequently choose a school other than the one assigned. While Muslims still exercised school choice less often than non-Muslims in 2008, the relative increase is even stronger for Muslims. At first glance, this is surprising. However, before 2008, denominational schools presented a less bothersome alternative for many parents who wanted to opt out of their children's assigned school without going to the trouble of applying to a different school. Since 2008, however, families have not needed to present a coherent reason for opting out. Hence, Muslims might particularly benefit from the new school law. They might have had strong preferences regarding education before 2008, but decided not to

exercise choice when choice implied attending a Christian school.[7] The data, however, does not fully support this view. 19 percent of the Muslims in Wuppertal attended a Catholic school in 2007. This percentage rises to 21 percent in 2008. As expected, however, the largest increase for this group is observed for public schools.

4. Determinants of choice

Analytical strategy

Our analytical strategy is twofold. First, we analyze the data in a regression framework to better understand the motives behind school choice and how the new legislation has affected school choice decisions. According to the literature presented above, we expect that choice (i.e. opting out of one's assigned school) is generally driven by school characteristics such as student composition and school quality. However, preferences differ according to background: we expect the choice of non-immigrant parents to be driven by preferences for high-quality schools and favorable student composition. In contrast, immigrant parents face a trade-off between high-quality schools and schools with a high proportion of students from their own ethnic background. Second, we study the effect of free school choice on segregation in Wuppertal. In general, we expect segregation to be higher after the abolition of school districts than before. Non-immigrant (i.e. advantaged) parents should benefit more from the new law than immigrant (i.e. disadvantaged) parents.

The models to be estimated are based on the following considerations. Parents will not choose their assigned school if choosing another school is more attractive, i.e. if the benefits of choice outweigh the costs. Choice is a binary variable, i.e. the dependent variable, Y_{is}, is 1 if the student chooses a non-assigned school, and zero otherwise. The underlying probability that student *i* will not visit his/her assigned primary school depends on the costs and benefits of opting out. It is a function of student level variables, $\mathbf{X}_{is}$, such as family preferences regarding education, distance between the students' home and the assigned public school, and characteristics of the students' neighborhood. Besides individual characteristics, choice is also a function of the characteristics of the school district and school characteristics, X_S, such as the ethnic composition and academic achievement of the school. The school district variables reflect the socioeconomic composition of assigned schools in the absence of choice. If the assigned school is located in a school district with a high percentage of families with a non-

[7] The importance of religion and religiosity for school choice are analyzed using US data in Cohen-Zada and Sander (2008).

German ethnic background, this suggests that the assigned school exhibits an unfavorable socioeconomic composition, which might induce families to send their children to schools with a more favorable composition.

School quality is yet another important predictor of parental choice. One available indicator of quality is the transfer rate to the academic track. Higher transfer rates correspond to higher academic achievement, and hence also reflect the academic level of the school's peer group. Thus, schools with higher transfer rates are more often chosen. To avoid potential endogeneity problems – school composition is affected by choice, and choice affects transfer rates – we use lagged values of the academic track transfer rate. There are two alternatives to control for the transfer rate in our regression analysis. First, one could use the transfer rate of the assigned school. However, the transfer rate and the ethnic composition of the school district are highly correlated, and it is not possible to disentangle the effects of school quality and ethnic composition. Second, one could use the transfer rate at the school attended. We interpret a positive coefficient for the academic track transfer rate of the attended school as evidence that school quality has a positive impact on choice. If the transfer rate at the attended school is high, it will be more likely that the school is not the one assigned.

Moreover, choice also depends on the availability of alternatives, $\mathbf{A}_{is}$. Hence, we control for the number of accessible primary schools. If no alternative primary school is located within a reasonable distance, allowing for choice will not affect actual choice behavior. The availability of better alternatives can be measured by the distance to the next school with a more favorable composition and/or a higher transfer rate to the academic track, for instance. It is expected that the availability of alternatives increases the probability of opting out.

Since school districts were abolished in 2008, school choice behavior might have changed in the meantime. Hence, a time dummy, *T*, which is 1 if the data is from 2008 and 0 otherwise, has been included. And finally, we control for differences in school choice behavior between the two sub-groups, the Muslim and the non-Muslim populations, by introducing a dummy variable, M_{is}, which is 1 if the student is Muslim and 0 otherwise. Our data contains information on the school district level as well as individual student/neighborhood data. While the sample of the school districts can be treated as a random sample, the students in each school district clearly do not constitute a random sample of Wuppertal's student population. Due to residential segregation, students in different school districts will differ with respect to socioeconomic and ethnic background. Thus, clustering occurs at the school district level, and errors will be correlated within clusters, but not across

clusters. Since our data is a cluster sample, in which a cross section of individuals is part of a school district, we need to account for the possible correlation of observations within a cluster. Hence, we estimate the linear probability model

$$y_{is} = a_s + \beta_1 \mathbf{X}_{is} + \beta_2 \mathbf{X}_s + \beta_3 \mathbf{A}_{is} + \gamma T + \delta M_{is} + e_{is}, \quad (1)$$

where e_{is} is the error term and α_s is the school district-specific effect. If the school district effect is correlated with the explanatory variables, the fixed effects transformation can be used to estimate (1), while a more efficient random effects model ought to be estimated if the school district effect is uncorrelated with the explanatory variables. While the fixed effects estimator is more robust, the main drawback of using fixed effects is that the coefficients of the cluster invariant variables cannot be estimated. In this study, this applies to the coefficients of school district variables like socioeconomic composition. Since the usual Hausman test is not valid in the presence of heteroskedasticity, we use the robust version of the Hausman test to test the fixed effect versus random effects model (Wooldridge, 2002).[8]

In 2008, an entirely new school choice policy was introduced. Including a time dummy might not be sufficient to capture the effect of this policy change. Therefore, we also estimate the fully interacted model in (2) and test the coefficients on the interaction terms and the time dummy using a Wald test[9].

$$y^*_{is} = a_s + \beta_1 \mathbf{X_{is}} + \beta_2 \mathbf{X_s} + \beta_3 \mathbf{A_{is}} + \gamma_0 T + \gamma_1 T \mathbf{X_{is}} + \gamma_2 T \mathbf{X_s} + \gamma_3 T \mathbf{A_{is}} + e_{is} \quad (2)$$

If $H_0: \boldsymbol{\gamma} = \mathbf{0}$ is rejected, there is statistical evidence that school choice behavior changed after the abolition of school districts.

Similarly, in order to allow for different choice behavior for each of the two ethnic groups, a second fully interacted model is specified, and the coefficients of the interaction terms are tested for joint significance.

$$y^*_{is} = a_s + \beta_1 \mathbf{X}_{is} + \beta_2 \mathbf{X}_s + \beta_3 \mathbf{A}_{is} + \gamma T + \delta_0 M_{is} + \delta_1 M_{is} \mathbf{X}_{is} + \delta_2 M_{is} \mathbf{X}_s + \delta_3 M_{is} \mathbf{A}_{is} + e_{is} \quad (2')$$

[8] The alternative model, a conditional logit model, was not chosen, because heteroskedasticity in clustered samples cannot be dealt with in the conditional logit model and leads to biased parameter estimates (Greene, 2004).

If $H_0: \boldsymbol{\delta} = \mathbf{0}$ is rejected, it follows that school choice behavior differs between the two ethnic groups. Provided that H_0 is rejected, separate models for Muslim students and non-Muslim students will be estimated.

In the second part of our analysis, we calculate the effect of increased choice on the level of segregation in schools. There is a vast body of literature on the measurement of segregation, with various indices in use. The most widely-used measure of segregation is the dissimilarity index, D (Duncan & Duncan, 1955). The dissimilarity index between group *a* and *b* is computed as

$$D = \frac{1}{2}\sum_{i=1}^{N}\left|\frac{a_i}{A} - \frac{b_i}{B}\right|, \tag{3}$$

where a_i and b_i are the number of individuals in group *a* (i.e. Muslim students) and *b* (i.e. non-Muslim students) in school district *i*. A and B are the total number of individuals in group *a* and *b*. The main criticism of the recent school reform is the fear of increasing segregation in primary schools due to expanded choice. More choice might help advantaged groups, but not disadvantaged groups, to find the best suited school. Politically speaking, this is a highly relevant issue. However, since limited school choice also existed before 2008, as described above, the old situation might already have constituted an equilibrium; it would then follow that the new school choice policy does not necessarily have a further detrimental effect on ethnic segregation. To test whether the level of segregation remains constant over time, we compute a Wald test, as suggested by Ransom (2000) and Allen, Burgess, & Windmeijer (2009). Under H_0 the test statistic is given by

$$W = \frac{D_1 - D_2}{\hat{V}(D_1) + \hat{V}(D_2)}^2, \tag{4}$$

where W is asymptotically χ_1^2-distributed.

As known from the literature (Carrington & Troske, 1997), with small groups sizes and small minority shares the most common indices of segregation indicate substantial segregation even when the population is randomly allocated across units. Hence the standard dissimilarity index reflects random as well as systematic segregation. Following Carrington & Troske (1997) we control for random segregation by computing the index of systematic segregation

$$\hat{D} = \frac{(D - D^*)}{(1 - D^*)}. \quad (5)$$

In (5) D^* is the expected dissimilarity index implied by a random allocation of the students to the schools in Wuppertal. Here we compute the expected dissimilarity index as the mean of the dissimilarity index from 100 randomly allocated samples. The systematic dissimilarity index $\hat{D}$ is the extent to which the sample is more dissimilar than random allocation would imply, expressed as a fraction of the maximum amount of excess dissimilarity, $(1 - D^*)$.

The Results

Determinants of choice

Tables 4 to 6 summarize the results of the regression analyses. Using data from the official statistics and the school statistics allows us to work with data that has not been contaminated by a selectivity bias. Moreover, the data allows us to control for changes over time, and our approach should be easily replicable for other municipalities with similar data.

Table 4 summarizes the regression results from estimating equation (1). Note that the coefficients provided in this paper are correlations; they cannot be interpreted as truly causal effects. In model (1) we estimate the pooled model by OLS with cluster robust standard errors, including a time dummy for 2008[10]. The decision to choose a non-assigned school positively correlates with distance to the assigned school. Thus, if distance to the assigned school increases by 100 m, the probability of choosing another school increases by 3 percent. The greater the distance to the assigned school, the more likely it is that parents opt out. Having more schools close by increases choice. The academic track variable has the expected positive effect on choice, i.e. if parents exercise school choice, the chosen school is one with a higher level of academic achievement. Looking at the availability of alternatives with a more favorable social composition, it turns out that the closer the better alternatives are, the more likely it is that students will choose another school. Being Muslim reduces the probability of exercising school choice by as much as 13 percent. In addition, the larger the Turkish population in the school district, the more likely it is that the assigned school is not chosen. However, the coefficient is insignificant. Last but not least, the time dummy has a positive and significant effect. So far, the results confirm our conjectures: Choice does, in fact, depend

[10] We estimated logit and conditional logit models as well. The results are qualitatively the same; hence, we report the heteroskedasticity-robust linear models only.

on distance to the school, the academic achievement level and ethnic composition of the school, and the student's family background.

–- About here Table 4 –-

To account for school district-specific effects, we present the random effects specification in model (2). Compared to model (1), the distance variable becomes less important, as does the number of schools within a radius of 1 km. The number of alternative schools is still highly significant, but the coefficient drops by about one half, to 0.03. Thus, one additional school with a radius of 1 km is associated with 3 percentage points more observed choice. The transfer rate variable, however, becomes more important in terms of size and significance. This also applies to the availability of alternative schools with a higher transfer rate. Being Muslim reduces choice by 8 percent; moreover, compared to the OLS model, the ethnic composition of the school district becomes more important. A one percentage point increase in the Turkish population in the school district leads to an increase in school choice of 6 percentage points.

The third specification is the fixed-effects model in column (3), including only variables that vary at the school district level. Note that the coefficients for the variables which vary at the school district level are very close to the random effects coefficients; the standard errors, however, increase as expected. Distance to alternative schools is no longer significant, while the time dummy is now sizable and significant. To decide between the random and fixed effects specifications, we perform a Hausman test. The robust Hausman test of fixed versus random effect produces a test statistic of 4.89, which follows a F(9.46)-distribution. Hence, we reject the random effects model at the 1 percent significance level.

In models (4) and (5) we restrict the sample to public schools only, as they are predominantly affected by the new school law. Moreover, we include the welfare dependency rate as an alternative variable to control for the socioeconomic composition of the city block.[11] The Hausman test is again significant (F=5.56); hence, we reject the random effects specification and focus on the fixed effects model. In the restricted sample, which only includes public schools, proximity to the assigned school as well as the transfer rate are now

[11] Note that we estimated alternative specifications, including different variables describing the socio-economic characteristics of the neighborhood. However, since all available characteristics like unemployment, long term unemployment, the percentage of non-German inhabitants, and the welfare dependency rate are highly collinear, the results are fairly robust with respect to the specification of the model and are not reported here.

less important, while the time dummy increases in size and significance. This is expected, as abolishing school districts does increase the choice set with respect to public schools, though not denominational public schools. Moreover, being Muslim reduces the probability of choosing an unassigned public school by only 5 percentage points in the restricted sample, which is 3 percentage points less than in the unrestricted sample.

To test for structural change between the years before and after 2008, we estimate the fully interacted model as specified in equation (2) and test the joint significance of the time dummy and the interaction effects using a Wald test. When all schools are included, the test is not significant (p-values: 0.17, 0.26). However, for the public school sample the tests are significant at the 1 percent level. Thus, there is additional evidence that the new enrollment policy has changed parental school choice, particularly in regard to public schools.

Next, we test whether choice differs between ethnic groups by estimating the fully interacted model in equation (2') and testing for the joint significance of the interaction effects. The Wald test for differences between Muslims and non-Muslims is highly significant in all specifications. Hence, separate models are estimated and reported in Table 5. Note that the sample is restricted to public schools only. As before, we first report the random effect models. The results for non-Muslims in column (1) and Muslims in column (2) do, in fact, exhibit some differences. Generally, the model explains the school choice of the German, non-Muslim population better than that of Muslim families. However, there are also noteworthy differences between the estimated coefficients. Distance to one's assigned school is more important for Muslim students, but the number of available alternative schools and the availability of schools with a more favorable composition only matters significantly for non-Muslim families. Families of both groups who live in a city block with high levels of welfare dependency exercise school choice less often. This emphasizes the remaining and substantial degree of heterogeneity within both groups. Thus, educational disparities not only arise as a result of ethnicity.

The Hausman test is again significant. Note, however, that the values of the test statistics are fairly small (F=2.24 for the Muslim sample; F=2.97 for the non-Muslim sample), allowing us to place some confidence in the random effects specification. In (3) and (4), the fixed effects results are reported. While the coefficients are again close to the random effects coefficient, the level of significance is lower. The distance to one's assigned school remains a significant predictor of school choice for both groups, and larger effects are estimated for Muslim families. The number of available schools, the composition of the schools, and school

quality variables are only marginally significant in the sample of non-Muslim families. Our quality variable, the academic transfer rate, explains the choice of non-Muslim families much better than that of Muslims. Families from poorer neighborhoods tend to opt out less often, but this effect is only marginally significant for the Muslim sample. The time dummy is highly significant for non-Muslims, but insignificant for Muslim families.

Finally, in the last two columns in Table 5, the dependent variable represents whether families choose a Catholic school instead of a public school. The reason for estimating a model to predict the choice of a Catholic school is that the Catholic schools in Wuppertal are located around the city's central axis, i.e. in the school districts with many immigrant families and high welfare dependency rates among the ethnic German population. Hence, Catholic schools might have become a more attractive option to less advantaged groups after the abolition of school districts, with the more advantaged groups now choosing among the public schools. Again, the Hausman test rejects the random effects model; therefore, we only report the fixed effects results. As in the other models, distance is an important variable, one which is twice as important for Muslim families as it is for non-Muslim families. The same is true for the transfer rate variable. Muslim families are more likely to choose a Catholic school if it has a higher transfer rate than the assigned school. The coefficient is almost three times as large as in the non-Muslim sample, and is highly significant. Distance to alternative schools is not significant in either sample. The welfare dependency rate and the choice of a Catholic school are positively and significantly correlated for both groups. Because Catholic schools are located in less advantaged areas, this is to be expected. Catholic public schools are not an option for the advantaged families in Wuppertal – they do not live in the neighborhoods where these Catholic schools are located, and there are already high-quality public schools located in their neighborhoods. Therefore, Catholic schools in Wuppertal constitute an alternative for disadvantaged rather than advantaged families.

–- About here Table 5 –-

One clear drawback of this analysis is that observed school choice not only depends on the choices made by families – the demand for schooling – but also on whether or not schools decide to accept any given application. Thus, some cream skimming might occur among schools with more applicants than places, and the endogeneity of supply and demand might lead to biased estimates. To address this issue, we use information about maximum school capacity, which is determined by the school authority. More precisely, the local school

authority decides on the number of classes per grade and school. The maximum number of students per class is set by the state school authority. In NRW, there is a maximum of 30 students per one primary school class. The minimum class size is 18 students, and the recommended class size is 24 students. Therefore, schools cannot grow if demand is high. Schools can, however, shrink. If enrolment is too low, fewer classes are formed. If not even one class is formed, the school might be closed in the future. Schools are obliged to admit students as long as the school's capacity is not fully exhausted. Since we know the capacity of the schools in our data, we were easily able to determine whether school choice is restricted by school capacity. In 2008, as it turns out, only 4 schools have a remaining capacity smaller than 2 students per class. 16 schools have a remaining capacity of less than 6 students per class, resulting in class sizes between 24 and 30.

–- About here Table 6 –-

If the capacity of the school is not fully exhausted, we do not expect families to be constrained in their choice. In Table 6 we summarize the results for the different subsamples. First, we include schools that have room for at least 2 more students in each class. Second, we look at schools where classes are not larger than the recommended class size of 24 students. Finally, the last sample is restricted to schools with average class sizes of at least 25 students, i.e. schools with a low remaining capacity. If schools with a remaining capacity of less than 2 students (high demand schools) are excluded, the results are still quite similar to the fixed effects model in Table 5. Hence, families appear not to be constrained in their choice of school.

When only schools that have average class sizes below the recommended size of 24 students (low demand schools) are included, the fit for the Muslim sample is reduced even further. None of the included variables are significant. This confirms our earlier impression that our model does not predict the school choice of Muslim families as well as that of non-Muslims.

The last two columns in Table 6 show the model with only high demand schools included. Interestingly, high demand schools are often chosen schools and not assigned schools. In the full sample, 17 percent of students attend a public school other than the one assigned. This number rises to 22 percent if only high demand schools are included in the sample (23 percent non-Muslim students, 20 percent Muslim students). While observed choice can again be predicted by the model, the coefficients are – except for the time dummy – much smaller. The choice of Muslim families whose children attend a high demand school

is, again, not well predicted by the variables in the model. However, the number of Muslim students in the sample is quite small. The small number of Muslims in the sample, besides making statistical inference problematic, is also interesting in itself. The ratio of Muslim students to non-Muslim students is 1 to 3.7 in the full public school sample and 1 to 6.5 in the sample of high demand public schools; the schools with less free capacity and larger classes are more frequently attended by advantaged students than disadvantaged students.

So far, the analysis has shown that school choice patterns have changed after the new school choice policy was implemented. The option to freely choose a public school other than the one assigned (given sufficient school capacity) is being utilized by parents. The percentage of children who do not attend their assigned school increased between 2007 and 2008. Proximity and school quality, as well as the socioeconomic background of the students and the composition of the schools, are important factors regarding whether this increased school choice is utilized. However, the motives underlying the school choice of Muslim parents are less clear-cut than those of non-Muslim parents.

Choice and Segregation

In the political debate on free school choice, the most important argument against increased choice is the fear of a corresponding increase in ethnic segregation in schools. Riedel et al (2010) show that – even before 2008 – school choice in NRW created a level of segregation within schools higher than that corresponding to the level of residential segregation in the school district. In the following we look at segregation as measured by the dissimilarity index and how it has evolved over time. Moreover, we also discuss how systematic segregation evolves over time.

The dissimilarity index is calculated using data from the school statistics on primary schools, which yields information about the composition of the schools. In particular, we use data from the 2007/08 (grade 4) and 2008/09 (grades 1 to 4) school statistics. Thus, we have data for enrolment spanning 5 years (grades). Children who entered school in 2004 are fifth-graders in 2008 (grade 4 in the 2007/08 school statistics), children who entered school in 2005 are in the fourth grade, and so on. Note that children in grade 2 and above are not affected by the new legislation concerning school districts. Only those students entering the first grade in 2008/09 are no longer restricted in their choice by the existing school districts. In order to assess the effect of the abolition of school districts, we use the allocation of students in grades 2-5 as a benchmark against which we compare segregation in grade 1. An increase in

segregation in grade 1 in the school year 2008/09, combined with a stable level of segregation (or a less pronounced increase) in grades 2-5, can be interpreted as evidence for the hypothesis that the new school choice policy increases segregation. Since segregation might follow a time trend that is unrelated to the existence of school districts, it clearly does not suffice to only compare, for instance, D_1 and D_2. The time path of segregation also has to be accounted for.

Moreover, the abolition of school districts was not the only factor that might have potentially affected segregation from 2004 to 2008. First, the number of Turkish students reported in the official statistics is decreasing, because the majority of children of non-German ethnicity who have been born in Germany after January 1st, 2000 are German citizens.[12] Hence, there is an expected drop in the number of Turkish children reported in the official statistics for the 2006 and 2007 school years, i.e. students in grades 2 and 3. Moreover - and this is a general problem with data derived from school statistics - the information about a child's first citizenship is reported by his or her parents. This information is neither verified by the school, nor is it compared to the official statistics. Hence, data on citizenship might increasingly refer to subjective rather than actual citizenship, thus making it a better indicator of ethnicity. This problem has been acknowledged by educational authorities, and more care will be given to collect data on minority students in the future. Our second indicator of ethnicity – being Muslim or not – is more reliable when the family's ethnic origin is of interest. However, as noted earlier, Muslims in Germany are quite heterogeneous in regard to issues of integration and educational preferences. Unlike citizenship, however, religious denomination is a stable characteristic of minority families. While the number of Turkish students decreases over time, the number of Muslim students remains fairly stable. Moreover, the proportion of Muslim students is even growing from 18 to 20 percent of the students because the number of non-Muslim students is decreasing. The proportion of Turkish students decreases from 10 percent in grade 5 to less than 6 percent in grade 1.

Second, the cut-off date for entering school was changed from June 30th to July 31st in 2007. Thus, children born in July of 2007 were enrolled in school in addition to the regular cohort of 12 months for that year. This amounts to a sizable increase in the number of students in the 2nd grade, which might also affect segregation in either direction. Compared to the first grade, there are about 8 percent more children in grade 2.

[12] This confirms a general trend in NRW. The percentage of Muslim students rose from 13 percent in 2005 to 14 percent in 2008, whereas the percentage of Turkish (non-German) students fell from 8 (15) percent in 2005 to 6 (13) percent in 2008.

Both changes, the new citizenship law and cut-off date, affect the group size and also the minority proportions in grades 3 and 2. As noted earlier, the dissimilarity index is quite sensitive with respect to those changes. Hence we also compute the expected dissimilarity index implied by a random allocation of the students on the schools and also the index of systematic segregation, that accounts for changes in expected dissimilarity.

Table 7 summarizes the results. As before, we focus on two minorities in Germany: Turkish students and Muslim students. We first look at the sample of all schools, both public and denominational. The number of schools has been reduced from 61 to 59, and finally to 57, for the first graders in 2008, because one school did not have enough applications to form a first grade in 2008, while the other three schools either have closed or are about to be closed. Column 1 in Table 7 shows the dissimilarity index of Muslim versus non-Muslim students. The dissimilarity index is stable at high values of about 0.42. Hence, an equal distribution of Muslim and non-Muslims students requires removing 42 percent of the sample.

Only in the second grade does the index drop to 0.38; it increases again to 0.43 in 2008. At first glance this is surprising, as it cannot be explained by changes due to the abolition of the school districts one year later. This result is due to the new cut-off-date, which means that the number of students is larger in the second grade than in the first grade. Moreover, while the number of Muslim students (the minority) increases by 8 percent, the number of non-Muslim students increases by less than 1 percent. Hence, given that the dissimilarity index is quite sensitive for small group sizes and small minority shares, it is not surprising that the dissimilarity index, i.e. segregation, changes. The direction of change, however, is interesting, as the distribution of Muslim students among schools has become more uniform rather than less. In the first grade, when school districts are abolished, the index returns to the value of 0.43. The small differences between the dissimilarity indices are not significant. Hence, there is no evidence thus far that segregation of the Muslim and non-Muslim populations has increased after school districts were abolished.

The values for random segregation D^* are around 0.13 for all grades, including grade 2. Expected segregation is 0.33 for all grades, except for grade 2, where expected segregation is 0.29. Thus, the drop in the dissimilarity index cannot be simply explained by the changing group size. The allocation of the additional students in grade 2 was not random and led to a lower level of segregation between Muslims and non-Muslims.

-- About here Table 7 --

A different situation becomes apparent if we study segregation of the Turkish and non-Turkish student populations. D_3 (0.39) is significantly lower than D_1 (0.48). However, the increase between D_2 and D_1 is again moderate in size and insignificant. Recall, though, that in the second grade there are more students due to the change of the cut-off date. Unlike the dissimilarity index between Muslims and non-Muslims, the dissimilarity index for Turkish students increases significantly as a result of the cohort of 13 months which entered school in 2007. However, only part of that increase is due to systematic segregation. Random segregation, D^*, increases as well, reducing the differences in systematic segregation between grades 3 and 1. The systematic or excess dissimilarity in grade 3 is 25 percent. This value increases to 32 percent in grade 2 and 31 percent in grade 1.

Hence, Turkish children, or rather children of parents who report that they are Turkish citizens, are distributed less equally among schools over time. The dissimilarity index and the systematic dissimilarity index increase from grade 3 to grade 2 and 1. The corresponding values for Muslims are constant with the exception of grade 2, where the value decreases, indicating less segregation. However, this cannot be driven by the abolition of the school districts, but rather is the result of the cut-off date.

These finding confirm our earlier interpretation of the regression results. We presume that the group of Muslim families is heterogeneous and that some Muslim families use the new school law as an opportunity to choose a school that suits their educational preferences best. The group of Turkish students, however, are either first-generation immigrants or have parents who misreport their citizenship. Either way, it is not surprising that a more pronounced increase in segregation is observed for the group of Turkish families than for the group of Muslim families. In any case, the evidence obtained so far on segregation tendencies after the abolition of school districts is rather inconclusive and does not support the hypothesis that free school choice increases segregation.[13]

As shown in the lower part of Table 7, the results are similar when restricting the sample to public schools only. The number of schools drops to 46 in the first grade, and the dissimilarity index for Muslims and non-Muslims is, again, fairly constant and about as large as in the full sample. None of the differences in the index are statistically significant. However, the index for Turkish and non-Turkish students is higher in the first grade than in

[13] Using data from the school statistics for all municipalities, Makles and Schneider (2011) confirm that systematic segregation has not significantly increased in NRW after abolishing school districts. Thus Wuppertal is not an exception in NRW.

grades 3, 4 or 5, and the increase of 5 percentage points is sizable, though not significant. Hence, the existence of denominational schools cannot explain the high levels of segregation in Wuppertal. Segregation remains at a high level, regardless of whether denominational schools are included in the sample or not.

5. Conclusions

In 2005, the government of NRW decided to allow for more school choice by abolishing school districts. The 2008/2009 school year was the first in which every community had to enforce this new legislation. In this paper, we addressed the differences in school choice behavior before and after the abolition of school districts, using data from Wuppertal, a major city in NRW. More specifically, we focused on two questions: First, we were interested in the changes in school choice behavior of Muslim and non-Muslim parents over time. Second, we looked at school choice and its effect on ethnic segregation.

On average, the percentage of parents who choose a non-assigned public school increased significantly in 2008. Although Muslim families and/or families of Turkish ethnicity in Germany constitute a socioeconomically disadvantaged group with less access to education, they have benefited from increased choice as well. School choice gives both groups a chance to find the school that best suits their educational preferences. However, non-Muslim parents exercise school choice more often than Muslim parents, both before and after 2008, and the two groups differ with respect to the motives underlying school choice. Hence, increased school choice might not actually reduce educational disparities. Moreover, without knowing the direction of choice, the effect of choice on segregation is not clear, and our analysis of school composition is still inconclusive. The dissimilarity index, our measure of segregation, increases over time when looking at the allocation of Turkish students versus non-Turkish students. However, we find no differences in segregation before and after the abolition of school districts when comparing Muslim and non-Muslim students.

In 2010, a new state government has been elected in NRW, and the new government plans to reestablish school districts, allowing the municipalities to re-establish school districts. Currently, it is too early to assess the effect of this latest policy change and the increased variation in regard to school choice in NRW which it makes possible, but the debate on segregation and free school choice will no doubt continue to be on the agenda.

References

Algan, Y, Dustmann, C., Glitz, A., Manning, A. (2010). The economic situation of first and second-generation immigrants in France, Germany and the United Kingdom. The Economic Journal, 120, F4-F30.

Allen, R., Burgess, S. Windmeijer, F. (2009). More reliable inference for segregation indices. CMPO Working Paper 09/216.

Berlin Institut für Bevölkerung und Entwicklung (2009). Ungenutzte Potentiale. Zur Lage der Integration in Deutschland [Unutilized potential: The state of integration in Germany], Berlin.

Bifulco, R., Ladd, H. F., Ross, S. L. (2009). Public school choice and integration – Evidence from Durham, North Carolina. Social Science Research, Vol. 38, Issue 1, 71-85.

Bourdieu, P. (1986). The forms of capital, in: Richardson, J.G. (ed.), Handbook of Theory and Research for the Sociology of Education. Greenwood Press, New York, pp. 241-258.

Booker, S., Zimmer, R., Buddin, R. (2005). The effect of charter schools on school peer composition. Rand Working Paper, WR-306-EDU.

Burgess, S., Briggs, A. (2006). School assignment, school choice and social mobility. CMPO Working Paper No. 06/157.

Burgess, S., Briggs, A., McConnell, Slater, H. (2006). School choice in England: Background facts. CMPO Working Paper No. 06/159.

Carrington, W., Troske, K. (1997). On measuring segregation in samples with small units. Journal of Business and Economic Statistics, Vol. 15, No. 4, 402-409.

Cohen-Zada, D., Sander, W., (2008). Religion, religiosity and private school choice: Implications for estimating the effectiveness of private schools. Journal of Urban Economics, 64, 85-100.

Cullen, J.B., Jacob, B.A., Levitt, S.T. (2005). The impact of school choice on student outcomes: an analysis of the Chicago Public Schools. Journal of Public Economics, Vol. 89, Issues 5-6, 729-760.

Duncan, O., Duncan, B. (1955). A methodological analysis of segregation indexes. American Sociological Review, 20, 210-217.

Dustmann, C. (2004). Parental background, secondary school track choice, and wages. Oxford Economic Papers, 56, 209-230.

Fertig, M., Tamm, M. (2009). Always poor or never poor and nothing in between? Duration of child poverty in Germany. German Economic Review, 11(2), 150-168.

Figlio, D.N., Hart, C. M.D., (2010). Competitive effects of means-tested school vouchers. NBER Working Papers 16056.

Fryer, R. G., Levitt, S. D. (2004). Understanding the black-white test score gap in the first two years of school. Review of Economics and Statistics, 86 (2), 447-464.

Greene, W. (2004). The behavior of maximum likelihood estimator of limited dependent variable models in the presence of fixed effects. Econometrics Journal, 7, 98-119.

Hastings, J. S., Weinstein, J. M. (2008). Information, school choice, and academic achievement: Evidence from two experiments. The Quarterly Journal of Economics, 123 (4), 1373-1414.

Hanushek, E. A., Kain, J. F., Rivkin, S. G. (2009). New evidence about Brown v. Board of Education: The complex effects of school racial composition on achievement. Journal of Labor Economics, 27(3), 349-383.

Hoxby, C. (2003). School choice and productivity: Should school choice be a tide that lifts all boats? In C. Hoxby (Ed.), The Economics of School Choice. Chicago, IL: University of Chicago Press.

Kristen, C. (2005). School choice and ethnic school segregation: Primary school selection in Germany. Münster: Waxmann.

Lankford, H., Wyckoff, J. (2001). Who would be left behind by enhanced private school choice. Journal of Urban Economics, 50, 288-312.

Lavy, V. (2010). Effects of free choice among public schools. Review of Economic Studies 77:3, 1164-1191.

Machin, S., Salvanes, K. (2010). Valuing school quality via school choice reform. CEE Working Papers 0113.

Makles, A., Schneider, K. (2011). Segregation in primary schools – Do school districts really matter? Evidence from policy reforms. Working Paper. University of Wuppertal.

O'Shaughnessy, T. (2007). Parental choice and school quality when peer and scale effects matter. Economics of Education Review, 26, 501-515.

Ransom, M. (2000). Sampling distributions of segregation indexes, Sociological Methods & Research, 28, 454-475.

Riedel, A., Schneider, K., Schuchart, C., Weishaupt, H. (2010). School Choice in German Primary Schools: How Binding are School Districts? Journal for Educational Research Online, 2, 94-120.

Söderström, M., Uusitalo, R. (2010). School choice and segregation: Evidence from an admission reform. Scandinavian Journal of Economics 112(1), 55-76.

Urquiola, M. (2005). Does school choice lead to sorting? Evidence from Tiebout variation. American Economic Review 95(4), 1310-1326.

Walsh, P. (2009). Effects of school choice on the margin: The cream is already skimmed. Economics of Education Review, Volume 28, Issue 2, 227-236.

Wooldridge, J. M. (2002). Econometric analysis of cross section and panel data. The MIT Press.

Figure 1

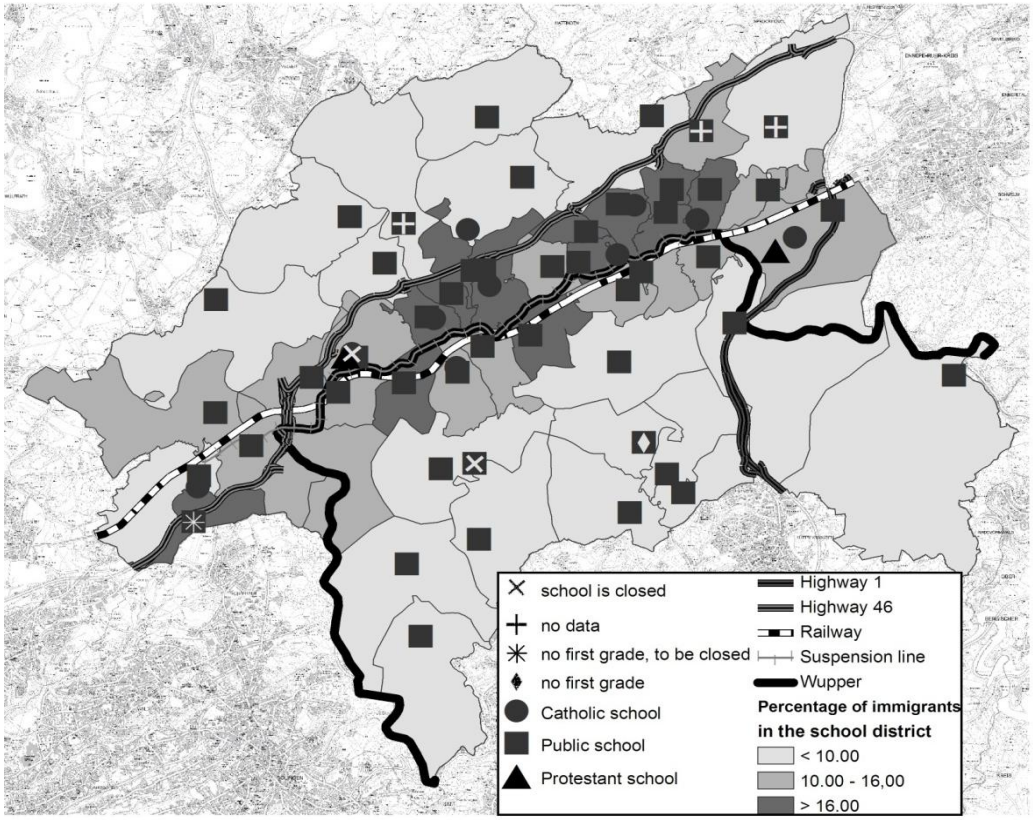
school is closed
no data
no first grade, to be closed
no first grade
Catholic school
Public school
Protestant school
Highway 1
Highway 46
Railway
Suspension line
Wupper
Percentage of immigrants in the school district
< 10.00
10.00 - 16,00
> 16.00

Table 1. *Sample description*

	All		Public Schools	
	2007	2008	2007	2008
% Turkish inhabitants, city block	**4.149**	**4.861**	**3.996**	**4.489**
	(6.300)	(6.702)	(6.497)	(6.721)
% Turkish inhabitants, school district	**3.392**	**3.732**	**3.133**	**3.451**
	(2.843)	(3.129)	(2.867)	(3.180)
Student is Muslim	**0.208**	**0.232**	0.207	0.229
	(0.406)	(0.422)	(0.405)	(0.420)
% Welfare dep. rate city block	**15.97**	**17.76**	**14.76**	**16.25**
	(13.44)	(13.72)	(13.29)	(13.51)
Distance to assigned school (in m)	642.1	633.1	611.8	606.1
	(495.1)	(505.4)	(495.8)	(499.7)
Schools within a radius of 1 km	**2.427**	**2.522**	**2.188**	**2.304**
	(1.478)	(1.539)	(1.405)	(1.500)
Schools within a radius of 2 km	**7.505**	**7.705**	6.952	7.127
	(3.855)	(3.783)	(3.875)	(3.803)
% Transfer rate to academic track chosen school	**35.17**	**33.94**	**35.90**	**34.64**
	(13.28)	(13.22)	(13.86)	(13.87)
Distance to school with 5 PPT higher transfer rate (in m)	**1,504.3**	**1,420.8**	**1,693.3**	**1,596.3**
	(1,497.1)	(1,379.6)	(1,592.9)	(1,466.7)
Distance to school with 5 PPT less immigrants (in m)	**2,493.6**	**2,262.2**	**2,884.7**	**2,608.7**
	(2,976.6)	(2,719.3)	(3,189.2)	(2,928.0)
Number of students	7,012	1,979	5,583	1,574

Notes: 42 schools are included. Standard deviations are in parentheses. Significant differences between 2007 and 2008 are in bold.

Table 2 *Sample description by denomination*

	Non-Muslims		Muslims	
	2007	2008	2007	2008
% Turkish inhabitants, city block	**2.645**	**3.327**	9.888	9.939
	(4.278)	(5.254)	(8.933)	(8.296)
% Turkish inhabitants, school district	**2.844**	**3.116**	5.483	5.771
	(2.514)	(2.758)	(3.050)	(3.409)
% Welfare dep. rate city block	**13.27**	**14.87**	26.28	27.33
	(12.48)	(12.75)	(11.88)	(12.41)
Distance to assigned school (in m)	669.0	669.2	539.6	513.5
	(511.6)	(522.8)	(410.6)	(421.9)
Schools within a radius of 1 km	2.226	2.307	3.192	3.235
	(1.442)	(1.511)	(1.359)	(1.410)
Schools within a radius of 2 km	**6.874**	**7.146**	**9.915**	**9.556**
	(3.777)	(3.762)	(3.132)	(3.224)
% Transfer rate academic track chosen school	**37.45**	**36.33**	26.49	26.02
	(12.99)	(13.06)	(10.50)	(10.36)
Distance to school with 5 PPT higher transfer rate (in m)	1,677.3	1,588.9	843.9	864.4
	(1,595.4)	(1,488.1)	(728.8)	(687.2)
Distance to school with 5 PPT less immigrants (in m)	**2,844.0**	**2,608.9**	1,156.4	1,114.2
	(3,209.2)	(2,983.3)	(1,056.1)	(835.2)
Number of students	5,556	1,520	1,456	459

Notes: See Table 1

Table 3. *Choice by denomination*

Choice		All	Muslim	Non-Muslim
All	2007	33.66	28.43	33.77
	2008	39.57	35.08	40.92
Public	2007	15.42	10.02	16.84
	2008	24.02	17.22	26.03
Catholic	2007	15.7	18.82	14.88
	2008	16.88	21.13	15.59
Protestant	2007	5.68	1.65	5.47
	2008	3.59	0.44	5.54

Table 4. *Decision to not attend assigned public school*

	All			Public Schools	
	OLS	RE	FE	RE	FE
Distance to assigned school (in 100 m)	0.0277**	0.0125**	0.0122**	0.0101**	0.0100**
	(6.05)	(13.43)	(4.21)	(10.62)	(4.45)
Schools within a radius of 1 km	0.0778**	0.0331**	0.0329**	0.0172**	0.0173+
	(4.90)	(7.19)	(3.03)	(3.46)	(1.79)
Schools within a radius of 2 km	0.0181	0.0181**	0.0172	0.0183**	0.0185
	(1.60)	(6.42)	(1.32)	(5.75)	(1.25)
% Transfer rate to academic track chosen school	0.0079*	0.0240**	0.0244**	0.0157**	0.0158**
	(2.35)	(32.01)	(6.03)	(14.19)	(3.72)
Distance to school with 5 PPT higher transfer rate (in 100m)	-0.0008	-0.0035**	-0.0041	0.0012	0.0013
	(-0.23)	(-2.95)	(-1.22)	(1.09)	(0.51)
Distance to school with 5 PPT less Immigrants (in 100m)	-0.0033*	-0.0009	0.0005	-0.0036**	-0.0034
	(-2.38)	(-0.89)	(0.13)	(-3.64)	(-1.15)
Student is Muslim	-0.1278**	-0.0787**	-0.0777**	-0.0482**	-0.0477**
	(-3.88)	(-7.72)	(-3.49)	(-4.90)	(-3.16)
% Turkish inhabitants, city block	-0.0040	-0.0011+	-0.0011	-0.0015*	-0.0014
	(-1.68)	(-1.65)	(-0.67)	(-2.13)	(-1.25)
% Welfare dep. rate city block				-0.0012**	-0.0012
				(-3.23)	(-1.59)
% Turkish inhabitants, school district	0.0145	0.0598**		0.0348+	
	(1.43)	(3.99)		(1.87)	
Year=2008	0.0632**	0.0444**	0.0438*	0.0548**	0.0543**
	(2.70)	(4.93)	(2.32)	(5.85)	(3.93)
Number of students	8,991	8,991	8,991	7,157	7,157

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Linear probability model. The dependent variable is the binary indicator for whether the student attends the assigned public school. We report in parentheses the t-values that are based on robust standard errors adjusted for clustering within the 47 school districts. RE is the random effects model; FE is the fixed effects model.

Table 5. *Decision to not attend assigned public /Catholic school by denomination*

	Not assigned school				Catholic school	
	Non-Muslim RE	Muslim RE	Non-Muslim FE	Muslim FE	Non-Muslim FE	Muslim FE
Distance to assigned school (in 100 m)	0.0104** (10.13)	0.0131** (4.61)	0.0103** (4.37)	0.0130** (3.35)	0.0063* (2.32)	0.0132** (3.03)
Distance to Catholic school (in 100 m)					-0.0080* (-2.41)	-0.0118* (-2.28)
Schools within a radius of 1 km	0.0207** (3.51)	0.0075 (0.81)	0.0208+ (1.89)	0.0052 (0.52)	0.0320** (3.16)	-0.0011 (-0.10)
Schools within a radius of 2 km	0.0198** (5.52)	-0.0029 (-0.44)	0.0200 (1.30)	-0.0048 (-0.53)	0.0057 (0.72)	0.0001 (0.01)
% Transfer rate to academic track chosen school	0.0163** (14.18)	0.0112* (2.21)	0.0165** (3.85)	0.0133 (0.99)	0.0114* (2.56)	0.0333** (5.89)
Distance to school with 5 PPT higher transfer rate (in 100m)	0.0017 (1.43)	-0.0038 (-1.23)	0.0019 (0.73)	-0.0052 (-1.38)	-0.0016 (-0.59)	-0.0011 (-0.17)
Distance to school with 5 PPT less immigrants (in 100m)	-0.0040** (-3.86)	-0.0022 (-0.74)	-0.0039 (-1.31)	-0.0018 (-0.44)	0.0034 (1.43)	0.0067 (1.36)
% Welfare dep. rate city block	-0.0018** (-3.89)	-0.0012* (-2.27)	-0.0018* (-2.13)	-0.0013+ (-1.89)	0.0016* (2.23)	0.0019* (2.05)
% Turkish inhabitants, school district	0.0352+ (1.76)	0.0280 (1.01)				
Year=2008	0.0617** (5.57)	0.0221 (1.43)	0.0612** (3.53)	0.0192 (0.97)	-0.0125 (-0.70)	0.0218 (1.07)
Number of students	5,639	1,518	5,639	1,518	6,703	1,889

Notes: see Table 4. The dependent variable is the binary indicator for whether the student attends the assigned public school (Catholic school).

Table 6. *Decision to not attend assigned public school: High and low demand schools*

	Free Capacity ≥ 2 Non-Muslim	Free Capacity ≥ 2 Muslim	Free Capacity ≥ 6 Non-Muslim	Free Capacity ≥ 6 Muslim	Free Capacity < 6 Non-Muslim	Free Capacity < 6 Muslim
Distance to assigned school	0.0074**	0.0112**	0.0063**	0.0050	0.0030*	0.0016
	(3.30)	(2.73)	(2.99)	(1.47)	(2.26)	(0.54)
Schools within a radius of 1 km	0.0310*	0.0095	0.0325*	0.0092	-0.0060	-0.0137
	(2.58)	(0.98)	(2.41)	(0.77)	(-0.73)	(-0.78)
Schools within a radius of 2 km	0.0208	-0.0017	-0.0007	-0.0010	0.0005	-0.0020
	(1.26)	(-0.21)	(-0.13)	(-0.11)	(0.07)	(-0.47)
% Transfer rate to academic track chosen school	0.0149**	0.0164	0.0201*	0.0132	0.0121*	-0.0021
	(3.02)	(1.22)	(2.45)	(0.85)	(2.29)	(-0.05)
Distance to school with 5 PPT higher transfer rate	0.0009	-0.0028	0.0060*	-0.0024	0.0030	-0.0080
	(0.31)	(-0.67)	(2.02)	(-0.41)	(1.21)	(-1.24)
Distance to school with 5 PPT less immigrants	-0.0002	0.0011	-0.0026	0.0072	-0.0020	0.0007
	(-0.07)	(0.26)	(-0.84)	(1.08)	(-0.68)	(0.35)
% Welfare dep. rate city block	-0.0012	-0.0013*	-0.0020*	-0.0010+	-0.0016	-0.0008
	(-1.34)	(-2.41)	(-2.12)	(-1.79)	(-1.54)	(-1.11)
Year=2008	0.0555**	0.0131	0.0372*	0.0060	0.0396+	0.0059
	(2.99)	(0.70)	(2.10)	(0.26)	(1.91)	(0.70)
Number of students	4,715	1,419	3,214	1,144	2,425	374

Notes: See Table 4. Fixed effects models.

Table 7. *Dissimilarity Index D*

	D Muslim students	**D^* Muslim students**	**$\hat{D}$ Muslim students**	**N Muslim students**	**N non-Muslim students**	**D Turkish students**	**D^* Turkish students**	**$\hat{D}$ Turkish students**	**N Turkish students**	**N non-Turkish students**	**Number of schools**
All schools											
Grade 5	D_5=0.4212	0.1396	0.3272	577	2,642	D_5=0.4011	0.1763	0.2729	336	2,883	61
H_0: $D_5=D_4$	0.0193					0.1192					
	(0.8894)					(0.7299)					
Grade 4	D_4=0.4251	0.1351	0.3353	603	2,575	D_4=0.3885	0.1811	0.2533	307	2,871	59
H_0: $D_4=D_3$	0.0054					0.0183					
	(0.9413)					(0.8924)					
Grade 3	D_3=0.4231	0.1334	0.3343	619	2,558	D_3=0.3936	0.1896	0.2518	276	2,901	59
H_0: $D_3=D_2$	2.3881					3.6238					
	(0.1223)					(0.057)					
H_0: $D_3=D_1$	0.0047					**4.0442**					
	(0.9455)					**(0.0443)**					
Grade 2	D_2=0.3806	0.1286	0.2891	668	2,576	D_2=0.4675	0.2130	0.3235	215	3,029	59
H_0: $D_2=D_1$	2.5134					0.0549					
	(0.1129)					(0.8147)					
Grade 1	D_1=0.4250	0.1358	0.3346	604	2,391	D_1=0.4777	0.2382	0.3144	164	2,831	57
Public schools only											
Grade 5	D_5=0.4355	0.1352	0.3473	492	2,130	D_5=0.4001	0.1714	0.2760	290	2,332	48
H_0: $D_5=D_4$	0.0004					0.0298					
	(0.9841)					(0.8629)					
Grade 4	D_4=0.4349	0.1362	0.3458	499	2,088	D_4=0.3933	0.1785	0.2615	259	2,328	47
H_0: $D_4=D_3$	0.0039					0.0029					
	(0.9505)					(0.957)					
Grade 3	D_3=0.4330	0.1304	0.3480	519	2,023	D_3=0.3956	0.1839	0.2593	234	2,308	47
H_0: $D_3=D_2$	0.5174					3.5421					
	(0.4720)					(0.0598)					
H_0: $D_3=D_1$	0.0667					1.2927					
	(0.7963)					(0.2555)					
Grade 2	D_2=0.4116	0.1285	0.3249	555	2,020	D_2=0.4752	0.2032	0.3413	184	2,391	47
H_0: $D_2=D_1$	0.9374					0.2981					
	(0.3329)					(0.5851)					
Grade 1	D_1=0.4410	0.1320	0.3560	490	1,901	D_1=0.4494	0.2263	0.2883	146	2,245	46

Notes: p-values of the Wald-test are in parentheses.