

# Does primary school siting influence pupil's trip lengths in Flanders?

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**Kobe Boussauw\*\*\***

Georges Allaert\*\*

Frank Witlox\*

\* Geography Department, Ghent University, Krijgslaan 281/S8, B-9000 Gent, Belgium

Tel.: +32 9 264 45 55 - Fax.: +32 9 264 49 85

E-mail: [kobe.boussauw@ugent.be](mailto:kobe.boussauw@ugent.be), [frank.witlox@ugent.be](mailto:frank.witlox@ugent.be)

\*\* Civil Engineering Department, Centre for Mobility and Spatial Planning, Ghent University, Vrijdagmarkt 10/301, B-9000 Gent, Belgium

Tel.: +32 9 331 32 50 - Fax. +32 9 264 54 89

E-mail: [kobe.boussauw@ugent.be](mailto:kobe.boussauw@ugent.be), [georges.allaert@ugent.be](mailto:georges.allaert@ugent.be)

## 1. School presence and pupil's commute trip characteristics

This contribution assesses the link between school trip length and school siting in primary schools in Flanders, Belgium. To this end, we examine whether there is a link between spatial clustering, school size, and catchment area size of the schools. The presence of spatial clusters of schools in urban areas could indicate the existence of an intra-urban polycentric structure. From a planning perspective, we can say that a dense network of relatively small schools is desirable if we consider spatial proximity as a place quality, if we want to maximize accessibility of the school network and if we want to avoid excess (auto) mobility (Müller, 2011). As in previous decades almost all students went to school on foot or by bike (Cardon et al. 2012), historically, the current school system in Belgium is indeed based on a dense network. The existence of two parallel-operating educational networks (government-organized official education, and the largely by the Catholic pillar organized subsidized education) has additionally contributed to this density.

As in many western countries, we have seen a period of expansion followed by a period of rationalization (De Boer, 2010, p. 1). Rationalization introduced business economic logics in the organization of the education system. In order to maximize economies of scale schools were included in partnerships with in many cases the closure of a number of smaller branches as a result. The consequent increase in home-school distance which partly results from this process induces additional transport costs, which are eventually covered by society too.

The increase in average home-school distance means that students are less likely to walk or cycle to school, that the demand for organized transport increases and,

particularly, that students become more likely to travel as a car passenger. On the other hand it is not appropriate to interpret this link as of causal nature. Along with the home-work commute, school mobility has been expanding a lot faster during the last hundred years than the spatial system itself was fanning out (Boussauw et al., 2011; Marique et al., 2013), and, conversely, changes in travel behaviour have also encouraged school consolidation.

In Flanders, over the years, home-school trip length has significantly increased. At the time of the Belgian census of 1991 more than 82.5% of the pupils in nursery and primary education lived less than 5 km from their school, while in 2001 this share had dropped to 73.3%. Over the same period the share of car users in this group increased by 11%, while the number of children on foot decreased by as much as 39% (Halleux et al., 2009).

## 2. Data and method

We rely on data that were made available for this study by the Flemish Ministry of Education and Training. The data contains the address for each school branch, and the postal code of the residence of each of the students for the 2011-2012 school year. Only schools offering “common” education to children aged 6 tot 12 were considered.

A total of 2,867 primary school branches were thus identified, of which 128 are located in the Brussels capital region (and 1 in the Francophone Walloon region in the south of Belgium). Since we have only Dutch-language schools incorporated in this analysis, our assessment will have little relevance to the schools that are located in Brussels.

Subsequently, a spatial cluster analysis was performed by means of the DBScan technique, also known as “density-based spatial clustering” (Ester et al., 1996). Furthermore, the data from the ministry allow calculating for every school an approximation of the average home-school distance. For privacy reasons, only the postal code corresponding with the residence of the pupil was made available. For each student-school pair we calculated the Euclidean distance between the centroid of the postcode area of the pupil’s residence, and the address of the school. For intra-zonal home-school distances, a standard size was applied for each trip that does not cross postcode area boundaries. Subsequently, outliers were eliminated.

For primary schools, the result of the method applied reveals an average Euclidean distance from home to school of 2.4 km. Multiplied by an assumed detour factor of 1.4 (Rietveld et al., 1999), we obtain a mean trip length of 3.4 km, which is a slight over-estimation with respect to the 3 km given by De Boer (2010).

## 3. Results

### 3.1. Spatial distribution

The spatial cluster analysis indicates that primary schools in urban areas are often grouped in centres and sub-centres, where these contribute morphologically speaking to a polycentric amenity structure. In more remote municipalities, we often see two or three schools (often of different ideologies) near each other, although generally

speaking the spatial distribution is quite homogeneous and therefore offers decent coverage.

### **3.2. Spatial variation in home-school distance**

In many municipalities outside the agglomerations students live relatively nearby. This is particularly the case in regions where population density is quite high. In the southern parts of the provinces of Vlaams Brabant (south-central) and Limburg (east) we see the influence of the language border, a number of Dutch-speaking children who live in the Walloon region travel above average distances. We observe large differences: in Antwerp, the home-school distance is below average. Also the Kortrijk region, which meets the image of an intra-urban polycentric system rather well due to the presence of many smaller clusters of primary schools, scores remarkably well. Brussels and Ghent score less well, and in Bruges and Leuven, students travel a lot further than average. At first sight, the presence of clusters of schools in centres and sub-centres does not necessarily coincide with shorter journeys: the local context seems to have more influence than the presence or absence of clustering as such.

In Brussels, Antwerp, Ghent and also in some smaller towns, we see that the inner city clusters are characterized by a relatively short home-school distance. On the other hand, some clusters are more than average car dependent, particularly in the east of the province of Vlaams-Brabant, south of Brussels, and on the southern side of Ghent.

### **3.3. Influence of the presence of clusters on the home-school distance**

Our basic hypothesis is that the formation of sub-centres in urban areas can contribute to the sustainability of travel behaviour. Using an unpaired *t*-test, we investigated whether the home-school distance in schools that are part of a cluster differs from schools that are not part of a cluster. Results show that clustering and the formation of sub-centres by primary schools does not necessarily contribute to shorter home-school trip lengths. Although the presence of clusters of schools in agglomerations contributes to spatial proximity features, still many children live relatively distant from their school. One obvious explanation is that these pupils carpool with (one of) their parents working near the school. This assumption is supported by the observation that home-school distance is often above average for schools that are located near a motorway access.

### **3.4. Relationship between school size and home-school distance**

The above findings could lead to the conclusion that the spatial distribution of primary schools is sufficiently fine-meshed. Pupils who live in remote municipalities can apparently still find a school close to home, so their home-school distance is not higher than average. Pupils who go to school far from home do this mainly for practical reasons, such as the opportunity to ride with a parent on the way to work. It is logical that this phenomenon occurs more frequently in the (edges of) agglomerations, where a large share of the daily commute is heading to. Nevertheless, it is possible that over the years school consolidation has reduced spatial proximity, partly by the closure of small branches (De Boer, 2010). If that were the case, this would be noticeable through a positive correlation between the size of the school and the home-school distance. We test this hypothesis by

calculating the Pearson's correlation between the number of pupils and the average home-school distance by school. However, our analysis proves to be statistically non-significant. This means that school size corresponds with local demand. Some schools are larger because the demand for education in the immediate vicinity is also above average.

## 4. Conclusion

Subject to the constraints within which this research was carried out it is concluded that the spatial distribution of the primary schools in Flanders is quite well adapted to a sustainable form of residential school traffic, which is based on short distances. Results show that the presence of clusters does not seem to influence home-school distance. In contrast with North-American literature, also school size does not show any influence. These findings may indicate that the spatial distribution of the primary schools is closely linked to the distribution of the housing stock, and that the observed increase in school mobility should be sought at least partly in non-spatial factors. Alternatively we can say that at least part of the growth in average home-school distance that was observed in primary schools over the last decades was caused by the closure of school branches.

## 5. Keywords

school travel, polycentrism, spatial proximity, sustainable spatial development, Flanders

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