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Teachers in schools with low socioeconomic composition: are they really that different?

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Summary: This article aims to assess whether differences in teacher characteristics vary with differences in socioeconomic compositions of schools. We conducted correlation analyses on administrative data from the French-speaking education system in Belgium. This database regroups more than 20,000 teachers in 1630 elementary schools. We selected indicators to measure the link between schools' socioeconomic composition and a set of dimensions of teachers' profile such as experience, job security and stability. The results confirm that some of these dimensions are linked to the school composition. The findings highlight the relevance of considering segmentation of the school market when studying the topic.

Keywords: Teacher characteristics, Inequality, Education

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1. Introduction

Academic and socioeconomic segregation has been identified as a major concern in the French-speaking Community of Belgium (FWB), both in elementary (Danhier 2016; Marissal 2014) and secondary education (Baye & Demeuse, 2008; Danhier, Jacobs, Devleeshouwer, Martin, & Alarcon, 2014). The Francophone-Belgian authorities have, in consequence, declared desegregation a top priority, underlining the slogan 'No to ghetto schools' (MCF, 2005). Over the years, efforts have been made to regulate enrolment of students in secondary education (reforms which met quite some resistance on the ground) and segregation remains at the center of current educational debates.

Segregation has been identified as a detrimental process hindering optimal school achievement for all pupils. Pupils in deprived schools may collectively underachieve because they are confronted with a cocktail of problematic influences within classroom and school contexts. Formulated otherwise, disadvantaged pupils may face a double handicap: firstly, because they live in poorer families but secondly, and on top of that, because they often find themselves in classes with other students from vulnerable socioeconomic backgrounds, further aggravating the challenges. This impact of segregation is usually called the compositional effect (Dumay & Dupriez, 2008; Sykes & Kuyper, 2013). In their literature review, van Ewijk and Sleegers (2010) sum up three categories of explanations. Beyond statistical misspecifications (Marsh et al., 2009; Televantou et al., 2015), the composition effect can result from direct peer interactions (discussions, motivation, disruptions or, for ethnic composition, tensions between ethnic groups, or language difficulties hindering the pedagogical context), teacher practices (adjustments in teaching style or expectations) and school quality (problems in human resources management or funding).

Assuming that teachers have an important effect on the performance level of students, their unequal distribution across schools emerged as a potential equity issue (Little & Bartlett, 2010).

Following the typology for inequality reductions in education proposed by Grisay (1984), we can define equity as being linked to 'equality of treatment'. If we admit that the phenomenon of segregation places specific pupils in different types of classes and confronts them with different types of teachers, we can doubt that they all receive equivalent conditions of learning. In the present article we focus on the distribution of teachers across schools in the FWB. In the FWB (similar to some other continental European educational systems but unlike the situation in the United States), teacher salaries are standardized between schools and principally linked to seniority. No matter where one teaches, in principle one earns the same salary. Consequently, this context provides an interesting case study for teacher sorting since teacher choice of school does not depend on salary, but will depend on other factors such as working conditions. As working conditions are often linked to the school population (Loeb, Darling-Hammond, & Luczak, 2005), we expect to observe differences between schools with regard to the profile of their teachers (Murnane & Steele, 2007. 29). The aim of this paper is to assess whether pupils with low socioeconomic background receive equivalent resources in terms of teacher characteristics. We hypothesize they more often have less qualified teachers allocated to them.

On the basis of administrative records, our article tries to tackle a simple question: how similar are the French-speaking Belgian teachers in schools with different pupil compositions? In the FWB, teachers' wage is within the scope of competence of the Community government. For the payment of wages, the general administration of teachers uses software, which records on a monthly basis, each job in each school. This unique source of data in the FWB presents the main advantage of availability, as it gives access to an exhaustive database of all teachers. A second benefit is the possibility to desegregate data to analyse teacher sorting at a relevant local level. A third advantage is the quality of the data that are validated by the administration.

Our main hypothesis is that school with low socioeconomic composition face problems with

regards to teaching staff in terms of experience, job security and stability. After first presenting the state of the art in the literature, we will present the results of our analyses of correlations between pupil body and teaching staff characteristics.

2. The Teacher Effect

The literature has repeatedly shown that teachers have an effect on pupil achievement. One way to assess this effect is to decompose variance of pupil achievement and measure its part that is attributable to teachers. This approach highlights moderate effects of teachers. A first example is provided by the LOSO project in Flanders, the Dutch-speaking part of Belgium. Researchers have shown that, in the first grade of secondary education, 18% of the variance in pupils' mathematical performances lies at the teacher level (Opdenakker & Van Damme, 2000). A second example comes from the Prospects data covering the six grades of the elementary American schools. Researchers estimate the variance at the teacher level at 12-23% in reading achievement and 18-28% in mathematical achievement, depending on the grade considered (Rowan, Correnti, & Miller, 2002). As the latter researchers noted, such variance decomposition does not account for the non-random attribution of pupils to teachers.

A more complex modelling is required to correctly model the sorting of pupils amongst teachers. In the framework of value-added models, several researchers regressed pupils' achievement or pupils' gain on, at least, pupils' socioeconomic background and prior achievement. In the STAR project (a randomized experiment conducted in Tennessee's elementary schools), a substantial teacher effect on mathematics and reading gains was observed (Konstantopoulos & Chung, 2011; Nye, Konstantopoulos, & Hedges, 2004). Using a cross-classified random effect model of achievement growth in Prospects data, Rowan, Correnti, Miller (2002) have found a large effect of teachers (at least a 0.7 standardized effect size in mathematics and reading achievement growth). On administrative data, Chetty, Friedman, Rockoff (2011) have shown that when a highly

effective teacher (identified on the basis of a value-added model), arrives in a school, school performances increase. Some interesting findings complete the picture: this teacher effect could be long-lasting and additive (Heck, 2009; Konstantopoulos & Chung, 2011; Sanders & Rivers, 1996). Moreover, there is some support showing that effective teachers are effective for all pupils (Aaronson, Barrow, & Sanders, 2007; Sanders & Rivers, 1996; Wright, Horn, & Sanders, 1997) but that stronger effects are observable in class with lower achievers (Wright et al., 1997) or with pupils from lower socioeconomic background (Nye et al., 2004). Let us note that the ability of value-added models to validly assess the teacher effect remains an open debate as highlighted in the recent ASA statement (American Statistical Association, 2014) in which it is recalled that there are strong technical requirements of such modelling (both on the level of data and methods) and that the consequences of their implementation in accountability systems are complex.

Once the existence of a teacher effect has been documented, examining how teachers have an effect appears to be the next relevant question. However, the literature does not provide a unanimous view on the topic. Amongst the teacher characteristics that can matter, some variables have been extensively studied as they have the advantage of being easily observable and available in numerous datasets. In the following section, we restrict ourselves to some attributes of the teacher career (namely experience and qualification) that impact on teacher wages in FWB, in addition to some attributes of the job conditions (notably stability).

Effects of longer teaching experience on pupil achievement have been observed in American elementary (Chetty, Friedman, Hilger, et al., 2011; Clotfelter, Ladd, & Vigdor, 2007), middle (Neild, Farley-Ripple, & Byrnes, 2009) and high schools (Goldhaber & Brewer, 1997). The positive effect of experience cannot be imputed to the persistence of more effective teachers in the profession as they tend to quit it more frequently (Clotfelter et al., 2007). However, as the teacher's quality improves mainly during the first teaching years, having a novice teacher might be more

detrimental than having a somewhat more experienced teacher (Rivkin, Hanushek, & Kain, 2005). Moreover, schools with a higher proportion of novices are in a specific situation, not only because novices are less experienced, but also because these novice teachers face difficulties linked to their entrance in a new profession without any transition and in an insecure job (De Stercke et al., 2010). Findings are, however, not always consistent. Indeed, several other researchers did not detect any effect of experience on pupil achievement (Desimone & Long, 2010; Heck, 2007; Hill, Rowan, & Ball, 2005; Stronge, Ward, & Grant, 2011), nor any effect of the proportion of novice teachers in school (Baker, Goesling, & LeTendre, 2002).

A second largely documented characteristic is the teacher diploma. One entry consists of measuring the effect of having a graduate level, but most researchers have not found any effect (Clotfelter et al., 2007; Rivkin et al., 2005). Desimone and Long (2010) found, in ECLS-K data, a negative effect of being taught by a teacher with less than an undergraduate level in the first grade but not in kindergarten. A second entry consists in assessing whether the teacher has acquired knowledge in the field he teaches, a question that became of primary importance since a lot of schools experience qualified teacher shortages. Comparing teachers with an infield degree with those with an out-of-field degree in American high schools (NELS data 1988), Goldhaber and Brewer (1997, 2000) found a higher effect of infield teachers in pupil achievement in math but not in science. On the same data, Dee and Cohodes (2008) did not find any effect of the infield degree but rather of the certification in the subject that the teacher teaches.

Finally, some characteristics regarding job conditions can have an effect. Schools where the team is stable may be more able to set up and focus on pedagogical dynamics rather than supplying teachers. Heck (2009) has shown that stability is one of the main factors explaining variance in pupil achievement at the school level. Furthermore, a high turnover has a disruptive effect on collaboration as a lot of time and energy is required to help new colleagues, take responsibilities for

them while there is uncertainty concerning the time the colleague will stay (Guin, 2004). Workload planning can also play a role as teachers who are more satisfied with it are more likely to teach until retirement and, consequently, can improve the stability of the team (Hughes 2012).

All in all, we could summarize the mixed results from the literature by two competing conclusions: Clotfelter, Ladd, Vigdor (2007) compared the effect of having a teacher with weak credentials (concerning experience, degree, licensure, test-score, competitiveness of the undergraduate institution) to the effect of having poorly educated parents. In contrast, Aaronson, Barrow, Sanders (2007) noted that the majority (more than 90%) of the variance in teacher quality is not explained by observable variables (as experience, degree, certification, major in undergraduate and graduate levels). In other words, according to them, these observable attributes can have an effect, but this effect would be limited.

3. Different Kinds of Teachers Across Schools

Like Gawlik, Kearney, Addonizio, and LaPlante-Sosnowsky, we defined teacher sorting as 'the non-random distribution of teacher quality across students and schools' (2012, p. 423). Since teachers have substantial effects on pupils' achievements, who teaches whom becomes a critical question. If teachers have different effects, their sorting across schools matters. However, the literature has extensively treated teacher sorting based on easily measurable traits that, as we have shown, only seem to have modest effects on pupil achievement.

Firstly, let us consider experience. Experienced teachers tend to run away from high-poverty, minority or low-achievement schools, while novice teachers are overrepresented in these schools. This has been observed in American schools for all education levels (Boyd, Lankford, Loeb, Ronfeldt, & Wyckoff, 2011; Clotfelter, Ladd, Vigdor, & Wheeler, 2006; Lankford, Loeb, & Wyckoff, 2002), in France (Léger, 1981), and recently also in the FWB (Delvaux, Desmarez,

Dupriez, Lothaire, & Veinstein, 2013). Kalogrides, Loeb and Béteille (2013) have also noticed in Florida that more experienced teachers tend to be assigned to classes with higher prior achievement. Surprisingly the inverse relationship has been observed in Michigan, in this case probably due to the growing demand for teachers in high SES schools or the specific structure of the teacher population (Gawlik et al., 2012). The probability to have a novice teacher that is higher for a black pupil than for a white pupil is linked to both teachers' sorting between schools and between classes within schools (Clotfelter, Ladd, & Vigdor, 2005). The conclusion is the same for low-achieving and poor pupils (Kalogrides & Loeb, 2013): some kids risk having less experienced teachers.

Regarding qualification, out-of-field teachers are more highly represented in American high-poverty schools (Ingersoll, 1999; Richards, 2014). In the Belgian Flemish Community too, pupils from high socioeconomic background tend to be more often matched with infield mathematics teachers (Akiba, LeTendre, & Scribner, 2007).

As previous investigated traits do not seem to have important effects, researchers have mobilized different measures to approach the professional quality of teachers. In North Carolina, Clotfelter et al. (2006) showed that high-poverty schools have more teachers from less-competitive colleges, with lower test scores or with a non-regular licence. Using a composite index for overall teacher quality (covering experience, degree, certification and competitiveness of the college), Lankford et al. (2002) observed that pupils with lower socioeconomic backgrounds have less qualified teachers. Although most of the variation occurs across districts, a substantive part of the variance remains between schools in the same district. Using estimations of teacher effectiveness from value-added modelling, Boyd et al. (2011) have found a link between less effective teachers and high-poverty and low-achievement schools. Similar findings can be highlighted in Norway where certified teachers have a preference for schools with native pupils (Bonesrønning et al., 2005).

Finally, schools with low socioeconomic composition seem to have problems retaining teachers in general and assure the stability of their staff. In high-poverty, low-achievement or minority schools, teachers report more often that their school has a turnover problem (Loeb et al., 2005). Comparing teachers who stay in the same school with those who do not stay, Scafidi, Sjoquist and Stinebrickner (2007) showed that the latter tend to work in high-poverty, low-achievement or minority schools. Amongst American elementary and secondary schools, Ingersoll (2001) has observed greater turnover rates in high-poverty schools. Dumay (2014) has found that French-speaking schools with a more deprived population have a higher teacher renewal rate. Compared to working-class secondary schools, French middle-class schools have a different teacher renewal in quantitative and qualitative terms (Léger, 1981). They show lower renewal rates, but also teachers tend to stay longer, often until retirement. Furthermore, the effect of the school composition might influence high quality and novice teachers in a different way, the latter being more sensitive to the pupil level (Donald Boyd, Lankford, Loeb, & Wyckoff, 2005). Drop-out can be viewed as a specific aspect of turnover. Drop-out results are mixed since some researchers did not find evidence of differential drop-out by socioeconomic composition (Clotfelter et al., 2006) while others did (Gawlik et al., 2012).

4. The Belgian Educational System

Since 1989, Belgium has three separate educational systems, reflecting the division of the country in three linguistic communities. Linguistic communities and territorial delimitations often overlap except, for example, for the bilingual region of Brussels. In this paper, we focus on the FWB that provides schooling for 44 percent of the Belgian pupils (MCF, 2010).

Going into detail would be beyond the scope of the article, but some features of the system are linked to our research strategy and need to be presented. A first feature of the educational system is that it is defined as free of charge, but it is also organized as a quasi-market where parents

are free to choose their children's schools. Schools are in competition with each other, specialize in attracting pupils and implement strategies to attract specific pupils. Indeed, the public funding of schools depends on the number of pupils they have (Delvaux & Joseph, 2006). Such competition contributes to the consequential segregation that characterizes Belgian education (Demeuse & Friant, 2010). In this market, teachers are equally free to apply for vacant teaching positions, which they will obtain if they have priority. Although the system is organized in different networks of schools with different sets of rules, the priorities mainly depend on the seniority within a specific segment or on having taught at least 10 years in a school falling under the affirmative action policy of the Community. Consequently, schools can be composed of different types of pupils but also of different types of teachers.

Secondly, compulsory education (between 6 and 18 years of age) is divided into two levels: an elementary level (with 6 consecutive grades) where pupils follow a common-core curriculum, and a secondary level (with also 6 consecutive grades) in which pupils are enrolled in different tracks. In this article we focus on elementary education because only at this level, all schools are supposed to organize the same curriculum with similar rules and the required diplomas are the same for all teachers. From a purely legal perspective, teachers are assumed to be interchangeable in the light of the required diplomas and all schools hence hire similar teachers. However, this coherence is not perfect, as schools organize their classes differently, despite the administration's attempts to regulate it; as affirmative action programmes allocate different resources to schools with low socioeconomic composition (allowing them to hire more teachers); and as teachers have different career paths. In secondary education multiple tracks coexist, and we cannot disentangle teacher allocation to the tracks. As tracking does not exist in primary education, we will focus on this level, eliminating self-selection effects of pupils and related sorting mechanisms for teachers.

Let us stress that, although teachers are interchangeable regarding their diploma, the market

structure of the system and the priorities in hiring procedures imply that teachers can to a certain degree choose the type of school population they would like to teach to. The question is then, to what extent the possibility of choice is associated with non-random sorting of teachers. Do schools with a particular type of student body attract a specific type of teachers? The allocation of specific teachers to a specific student population is the core of the following chapters. We focus on the profile of teachers' staff in primary schools as an outcome of allocation and choice mechanisms. The study does not focus on the choice-making process itself. In sum, the aim is to assess, based on the data retrieved from administrative records, whether the primary schools with low socioeconomic composition attract equivalent resources in terms of teachers compared to schools with a wealthier student body. It should be noted that given the lower level of segregation and the higher similarities between teachers in the primary school level, we should not automatically assume that patterns will be similar in secondary education. We can readily assume that differential sorting is less of an issue in primary education than in secondary education. Moreover, as the quasi-market of FWB is segmented (regarding socioeconomic composition, self-governing Networks, geographic areas), we decompose the analyses to explore the possibility of different effects in these segmentations. Focusing on the entire school system at once might obscure particular patterns. We expect teacher characteristics to be more strongly linked to socioeconomic composition in some sub-markets.

5. Data and Methodology

Teacher records

In the FWB the teachers' wages are fixed for the whole territory and are a competency of the Community government. The general administration of teachers (AGPE) uses software, which records, on a monthly basis, each job in each school in a database called Teacher Wages. The lines of data are linked to individual teachers. In this study, we selected all teachers having received a

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Table 1: Indicators description

Variable	Definition
Seniority (Sen)	Average paid months (on the 1/09) for all teachers.
Novice rate (Nov)	Proportion of teachers with less than 5 years of seniority.
Turnover (Turn)	Number of teachers' arrivals and departures during the year, divided by the number of teachers at the beginning of the period.
Instability rate (Inst)	Proportion of teachers not present in the schools during each of the last three years. When the indicator reaches 0, the team has remained identical during 3 years.
Dropout rate (Drop)	Proportion of teachers who do not receive any salaries for a whole year after the current one.
Job scattering (JS)	Number of teachers hired divided by the whole workload. When this indicator reaches 1, the school consists of full-time teachers.
Job length (JL)	Average length in months for the work contracts.
Number of schools (Num)	Number of schools in which each teacher is paid each month during the year.

wage during the academic year 2010-2011. On the 18th of February 2014[1], our file included 39,102 recordings linked to 26,193 teachers in 1628 schools.

In collaboration with the administration, we constructed a battery of eight indicators to describe the profile of teachers at the aggregated school level (see table 1 for a description of the indicators). The approach was strongly driven by the data which obviously limits the characteristics we can explore. It does not allow to give a full picture, but this information available in the administrative databases is, however, exhaustive for the entire teacher body. The reference year lasts 10 months (excluding July and August) because temporary teachers are only paid during that period, contrary to those with tenure who are paid all year round. Consequently, we reduced the

[1] The database is dynamic and can always be corrected for material errors. However, we chose an academic year for which all the corrections should have been included. Indicating the specific year we extracted data for, can hence enable replication.

period of pay to the same length of time. Next, teachers can have a multitude of small jobs, fragmenting their full-time employment, each job corresponding to a line in the database. Therefore, some teachers can work a portion of time in a specific school while others can be full-time. All indicators, except job scattering, are adjusted to take this workload into account (full-time teachers having more weight than part-time ones).

The first two indicators (*Seniority* and *Novice rate*) cover the dimension of experience. For each school we computed the average seniority, namely, the average number of years during which the teachers of the school have worked (as teachers). As the literature has shown that experience does not seem to matter anymore after the first few years, we calculated the rate of novice teachers defined as the teachers with less than five years of seniority. A 5-year period is reasonable for the FWB: the novice period can last up to 7 years, when the novice becomes skilled and at ease with his job (Vonk & Schras, 1987) but after the first four years, the dropout rate of novices strongly decreases (Delvaux et al., 2013; Vandenberghe, 1999) and the proportion of teachers with a full-time job becomes similar for novices and non-novices, even though most of them keep having a temporary status (Delvaux et al., 2013).

The next three indicators are longitudinal constructs that measure career move and stability of the staff. While *turnover* aims at measuring the amount of short-term movements from the teachers, the *instability rate* measures longer-term movements. Finally, amongst teachers leaving school, the *dropout rate* focuses on teachers who have stopped working as teachers and have left the profession. The remaining indicators are not classically included in the analysis of teacher sorting but provide extra information about job conditions. We assume that it is more difficult to collaborate and communicate in a school in which the staff changes regularly, have short part-time jobs in several schools, are required to get simultaneously involved in several schools, to juggle with several contexts and to organize travel time. *Job scattering*, *job length* and *number of schools*

allow identifying schools with many temporary substitute teachers.

Student Count

The socioeconomic composition measure comes from another database providing information on pupils. This database, called Student Count, is used for the distribution of funding between the Belgian linguistic communities, the management of the French-speaking education (e.g. affirmative action) and statistics. The Student Count includes a socioeconomic variable at an aggregate level. Precisely, within the framework of an affirmative action policy, an index (ISE) was computed for each Belgian statistical sector (which is the smallest Belgian administrative unit, with an average surface of 1.61 km^2, the surface being smaller in cities and dropping to 0.22 km^2 in Brussels) on the basis of data extracted from the census and from the Belgian administrative data (BCSS). This synthetic factor was developed to 'cover the complexity of the socioeconomic reality of sectors' (Demeuse, 2002, p. 229) and covers the following dimensions: income, education level, living conditions, occupation and employment. Once the sector indexes are computed, each pupil receives the value from his sector of residence. Even if this is not individual level data (pupils receive the value of their neighbourhood and not of their own home situation), it is the closest proxy we can currently use in the FWB.

In this paper, we extracted data from the 2010-2011 Student Count, which took place on the 15th of January 2011. The socioeconomic index presents missing values for some pupils (due to privacy policies or errors occurred while encoding addresses) though only for a small proportion (3.4%). We then computed the average socioeconomic status (SES) of primary schools on the remaining 297,326 valid cases, the average socioeconomic index reaches 0.03. Although it is not problematic for most of the schools, some schools have a non-negligible rate of pupils with missing values for this variable. Therefore, schools with fewer than 70% of pupils having complete data were deleted (16 schools).

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Method

Both databases were linked at the school level. There is, however, a technical caveat as there is not any common available identification at a more disaggregated level that allows us to link them. The linkage between both databases is not perfect as two different institutions with different rules (and different definitions of a school) have developed their own database. Amongst the 1715 schools in the Student Count, we hence lost 101 schools due to the non-correspondence of linkage (namely, 5.1% of the population). Hence, our final population reaches 1614 primary schools.

Like Gawlik, Kearney, Addonizio and LaPlante-Sosnowsky (2012) and Richards (2014), we used correlational analyses to measure teacher sorting. Correlations between the socioeconomic school composition and each teacher indicator were computed at the school level and represented in figure 1. The means of the monthly number of full-time equivalent per school were used as weights so that bigger schools have more weight in the computation. All analyses were performed with R.

As we have already noted, parallel markets might cohabit and blur the picture. Gawlik, Kearney, Addonizio, LaPlante-Sosnowsky (2012) found different results when they considered other geographical levels. This is not necessarily a problem as one interest in studying the FWB resides precisely in the important segmentations of its quasi-market. It is hence fully justified and even advised exploring different segmentations.

Firstly, schools with a low SES might consist in a coherent sub-market where strong patterns can be observed. Pupils from low and high socioeconomic origins could arguably choose their schools in different markets, linked for instance to patterns of residential segregation. We hence also rerun the analysis focusing on the schools with the lowest socioeconomic compositions (gathering 20% of the pupil population).

Secondly, the educational system of the FWB consists of several self-governing Networks

(i.e. federations of schools and organizing authorities) with, amongst others, their own recruitment rules and different degrees of centralization (Beckers, 2008). While the Community Network (3.5% of our population) has only one organizing authority, the Municipal (55.3%) and the Provincial (.1%) Networks have one organizing authority for each corresponding administrative entity and the Free – mostly Catholic – Network (41.1%) has a multitude of smaller organizing authorities. Such organization has consequences since, for example, seniority in each organizing authority (that defines the priorities) is not added up and generally not transferred from the one to the other. In practice this means teachers will not make career moves from one organizing authority to another. To explore this segmentation, we compared the two biggest Networks.

Finally, Belgium is known to be a socioeconomically contrasted territory, beyond the neighbourhood level. For example, poor and desindustrialized areas lay beside rich middle-class areas. Analysis at the country level could render differences impossible to observe since schools with low SES in rich areas remain more privileged than privileged schools in poor areas. In order to overcome this limitation, a new level is analysed. Since administrative divisions may not be relevant, researchers proposed several scenarios to identify school market areas (Delvaux et al., 2005) based on the analysis of links of interdependence between areas of recruitment schools. Amongst the scenarios, we chose to use the one called ‘Big school market areas’, which has the advantage of having clear borders in terms of interdependence, of being socioeconomically coherent, and of presenting complete school offers, but which entails management difficulties because of the covered surface. As Charleroi and Liège are large markets in this scenario, we rerun the analyses with another scenario with more smaller areas (‘Scenario B’) where areas correspond to the cities.

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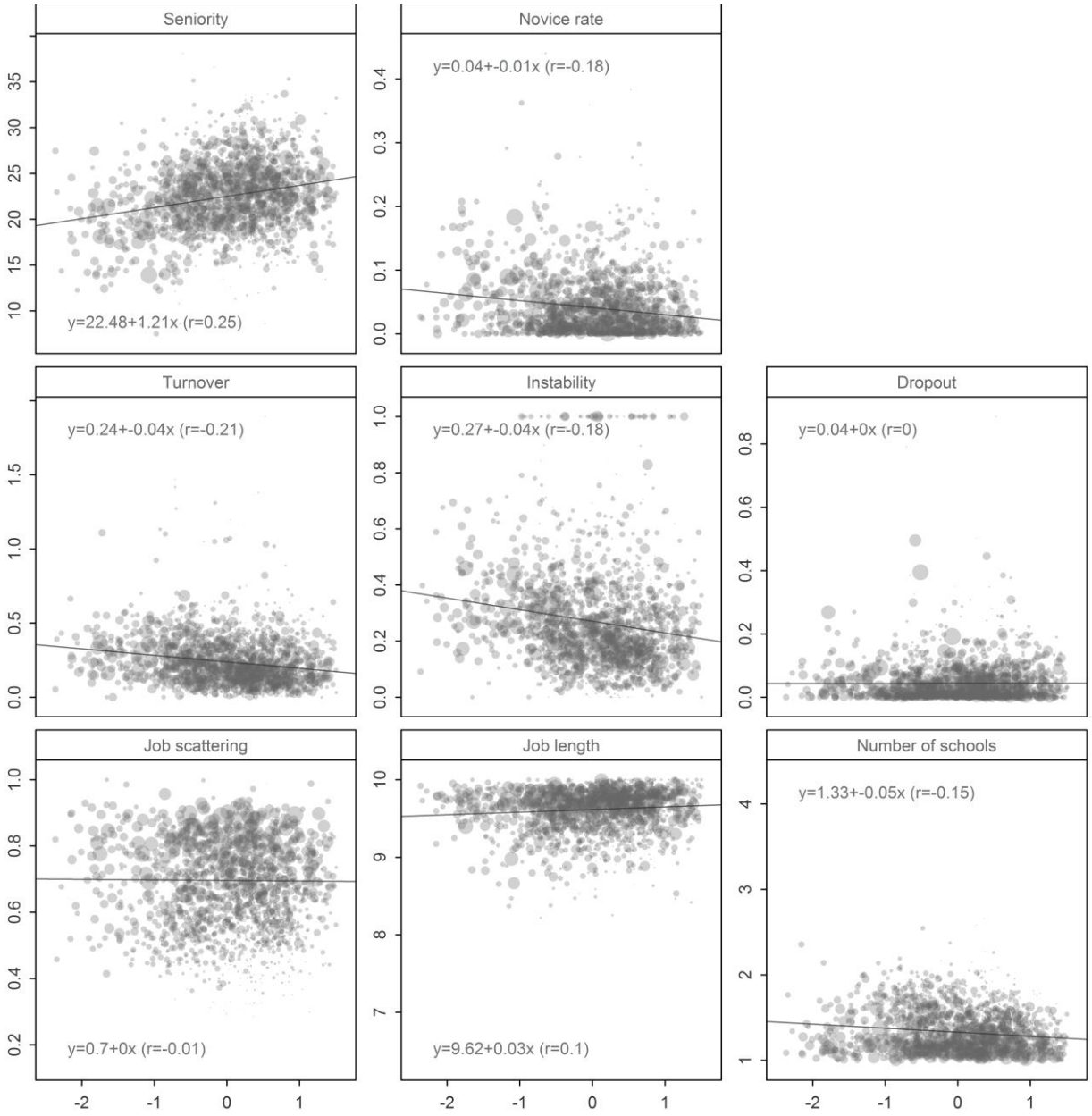
Figure 1: Relation between the socioeconomic school composition and each teacher team characteristics (weighted correlations in brackets)



6. Results

The whole Community

In Figure 1 (and Table 5), weak correlations for teachers' experience are reported. In low SES schools, teachers tend to be less experienced (r = 0.25) and the rate of novices is higher (r = -0.18) than in high SES schools. Secondly, turnover and instability are higher in low SES schools (r

= -0.21 and -0.18 respectively) but the dropout rate is not correlated with the socioeconomic composition. Finally, while there is no relation between composition and job scattering, teachers in low SES schools tend to teach for short periods and in multiple schools.

In order to interpret the results, we can compare the first and the last deciles, namely, the 10% of schools with the lowest socioeconomic composition with the 10% of schools with the highest socioeconomic composition (Table 2). There are a few powerful patterns. For example, highest SES schools have fewer novice teachers. They only have 3% of novice teachers compared to the lowest SES schools that have more novice teachers (6%). The latter also face more instability since they show a higher proportion of teachers who were not present in the schools during each of the last three years (35% against 26% in the highest SES schools).

Table 2: Comparison of indicator values between the first and last decile

Decile	Sen	Nov	Turn	Inst	Drop	JS	JL	Num
1st decile	20.22	0.06	0.31	0.35	0.05	0.69	9.56	1.40
10th decile	23.24	0.03	0.22	0.26	0.05	0.67	9.63	1.29

Table 3: Correlations for low SES schools

Sen	Nov	Turn	Inst	Drop	JS	JL	Num
0.22	-0.18	-0.04	-0.09	-0.04	-0.15	-0.12	0.1

Table 4: Correlations by Network

Decile	Sen	Nov	Turn	Inst	Drop	JS	JL	Num
Municipal Network	0.28	-0.20	-0.25	-0.23	0.00	0.03	0.14	-0.23
Free Network	0.25	-0.18	-0.17	-0.12	-0.01	-0.13	0.01	-0.02

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Segmented market areas

We firstly consider segmentation in the distribution of socioeconomic compositions and focus on the group of low SES schools (Table 3). As expected, there are important disparities within this group of schools. Some schools with low SES present problematic situations, whereas others do not. We do not detect stronger patterns amongst them since the correlations remain at the same level as for the whole community. However, the correlations for some indicators have unexpectedly changed. Turnover and instability are less strongly related to SES it in this subgroup where all schools face such problems.

In Table 4, the comparison of the results of the two biggest networks (Municipal versus Free Network) reveals some interesting points. Low SES schools from Municipal Network tend to have teachers who work for shorter periods of time and in a higher number of different schools (r=0.14

Figure 2: Box-plot of the unweighted dispersion of school socioeconomic composition by market areas (big point: median, segment quartile to 1.5 times the interquartile range, small points: school out of this latter range)

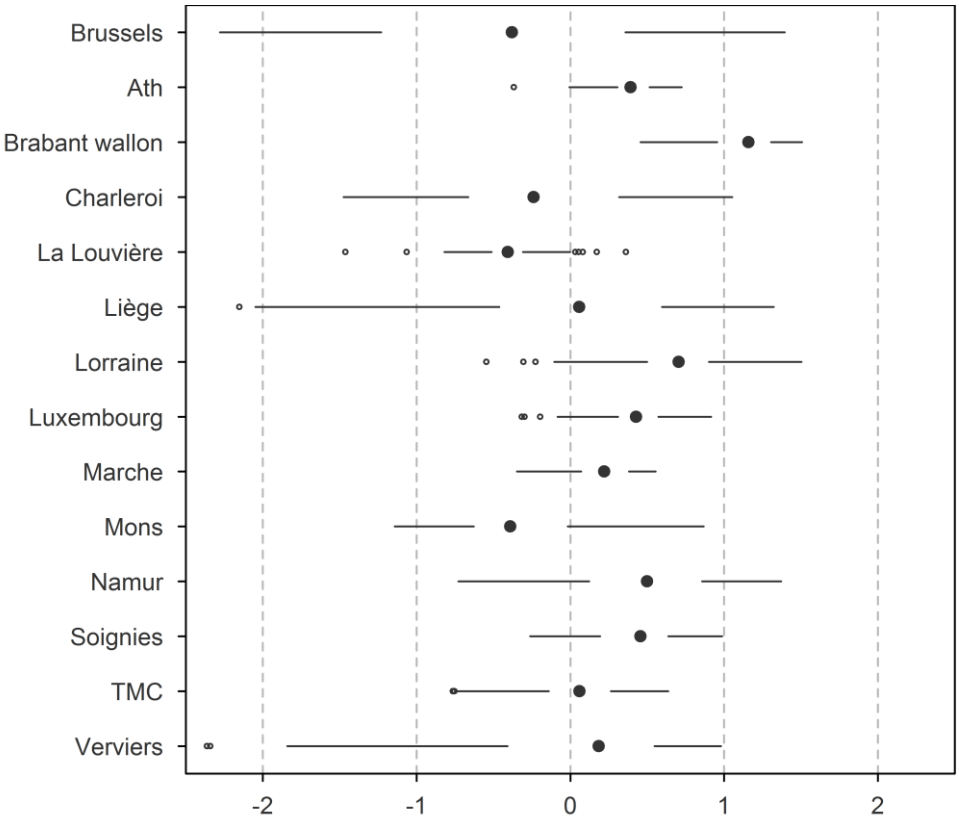

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Table 5: Correlations by school market area

Areas	Size	Sen	Nov	Turn	Inst	Drop	JS	JL	Num
Community	1614	0.25	-0.18	-0.21	-0.18	0.00	-0.01	0.10	-0.15
Liège	314	0.18	-0.08	-0.36	-0.34	0.00	0.16	0.22	-0.34
Brussels	241	0.43	-0.27	-0.32	-0.30	-0.03	0.04	0.11	-0.18
Charleroi	226	0.23	-0.08	-0.25	-0.24	0.05	0.18	0.39	-0.34
Namur	163	0.06	0.00	-0.05	0.11	-0.01	-0.14	-0.05	0.12
TMC	112	0.19	-0.03	-0.02	-0.16	0.01	-0.03	-0.03	0.03
Mons	98	0.01	0.01	-0.03	0.04	0.11	0.11	0.17	-0.12
Luxembourg	85	-0.07	0.19	0.17	0.20	0.02	-0.17	-0.01	0.21
Brabant wallon	84	-0.25	0.14	0.03	-0.16	0.09	0.09	0.00	-0.21
La Louvière	61	0.19	-0.01	-0.21	-0.18	-0.10	0.10	0.16	-0.15
Lorraine	59	0.03	-0.13	-0.06	-0.07	-0.07	0.12	0.10	-0.15
Verviers	54	0.10	-0.20	-0.28	-0.34	0.06	0.14	0.11	-0.19
Marche	47	0.17	-0.15	-0.08	-0.21	-0.07	-0.01	0.11	0.03
Soignies	45	0.03	0.12	0.07	-0.03	-0.05	-0.23	-0.07	0.11
Ath	25	-0.50	0.39	0.52	0.66	-0.09	-0.29	-0.53	0.40

and *r*=-0.23, respectively). However, the job scattering is not linked to composition. In contrast, jobs are more scattered in low SES schools from the Free Network (r = -0.13) though there is no link between composition and the two other indicators. Moreover, turnover and instability are more strongly linked to the composition in the Municipal Network (r = -0.25 and r= -0.23, respectively) as already observed by Dumay (2014). Actually, priorities in the Municipal Network give access to more schools than in the Free Network, what can multiply the opportunities to change school for teachers.

Correlations for each school market area are reported in Table 5. The results appear to be more balanced. Let us then begin with the three big school market areas (the 'size' column is the number of schools in the area), namely Brussels, Charleroi and Liège. Firstly, Brussels has the widest dispersion in terms of socioeconomic school composition (as shown in Figure 2) but also presents the densest school offer on a small surface. Indeed, Brussels welcomes almost four French-speaking pupils in primary education per hectare while this density only reaches 0.14 pupils per hectare in Wallonia, which gathers all the other markets. This area presents some low to moderate correlations on two axes. Firstly, the teachers in low SES schools tend to be less experienced and more teachers are novices. Secondly, the staff of teachers in low SES schools tends to be less stable.

Charleroi and Liège are also big markets with a wide dispersion in terms of school composition but less dense. In Charleroi, differences with regards to the job scattering, job length and number of schools are more stringent. With low to moderate values, the correlations between composition and these indicators but also turnover and instability are particularly high in Liège. In conclusion, in these three areas some characteristics are more strongly linked to a low socioeconomic composition, while the type of characteristics can be differently linked to SES composition in different areas. Charleroi and Liège being large markets, this link can be caused by important socioeconomic differences between sub-areas. The analysis of the markets from 'scenario B' leads to a light decrease of coefficients. In Charleroi, the job length and the number of schools reach respectively 0.37 and -0.27 while the number of schools, the turnover and the instability reach respectively -0.26, -0.31 and -0.28.

Verviers, situated near Liège, is also characterized by a wide dispersion and faces slight stability issues in more schools with low SES. The links between the socioeconomic composition and the indicators in Ath are surprising. Some of them are moderate in size and in the opposite direction compared to the mean. The smaller number of schools in this area does not suffice to

explain the strong influence of some schools. For example, some schools with low SES have a stable and experienced team, while there are privileged schools with a low stability. In Marche, finding experienced teams for schools with low SES seems to be a specific problem. The other areas do not show notable correlations or specific patterns. Some areas, like Walloon Brabant, are richer and more homogeneous, while others, like Mons, are more mixed.

7. Discussion and Conclusion

Our analysis reveals several elements. There are links, however weak, between teacher characteristics and school composition. Low SES schools tend to welcome less experienced and more novice teachers, as well as teachers with more divided workload. Moreover, these schools face higher turnover and instability rates. However, we did not detect any link to the job scattering or dropout rate. This latter observation is somewhat surprising although in line with the findings of Delvaux et al. (2013) in FWB and Clotfelter et al. (2006) in North Carolina.

Considering the whole Community as different markets, we reran the analyses. Some aspects appear to be more salient in some markets. This finding highlights the relevance of considering segmentations of the market when studying the differences in the profiles of teachers across schools. In competitive areas (higher school offer density) with a wide heterogeneous socioeconomic school composition low SES schools more often have a staff composed out of less experienced teachers (Brussels), confronted with less favourable job conditions (Charleroi) or showing more turnover (Liège). Some strong patterns are, furthermore, observable in Ath or Verviers, while the other areas with a homogeneous composition and a smaller offer density do not seem to particularly face problems.

Limits

The use of administrative records has benefits. They are the only existing source to investigate teacher sorting in the FWB. They are an exhaustive collection available at a low cost, validated by the administration and allowing geographic disaggregation. However, some limits are worth noting.

The database is intended for management, not for statistics or for analyses. Consequently, some variables are collected and conscientiously checked while others are not. In other words, the variables that we can use have to be chosen with caution and some relevant variables are missing. Firstly, we do not have any variable measuring teacher quality, since linking teachers to pupils is impossible in the administrative database and no exam is organized with the goal to assess teachers. Secondly, we do not have any variable measuring teachers' qualification. Teacher shortage has become a stringent problem and data is not available at this time because it remains a delicate political issue and because the information in the administrative teacher records is not reliable. However, this variable would in any event probably be less relevant in elementary school where 97.5% of teachers have a pedagogical bachelor and there is no specialization of teachers in specific fields (MCF 2016).

Next, the more desegregated common identification in both databases is the administrative unit: a school is defined as a group of classes that are managed by one principal. However, schools can have multiple buildings located at different addresses, sometimes far from another. Most schools have either one or two buildings at different addresses (respectively 66.1% and 24.1% of schools). In other words, in some cases, we treated multiple schools as one, in other, not. More serious is the absence of any linkage between pupils and teachers at the class or teacher level. Consequently, we had to do aggregated analyses at a level usually containing between 5.5 and 22.1 full-time equivalents (respectively the first and the ninth deciles). However, there is a risk of biases

in estimators when using aggregated analyses, namely, overestimation (Bennink, Croon, & Vermunt, 2013) and underestimation of the aforesaid estimator (Croon & van Veldhoven, 2007).

Regarding the index used to measure individual socioeconomic origin, some limitations are worth noting. First, there is a problem of data availability for the sector computation. For the last Student Count, some variables are out of date (the oldest one dates back to 2001), some are only available at a wider administrative unit such as the municipality, and some are not available for sectors with a low population density in order to ensure privacy protection. Second, as the dimensions that must be covered by the index are legally defined, some variables that are weakly correlated with the factor are still kept in the model. Such a choice can cause an issue of validity. Third, the use of data at the sector level introduces a bias, as a perfect socioeconomic homogeneity within sectors does not exist. Because sectors have a more or less heterogeneous population, the variance of this socioeconomic variable is artificially reduced (Delvaux, 2003). Nevertheless, the use of the index at the school level and not at the individual level can decrease such a bias. Actually, we can assume that similar pupils live in the same sectors and go to the same schools. Such a double assumption implies that schools will attract specific pupils from different sectors and that their index will reflect it even if some sectors are heterogeneous.

Affirmative action

Some characteristics of the investigated educational system might limit the statistical visibility of teacher sorting. Amongst them, affirmative action might compensate for the market. Actually, since 2010-2011, the schools (or more precisely, the buildings) are ranked in one out of 20 socioeconomic categories, each composed of 5% of the student population. Roughly speaking, the schools in the four categories with the lowest socioeconomic composition receive extra resources (proportionally to the socioeconomic composition of the category) to hire teachers or non-teaching staff but also to buy equipment and improve the school environment.

Nevertheless, the effect of affirmative action on the market is not clear. The potential effects of affirmative action policy are confused with the effect of composition in our data. Although the intention of these extra resources is not to regulate the teacher market, the categorization can affect the market in opposite directions. The extra resources may be used to complete part-time workloads and stabilize some teachers, but not necessarily. Some investments in school environment or staff expansion can also make the school more attractive. By contrast, teachers may also avoid such stigmatized schools, what can be allowed by the priority given to experienced teachers from these schools when they apply elsewhere. The desire to obtain such a priority may attract inexperienced teachers but also encourage experienced teachers to leave. Furthermore, the successive extensions of extra resources allow schools to hire more teachers, thus mechanically increasing our measurements of career movements.

Further Developments

Our approach requires some future developments. The first concerns the lack of some important variables. Since it is unlikely that in the future administrative records will contain more variables, surveys have to be done in order to gather more information, especially to explore more thoroughly the way teachers are distributed.

Survey would be particularly required if what matters is not that much what a teacher ‘is’ (at least on the basis of easily observable variables such as seniority), but rather what she does and how she behaves in the classroom. Some evidence in the literature points into this direction. For example, when Seidel and Shavelson (2007) compare (quasi) experimental studies in a meta-analysis, they found that domain-specific activities, time for learning, social experiences and the organization of learning had the highest impact on learning. Garrett and Steinberg (2015) found a significant but modest positive effect of teachers positively rated on the Framework For Teaching instrument (based on observation of teachers with regards to their planning and preparation,

classroom environment, instruction and professional responsibilities). In the LOSO project in the Belgian Dutch-speaking Community, Opdenakker and Van Damme (2006) identified the positive effects of a learner-centred teaching style, while Blazar (2015) showed that, in American elementary schools, an ambitious mathematical instruction (inquiry and concept-based teaching) has an effect on pupil achievement in mathematics. Moreover, studies observed an effect of teacher self-efficacy on pupil achievement (Guo et al. 2012). However, these practices and attitudes are obviously costlier to measure and require specific collection tools.

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To sum up, the aim of this article was to test whether certain type of teachers could be linked to certain type of socioeconomic school composition. In the Belgian French-speaking education system where pupils and teachers have to choose their schools, is there a correspondence between some of their characteristics? In other words, do at-risk pupils get the more or get the less experienced teachers and are they in schools with less or with more stable teacher teams? Investigating this correspondence is not only important in order to understand the way school composition hinders pupils' performances but also, from a democratic point of view, to determine whether all pupils are exposed to similar learning conditions.

We did find unbalanced teacher allocation across schools. However, the correlations are much lower than expected if we focus on the entire system. Different reasons were explored and discussed. As the education market in FWB is segmented, focusing on the entire educational system could lead us to focus on the wrong level to correctly make assessments. Some correlations increased for some indicators in the denser areas highlighting some local problems, even if most of the correlations remain weak. Technical limits as the use of aggregated measures or the existence of affirmative action could also impact the results but the sense of their influence (reduction of amplification) cannot be clearly disentangled. Finally, it is likely that schools in primary education

behave less as a competitive market for teachers than secondary schools, not only because the segregation is lower than in secondary education but also because the majority of them share the same pedagogical diploma. Tracked secondary education could provide another picture.

If we assume that the results are valid, we have to conclude that our indicators are linked, but only *weakly* linked with the socioeconomic characteristics of primary school population. Regarding these characteristics of teacher staff, pupils do face rather similar learning conditions. If then, segregation has an effect through compositional effect, this effect will not massively be explained by an inequitable sorting of teachers' staffs regarding their experience, stability or job conditions in the primary education of FWB.

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