Does strategic interaction affect demand for school places? A conditional efficiency approach

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ABSTRACT

This paper provides evidence on strategic interaction among public schools. We adopt a two-stage estimation procedure to assess whether competition among public schools influences demand for places. A robust conditional order-*m* approach is used to estimate the efficiency of each school; a spatial econometric framework is then applied to disentangle the determinants of demand for the school when strategic interaction among parents is present. We detect the presence of positive spatial autocorrelation in the demand for public schools, but the magnitude of the spillover effects drops when neighboring school performance is added in. Our results confirm the existence of competitive pressures among public schools' performance that we also infer from parents' school choices.

1. Introduction

In the last 20 years, synthetic measures of market performance such as improved consumer choice or published performance indicators have been introduced as useful indicators for implementing public policies, including education. Many countries are introducing school choice reforms with the aim of giving parents more opportunities to decide which school their children attend (OECD, 2011). Among others, the aims of school choice programs are to improve the match between children and schools and to enhance students' educational outcomes. In this environment, the determinants of school choice are perhaps one of the most hotly discussed issues in the current education policy debate (Ghosh, 2010; Calsamiglia and Güell, 2014).

The interpretation of school choice is part of a bigger movement within the New Public Management (NPM) (Hood, 1995). In this context, the idea behind school choice lies in the reforms that give parents the right to influence the decisions on pupil allocation to schools (Millimet and Collier, 2008). Most countries allow parents and students to select their school from a diverse array of choices. In most

OECD countries, an initial geographical assignment in an elementary school is accompanied by more flexible choice options later on in higher levels of education (OECD, 2011). Proponents of NPM argue that choice reforms will lead to stronger sorting, promote competition, and increase accountability in the public education system (Zanzig, 1997; Hoxby, 2000a; Ghosh, 2010). In addition, these NPM-inspired policies have a strong potential to shift school systems to a higher level of efficiency (Rincke, 2006). Within this framework, a vast literature has emerged attempting to uncover the factors that influence the relationship between competition and performance in education from the supply point of view (see Rincke, 2006; Millimet and Collier, 2008, and references within). However, assessments of such competitive effects on the demand for places in public schools are less frequent (e.g., Shumow, et al., 1996; Lai, et al., 2009).[1]

In this context, the objective of this paper is to test whether there is *strategic interaction* in parents' choice of school within an educational system with increasing choices available.[2] We address two research questions. First, within an educational system with increasing choices, we aim to assess the extent to which parents' choice of public school

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[1] The paper by Gibbons and Vignoles (2012) assesses the impact of geographical distance on students' choice, but only for one particular university in England.

[2] The term 'strategic interaction' is commonly used in the literature to refer to the interdependence between the units under analysis due to the existence of competition (for a survey of the literature see Brueckner, 2003). Strategic interaction is said to occur when the levels of variables in one jurisdiction are influenced by the levels of the same variables in neighboring jurisdictions (Ghosh, 2010).

depends only on the distance from their residence or whether this decision is also based on additional criteria such as the quality of school management. Once the school choice process is established, our second research aim is to identify the potential spatial dependence among public schools. Specifically we are interested in understanding whether the demand for a selected school is partially driven by the competition effect and its neighbors' performance.

This paper adopts a two-stage approach to tackle these questions, combining a non-parametric and robust efficiency analysis with a spatial econometric framework.[3] This is an innovative direction in the literature. Our aim is to examine whether competition among public schools in a system with increasing school choice influences demand from parents. Millimet and Collier (2008) argue that more competition impacts on the efficiency of public schooling. In addition, Hoxby (2003a) examines the achievement and productivity effects for three important school choice reforms in the US. This author concludes that school choice affects school productivity. She also argues that when school choice is implemented, the final allocation of students will be largely determined by parents' preferences. The previous literature exploring parents' preferences reveals that, on average, families do value the quality of education provided at school as one of the most important factors when choosing a school (Bast and Walberg, 2004; Hastings et al., 2005; Burgess et al., 2009; Gibbons and Silva, 2011).[4] It has been proven that the higher the quality of education, the higher the students' academic success and future labor market outcomes (Dearden et al., 2002). On the other hand, it can also be argued that the main factor impacting on the parents' decision is students' previous academic achievement and not the quality of education provided, because the latter is not easily perceived (Cullen et al., 2006; Gibbons et al., 2008; Lavy, 2010). In this respect, we consider that quality is a better proxy of how good a school is, and in an asymmetric information setting this information can also be perceived by parents to some extent. In sum, although students' achievement or school performance can be considered as alternative choices, our research objective induces us to choose variables at the school level. This choice is based on the results from Portela and Thanassoulis (2001) and Thieme et al. (2013) showing that (from a multilevel perspective) the overall students' academic achievement depends on the student effect and the school effect. The student effect is individual, and it can be isolated from the school, whereas the level of excellence is embedded in the school effect. The latter is the target of our paper. We aim to proxy capacity to attract students, and this effect appears to be more related to the school effect than to the student effect.

Concerning the school effect, when environmental factors can have a significant impact on the level of this effect, the existing literature indicates that these factors can be considered in one-step or two-step estimation models. Given the problems related to the two-step estimation models (Schmidt, 2011), we decided to estimate the schools' performance with a more consistent one-step conditional estimation method.

Our data refer to the public school system in Catalonia (Spain). This choice was driven by data availability but, nonetheless, the case of Catalonia is particularly relevant because it is a scenario in which public schools are competing to attract more students and government resources. The allocation system allows parents to freely rank up to 10 schools only and then a set of rules determines the final allocation. This mechanism assigns all applicants to the school ranked first in the parents' list, and if there is over-demand for a school, the final allocation is made according to established criteria such as distance to the school, siblings attending the school, or socioeconomic variables.[5] As stated before, in this environment parents may decide on a particular school not only based on distance, but also on their personal judgments about the quality of school management.[6]

One important innovation in this study is its sample. Several features merit discussion. First, the demand for a given school is the ratio between the number of enrollment applications from families (their first-choice option) and the places offered by the school. More details will be provided in Section 4. Second, following Millimet and Collier (2008, p.135), we focus on competition arising from nearby public schools, and not from other sources such as grant-maintained or private schools, because "*competition from other public schools is the most remarkable type of competition in the status quo.*" Hoxby (2002, p. 17) also states that "*this traditional form of [school] choice is by far the most pervasive and important form of choice in elementary and secondary schooling today.*" In addition, Hanushek and Rivkin (2003, p. 3) argue that "*the most important element of competition comes from other public schools.*" Third, we analyze public schools located in urban municipalities. Following EUROSTAT criterion, municipalities with fewer than 5000 inhabitants were classified as rural and those with 5000 inhabitants or more as urban. Rincke (2006) states that public schools in metropolitan areas face fiercer competition because they are divided into more school districts. With more schools available, it is easier for households to self-select according to preferences for public school choice. Finally, in contrast to most previous research, our relevant unit of observation is the school rather than the district. We are actually interested in knowing parents' behavior for one school, not the average demand in the district. As Misra et al. (2012, p.1180) point out, "*the results from the aggregate level may not reveal correct information on the individual school level, and policy prescription based upon these results may not be appropriate. To analyze school performance in the education market, one needs to use school level data instead of school district or county data.*"

The results confirm our hypotheses. First, we provide evidence that in an enrollment system with increasing choices parents perceive the quality of school management, and this perception proxies schools' performance. Location, together with the quality of the school management, is inferred through parents' demand for one school over another in their list of preferences. Second, we find evidence that parents' demand for a public school rises with the increasing demand for neighboring schools. This proves the existence of strategic interaction in the public educational system due to competition in location. This result is robust to the addition of potential features referring to the quality of the local geographical environment, family income or the presence of private schools. Nevertheless, these positive spillover effects shrink when we take into account neighboring schools' performance. These findings also confirm the existence of competition in performance among public schools in Catalonia. Our results suggest that the impact of neighbors' performance on demand for a school is substantial, and it contributes to the higher engagement in competition for students and resources.

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[3] Briefly, in order to proxy the quality of school management, in the first stage we estimate the efficiency of management in each school in the sample by applying a non-parametric and robust conditional order-*m* approach (Cazals et al., 2002; Daraio and Simar, 2005, 2007a, 2007b). In the second step we apply a spatial econometrics framework (Anselin, 1988; LeSage and Pace, 2009) to disentangle the existing spatial autocorrelation in the school demand due to this strategic interaction among public schools. The analysis relies on selected canonical spatial econometric models involving the definition of a proper spatial weight matrix.

[4] Families also value academic attainment, pupil composition and distance from their residence to the school.

[5] See Calsamiglia and Güell (2014) for more details about the school choice process.

[6] We explore the idea of "parents' personal judgments" about the quality of school management rather than actual school quality because of the asymmetric information situation in Spain. Unlike other countries such as the UK, Spanish schools are not obliged to disclose information about their characteristics to parents. In particular, schools are not required to publish detailed information on their websites about past students' academic achievement or similar statistics, such as pupil/teacher ratio, pupils' ethnic composition, educational program, etc. Furthermore, no educational body collects and publishes this information (such as OFSTED in the UK). Unfortunately, the only information available to parents refers to schools' data released by the Regional Educational Authority (REA). More details about REAs are presented in Section 3.3.