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ASSOCIATED FACTORS TO TEACHER MOBILITY IN THE MUNICIPALITY OF RIO DE JANEIRO*

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Abstract

The way in which teachers are distributed in schools is a relevant issue in the discussion of inequalities of educational opportunities. The objective of this paper was identify teachers' and schools' characteristics that impacts on teachers mobility. The research followed the movement of teachers who entered into the municipal system of Rio de Janeiro between 2009 and 2011. To estimate the probability of teachers switch schools logistic regression analysis were performed. The main result was that the number of times a school won the Prêmio Anual de Desempenho (Annual Performance Award) had presented a major impact in odds of mobility indicated that the policy that intend to improve students learning was increasing the inequality of educational opportunities.

TEACHERS • SCHOOLS • MOBILITY • EDUCATIONAL OPPORTUNITIES

FATORES ASSOCIADOS À MOBILIDADE DOCENTE NO MUNICÍPIO DO RIO DE JANEIRO

Resumo

A forma como os professores são distribuídos entre escolas é uma questão relevante na discussão das desigualdades de oportunidades educacionais. Assim, o objetivo deste trabalho foi identificar características do professor e das escolas que influenciam a mobilidade docente. A pesquisa acompanhou a movimentação de docentes que tomaram posse na rede municipal do Rio de Janeiro entre 2009 e 2011 e foram realizadas regressões logísticas para estimar a probabilidade de o docente mudar de escola. O principal resultado encontrado foi que o número de vezes que a escola ganhou o Prêmio Anual de Desempenho apresentou o maior impacto na chance de mobilidade, indicando que a política que pretendia aumentar a aprendizagem dos alunos estava agravando a desigualdade do sistema educacional.

PROFESSORES • ESCOLAS • MOBILIDADE • OPORTUNIDADES EDUCACIONAIS

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FACTEURS ASSOCIÉS À LA MOBILITÉ DES ENSEIGNANTS DANS LA COMMUNE DE RIO DE JANEIRO

Résumé

La modalité de répartition des enseignants entre les écoles est une question pertinente pour l'étude des inégalités et des chances éducatives. L'objectif de ce travail a été d'identifier les caractéristiques des professeurs et des écoles qui influent sur la mobilité des enseignants. La recherche a suivi les mutations d'enseignants ayant pris poste dans la commune de Rio de Janeiro entre 2009 et 2011. Des régressions logistiques ont été effectuées pour évaluer la probabilité de changement d'école. Le résultat le plus important concerne le rapport entre le nombre de fois qu'une école a gagné le Prêmio Anual de Desempenho (Prix Annuel Récompensant la Performance Scolaire) et l'impact important que ce fait représente sur les chances de mobilité, indiquant que la politique visant à améliorer l'apprentissage des élèves ne faisait qu'aggraver les inégalités du système éducatif.

ENSEIGNANTS • ÉCOLES • MOBILITÉ • OPPORTUNITÉS ÉDUCATIVES

FACTORES ASOCIADOS A LA MOVILIDAD DOCENTE EN EL MUNICIPIO DE RÍO DE JANEIRO

Resumen

La forma en que los profesores se distribuyen entre escuelas es una cuestión relevante en la discusión de las desigualdades de oportunidades educativas. Así, el objetivo de este trabajo fue identificar características del profesor y de las escuelas que influyen la movilidad docente. La investigación analizó el movimiento de docentes que tomaron posesión en la red municipal de Río de Janeiro entre 2009 y 2011 y se realizaron regresiones logísticas para estimar la probabilidad de que el docente cambie de escuela. El principal resultado encontrado fue que el número de veces que la escuela ganó el Premio Anual de Desempeño presentó el mayor impacto en la oportunidad de movilidad, indicando que la política que pretendía aumentar el aprendizaje de los alumnos estaba agravando la desigualdad del sistema educativo.

PROFESORES • ESCUELAS • MOVILIDAD • OPORTUNIDADES EDUCATIVAS

ACCORDING TO SEVERAL STUDIES ON SCHOOL EFFECTIVENESS, TEACHER - AND HIS or her practices – is one of the school factors that most affect student learning (DARLING-HAMMOND, 2000; SOARES, 2003; MORICONI, 2012; MUIJS *et al.*, 2014). Thus, the distribution of teachers among schools is a relevant issue in the discussion on educational opportunities, since teachers are considered prime school resources (CLOTFELTER; LADD; VIDGOR, 2010; RAO; JANI, 2011), and the way quality resources are distributed among students is fundamental to the analysis of whether a system is more likely to decrease or increase inequalities.

International research is consistent in indicating that the main factors associated with teacher mobility are those related to schools' characteristics, such student body composition (socioeconomic status, the strong presence of ethnic minorities), school climate, and student's proficiency level. These factors are generally assessed by the performance of students in external evaluations and are based on the results of educational accountability policies (BOYD *et al.*, 2008; ALLENSWORTH; PONISCIK; MAZZEO, 2009; WEST; CHINGOS, 2009; FENG; FIGLIO; SASS, 2010).

In Brazil, few studies have investigated factors and effects of mobility and teacher turnover, most of them are qualitative, and a few quantitative studies conducted have several methodological limitations to identify patterns of these phenomena. Nevertheless, such studies (TORRES *et al.*, 2008; DUARTE,

2009; ALVES *et al.*, 2013; CUNHA, 2015) indicate teacher turnover as a factor that perpetuates educational inequalities among schools with different socioeconomic profiles. Generally, schools that serve the most vulnerable populations suffer more frequently from teachers' absence.

In order to contribute to this discussion, this article, which is based on Carrasqueira's doctoral thesis, aims to determine the factors associated with teacher mobility in the municipal system of Rio de Janeiro by identifying both schools' and teachers' characteristics associated with a higher probability of occurrence of teacher mobility.

To accomplish this objective, we used logistic regression analysis to estimate the probability of teachers moving from one school to another in the early years after being admitted to the education system, considering a vector of teachers' characteristics (gender, education level, and age) and a vector of characteristics of the first school in which they were assigned (socioeconomic status of students, complexity of management, Índice de Desenvolvimento da Educação Básica [Basic Education Development Index] (IDEB), and the number of times the school had won an *Prêmio Anual de Desempenho* [Annual Performance Award] (PAD)).

In this study, in addition to *Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira* (INEP) databases, such as the School Census and *Prova Brasil*, we used data from the Rio de Janeiro Municipal Secretariat of Education to allow accurate and complete analyses of the teacher mobility phenomenon.

This article is divided into five sections in addition to this introduction. The second section presents a theoretical framework based on national and international empirical studies used to identify the factors associated with teacher turnover and mobility in various education systems and contexts. Afterwards, we describe the rules and procedures related to mobility that are practiced in the municipality of Rio de Janeiro and briefly presents the accountability policy, which was applied to the system between 2009 and 2016, as a factor that may be associated with teacher mobility in the municipality. Subsequent section presents the methodology used, including the aspects related to the databases and cases' selection, and we discuss the models and analysis performed. The results suggest that the factors related to schools' characteristics, such as the socioeconomic status of the student and the number of times that the school had won an Annual Performance Award (PAD), have a great impact on the odds of a teacher moving from one school to another. Finally, the final considerations section indicates the relevance of the trends observed in educational policies, as well as possible developments for further studies on teacher mobility in the Brazilian context.

TEACHER MOBILITY: DEFINITION AND ASSOCIATED FACTORS

The concept of teacher mobility, as stated by Cunha (2015, p. 18; own translation), refers to “the transfer of teachers from one school to another”, unlike teacher

turnover, which refers to “the flow of teachers into and out of schools”¹. That is, mobility is the understanding from the point of view of the teacher and turnover is the understanding from the point of view of the school. Although they are complementary, we must consider their meanings so as not to confuse them.

To a certain extent, teacher turnover is normal for all schools since teachers who retire or take leave for some reason are considered in this phenomenon. However, when turnover rate is very high, as Allensworth, Ponisciak and Mazzeo (2009) point out, it can generate organizational problems for the school and can even harm the pedagogical work due to the lack of consolidation of the teaching staff during the school year. If schools that serve a specific audience have higher turnover rates, it may cause inequalities in learning opportunities among the schools in the system (CLOTFELTER; LADD; VIDGOR, 2010).

Studies conducted in various contexts, particularly in the United States, indicate that schools’ characteristics have the greatest impact on teacher mobility. Generally, schools that suffer most from turnover are located in vulnerable regions and the composition of its student body is predominantly ethnic minorities, low socioeconomic status and low performance (BOYD *et al.*, 2008; WEST; CHINGOS, 2009; CLOTFELTER; LADD; VIDGOR, 2010).

Allensworth, Ponisciak, and Mazzeo (2009) conducted a study in the Chicago public education system in which they investigated factors related to the characteristics of students, teachers, schools, and the community where the schools were located. Thus, these authors were responsible for initiating the discussion on the impact of the school climate on teacher mobility.

According to the authors, the school climate alone explains more the variation in teacher mobility rates than do students’ characteristics. Being controlled by students’ and teachers’ characteristics, a good school climate can increase the stability rate by up to 6%. Finally, they state that the factors that best predict stability are related to working conditions in which the teacher has control over his or her practice, and an environment of support and cooperation.

Other studies indicate that pressures of school accountability policies may affect the pattern of teacher mobility (LADD, 2001; FENG, FIGLIO; SASS, 2010; CLOTFELTER *et al.*, 2004), especially in contexts in which the established goals do not consider students’ characteristics and do not use value added measures (LADD, 2001). For example, Feng, Figlio and, Sass (2010) analyzed the impact of accountability policy change in Florida. In this North American state, there was a change in the grading system of the schools, because of that a number of schools obtained grades different from what they expected, considering the previous grading system. The authors observed that the schools that achieved a lower grade than expected had a higher turnover when compared to the schools that achieved the same grade as or a higher grade than expected. The study did not investigate other schools’ characteristics.

1 In the original: “às transferências de professores de uma escola para outra [...] ao fluxo de entrada e saída de professores nas escolas da rede”.

Preliminary studies (TORRES *et al.*, 2008; DUARTE, 2009; ALVES *et al.*, 2013; CUNHA, 2015) in Brazil indicate that the distribution of teachers is similar to that observed in international studies (LUSCHEI; CHUDGAR; REW, 2013). More qualified and experienced teachers focus on schools with more favorable student profiles, perpetuating and increasing inequality.

Oliveira *et al.* (2013, p. 72; own translation) discuss, in a theoretical article, the issue of teacher mobility and point out that, in Brazil, “teachers in various systems systematically move from the periphery (at the beginning of their career) to the center”.² Torres *et al.* (2008), when researching spatial segregation and educational inequality in the city of São Paulo, found a pattern that corroborates the hypotheses of Oliveira *et al.* (2013), noting that schools on the periphery were the ones that concentrated more short-term teachers (i.e., teachers with less stability and substitutes) and had higher rates of teacher turnover.

Torres *et al.* (2008) identified a regulation that would facilitate this pattern of teacher mobility and would explain, to some extent, the inequality between central and peripheral schools. When entering the education system, teachers are assigned according to their preferences and their scores in the public tender they participated in. Once within the education system, teachers are classified for assignment to other schools in an order of classification, whose criteria include time in service and academic background.

In order to take a closer look at this issue, Alves *et al.* (2013) conducted an exploratory study to determine how teacher mobility is related to socio-spatial inequalities, mediated by the criteria established in the public tenders for transfer in the city of São Paulo.

In order to analyze mobility in one city sector of São Paulo, the authors classified the schools according to the socio-cultural composition of students and the vulnerability of the surrounding environment and verified the classification of teachers in public tenders for transfer. They observed that in this specific city sector, localized in the periphery of the city, have been losing teachers to schools in others sectors of the city. Moreover, teachers who go to the city sector analyzed are commonly the poorly classified, and try to choose schools with a less vulnerable surrounding environment and with students with a higher socio-cultural level. They observed that most of teachers who moved among sub-prefecture’s schools between 2006 and 2011, went to schools with lower social vulnerability and with students with greater cultural resources.

Duarte (2009), in his dissertation, researched the factors related to teacher turnover in Brazil using the SAEB 2003 data for three grades (4th and 8th grades of elementary school, and 3rd year of high school). The author found that the increase in white students decreases the likelihood of the class changing teachers during the school year. Furthermore, violence was shown to influence teacher’s decision to move from one school to another. The study considered the number

2 In the original: “é possível verificar em diversas redes um movimento sistemático de professores da periferia (no início da carreira) para o centro”.

of teachers, of Mathematics and Portuguese, that a class had during the school year as an indicator of teachers' transfer. However, this variable may also indicate that a class had more than one teacher for each subject and, may therefore, overestimate the phenomenon under study. Moreover, the data used did not make clear which classes lacked teachers or had more than one teacher, and which teachers moved from one school to another, left the school or took leave.

Cunha (2015) studied teachers' turnover in the city of Rio de Janeiro. The objective of the author was to verify teachers' characteristics associated with mobility and schools' characteristics, especially the student's body composition, associated with teacher turnover³. She presents some descriptive and bivariate analyses, and linear regressions, which give us important indications about the municipal system of Rio de Janeiro, despite the fact that she faced methodological problems, such as calculating the turnover rate of schools only for teachers who joined the system between the years 2002 and 2012 and thus ignoring the teachers with more time of activity.

Thus, studies in several countries, including Brazil, indicate that factors related to school – student's body composition, location, and school climate – are the best predictors of mobility. In the systems in which the teacher plays an active role in their mobility, the inequalities between schools that serve students of lower socioeconomic status (SES) and those that serve students of higher SES are significant. Lower SES schools have higher teacher turnover rates, as teachers tend to move to higher SES schools. These trends may be even stronger in the presence of pressures stemming from school accountability measures with less sophisticated designs, not considering the characteristics that schools cannot modify, such as student body composition and school size. However, even with the proliferation of school accountability policies, we do not find studies that provide empirical evidence on the relationship between accountability pressures and patterns of teacher mobility in Brazilian context.⁴

MOBILITY RULES AND ACCOUNTABILITY PRESSURES IN THE CITY OF RIO DE JANEIRO

There are two patterns of teacher mobility in the schools of Rio de Janeiro. The first is public tenders for transfer, which are regulated by specific public notices, and the second is when the teacher is "borrowed" from his original school to another one.

In the public tenders for transfer, teacher changes his or her original school, and for this reason, it has its own public notices. There are two types of

³ Their results show mobility rates varying between 15% and 30% (the results found in two years are quite discrepant, which may be due to problems with the database, such as duplicate data for the same teacher) in the following years.

⁴ A recent study observed the association between the pressures of introducing evaluation systems and pressures of school accountability, not on teacher mobility but on the turnover of principals in the municipal system of Rio de Janeiro (ANDRADE; KOSLINSKI; CENENIVA, 2018).

transfer, the intra-CRE⁵, that is, between schools of the same CRE, and the inter-CRE, that is, from one CRE to another. These transfers are conducted through annual public tenders, to which teachers interested in moving from their original school apply. To apply for a public tender for transfer, the teacher must have spent at least five years in the system (using the same enrollment intended to be transferred), and the teacher's transfer of school occurs after the end of the school year⁶. (CARRASQUEIRA, 2018).

Public notices indicate that the Human Resources Coordination stipulates the classification criterion. According to E/SUBG/CRH Ordinance No. 02 of November 26, 2014 (which is similar of subsequent years), the main classification criterion is "time of effective exercise, in days, in the current position"⁷ (RIO DE JANEIRO, 2014, p. 2). In order of ranking, teachers are called to go to the CRE and asked to choose which school they want to be assigned to, from among those with available seats. This means that the most experienced teachers or those with more time in the position are the first to choose, leaving the remaining schools for the less experienced teachers.

There is no indication in the resolutions or ordinances how many years in a row a teacher can apply for a transfer. Also, there is also no indication of the minimum retention period of the teacher in the new school before he/she can apply for a new public tender for transfer.

The other way is the "borrow", which in practice is very widespread in the system, with some teachers being already borrow at the time of admission⁸. The borrowed teacher is a teacher who belongs to one place of work but works on another. In other words, it is like he is on loan. There is no minimum or maximum period for the teacher to stay in the school where he or she is "on loan", nor a limit on the number of times the teacher can be "borrow". Furthermore, the teacher can be assigned to any school in the system, even if it is under a different CRE from its origin.

According to information obtained from employees who work in the Human Resources Sector, is the teacher who request to be "borrow". That means, it seems the teacher is the main agent and moves from one place of work to another at his own will. However, in practice, and this would merit an in-depth qualitative study, the school management may suggest that the teacher move to another school. For example, a teacher who returns from leave of absence may be "borrowed" when his or her home-school placement is occupied, or a teacher

5 CRE stands for Coordenadoria Regional de Educação [Regional Coordination of Education]. The CRE is an intermediary management body between the Secretariat of Education and the schools. Currently, the city has 11 CREs that supervise and assist the school units of their respective regions of coverage. CREs have management autonomy in relation to SME.

6 For more details on rules for transfer, see Carrasqueira (2018).

7 In the original: "tempo de efetivo exercício, em dias, no cargo atual".

8 Information on the practice of "borrow" was obtained in informal conversations with employees from different sections of the SME-RJ during our visits between 2016 and 2017 to request and seek data, and with teachers in the system because there is no normative act or legislation on the subject. High mobility was observed in our data, which could not only refer to public tender's transfers and must be the result of "borrow".

who has been assigned to a school may be borrow when teachers with longer time of activity return from their leave.

There is no specific guideline from SME-RJ on this issue because authorizing the transfer of personnel is an internal procedure. According to an official of the secretariat, as it is a procedure that depends only on the authorization of the school of origin and an idle vacancy in the school of destination, there was never a legal document that regulates these transfers published in the Official Gazette.

“Borrow” are mentioned in the resolutions about the inter-CRE transfer and stipulate that the teachers who are benefited from the borrowing practices between CREs in the current year should participate in the Inter-CRE transfer for the following year, under penalty of returning to their original CRE (CARRASQUEIRA, 2018). However, this obligation only applies to teachers whose date of admission allows them to register for the tender. The resolutions do not mention what happens to teachers who are not yet able to participate.

The absence of regulation for assignment implies something interesting to us: the rules do not induce a specific pattern of movement, unlike the public tender for transfer in which we expect teachers with more years in the system (who in many cases should be older and more experienced) to reach schools with a more favorable profile. It is important to point out, that teachers do not have the option of going to any school they want; their choice is limited by the existence of idle vacancies in the destination school. However, we do not have information on the conditions for the request for assignment.

With regard to the pressures of accountability, that may impact teacher mobility patterns, in 2009 the Municipal Education Secretariat of Rio de Janeiro adopted a school accountability policy that had the following supports: (i) an annual census evaluation, *Prova Rio*; (ii) the education development index of Rio de Janeiro based on IDEB or IDERio, and (iii) a bonus for schools linked to the achievement of performance goals, the Annual Performance Award (PAD) (CARRASQUEIRA, 2013). In 2016, this policy was discontinued.

The formulation of goals had been varying over the years, always following the same principle. Schools were separated by bands corresponding to their education development index, and each band had a specific goal of increasement to be fulfilled; the higher the index, the lower the goal of increasement. This is why it is understood that it would be more difficult to increase an index that is already close to the ceiling (CARRASQUEIRA, 2013). The prize was a bonus that corresponded to a 14th month salary for all active public servants assigned to the schools that achieved the goal⁹.

Accountability policies still generate many controversies about their real impact on student learning and school practices (LADD, 2001). It is believed that bonus incentives can generate changes in teacher’s practices and, consequently, can affect the students’ performance. However, as many studies has been shown,

⁹ For the *Escolas do Amanhã*, a SME-RJ program aimed at schools located in regions of high vulnerability, the amount of the premium is equivalent to 1.5 salaries.

this premise may not work according to the implemented model or may cause (perverse) effects policymakers did not expect (PONTUAL, 2008).

The policy of the municipality of Rio de Janeiro had no control over the socioeconomic characteristics of schools' student body, which can generate a certain feeling of injustice on the part of managers and teachers (LADD, 2001; CARRASQUEIRA, 2013; KOSLINSKI; CUNHA; ANDRADE, 2014). It also lacks direct incentives for equity, which can maintain practices that perpetuate inequalities.

Moreover, accountability policies may influence mobility, as it could encourage good teachers to remain in underperforming schools where they can reach their target. Conversely, it may encourage teachers to move from schools that do not have the odds of winning the prize to schools with better odds of winning. This would happen because, according to Ladd (2001), when the accountability policy focuses on the school but does not take into account whether the school has real conditions – material, social, and human resources – to achieve its goal, it can generate a sense of injustice in effective teachers. Such teachers would look for schools where their work would be valued, whereas ineffective teachers, in turn, would look for schools where they could benefit from peer effectiveness (free-rider effect).

METHODOLOGICAL PROCEDURES

For this study, we performed multivariate analyses that used logistic regression models to estimate the variable dependent on teacher mobility (a dichotomous variable that expresses whether or not the teacher changes the school during the analyzed period). The analysis takes as reference the first school where the teacher was admitted. The independent variables considered in the models cover both the characteristics of teachers (gender, education level, and age) and schools (socioeconomic status index, management complexity index, number of times it won an Annual Performance Award and the IDEB).

Logistic regression is the most used method for models with a dichotomous dependent variable (POWER; XIE, 2000; VOGT, 2007). The basic premise is the dichotomy between 'success' and 'failure'. In this feeling, the model estimates the probability of success, in our case expressed by the teacher moving from one school to another. In general, it works as an ordinary least square regression (OLS) that tells us the impact of independent variables on the dependent variable (VOGT, 2007). A major difference is that the answer obtained in a logistic regression analysis is in logarithm of odds, and therefore a conversion (to calculate the natural log through the exponential) is necessary to obtain the odds of the event happening and the odds of the event not happening for different groups (POWER; XIE, 2000). Practically, what we have as a result of logistic regression are the odds of the teacher moving from one school to another against his not moving, by considering each of the independent variables of the model.

For categorical independent variables, the result already represents the odds ratio. In other words, it already represents the ratio between the odds of two

groups (for example, the ratio of the odds of moving from one school to another between teachers with higher education and those with secondary education). When the variables are numeric, the result represents how much the increase of one unit of the variable increases (if the odds are greater than 1) or decreases (if the odds are less than 1) the odds of the event happening.

The selected teachers joined the Rio de Janeiro municipal system in 2009, 2010, and 2011. We chose those years because of the municipal accountability policy that was adopted in 2009. Moreover, we wanted to observe teachers' paths in the system for at least five years, and we have set a deadline of 2016.

It is important to note that, given the limited data, the selected teachers were active in the system at the beginning of January 2012. This means that teachers who left the system before that date could not be observed.

With this selection, the sample of the study was composed of 3594 teachers whose admission date corresponded to the date when they began working in their first place of work (two female teachers were removed from the cohort because they began working in 2008). These teachers were assigned to 1165 different school units (and 40 administrative positions) during the study period.

The data used in this work were obtained from various databases provided by the Municipal Education Secretariat of Rio de Janeiro and from the INEP electronic portal. The databases made available by SME-RJ uses data from the Administrative Management System, the Human Resources Coordination, and *Prova Rio*. The data from the *Prova Brasil* and the School Census were downloaded directly from the INEP website and are available in public domain.

Data from the SME-RJ were requested at various times, and have different collection methods and uses. The data from *Prova Rio* have a diagnostic purpose and, in this case, are better organized for use in research. Data from Administrative Management System and the Human Resources Coordination have administrative purpose. The bases of Administrative Management System are registration and annual updates of students – moves from one school or a class to another, bimonthly grades, etc. Moreover, the bases of the Human Resources Coordination are registrations and updates of teachers with the main purposes of payroll and organization of the educational system¹⁰.

The SME-RJ databases were used because no other database provided the date the teachers were admitted, the date they moved from one school to another, and the date they left the system. For example, INEP data do not provide information on mobility and turnover. Furthermore, the SME-RJ databases with students' information provide demographic and socioeconomic information with less missing data than the INEP databases.

¹⁰ For more details on the characteristics and limitations of the databases, see Carrasqueira (2018).

DISCUSSION AND DATA ANALYSIS

The analysis of mobility has factors of complexity inherent to the functioning of the educational system, because these transfers may be related to the teachers' willingness to go to another school but may also be the result of a lack of vacancy in the school of origin when returning from a leave or in the first place of work. Chart 1 shows the variables used in the analysis of mobility, as well as the source of the data used for its construction.

CHART 1
SUMMARY OF THE VARIABLES OF THE ANALYSIS OF TEACHER MOBILITY

VARIABLE	VARIABLE DESCRIPTION	FORMAT	SOURCE
DEPENDENT			
Moved from one school to another	If the teacher moved from one school to another (1 = Moved, 0 = Not moved)	Nominal categorical	Magister
INDEPENDENT			
TEACHER'S CHARACTERISTICS			
Age	Teacher's age at the date of admission	Discrete numerical	School Census
Education Level	Teacher's education level (1 = Higher education, 0 = High school)	Nominal categorical	Magister
Gender	Teacher's gender (1 = Female, 0 = Male)	Nominal categorical	School Census
SCHOOL'S CHARACTERISTICS			
Socioeconomic Status Index (SESI)	Indicator	Continuous numerical	AMS
Management Complexity Index (MCI)	Indicator	Continuous numerical	School Census
Basic Education Development Index (IDEB)	School's IDEB for the early years	Continuous numerical	INEP
Annual Performance Award (PAD)	How many times the school won the PAD	Discrete numerical	SME

Source: Author's elaboration.

Another issue that makes observing mobility a complex task is that teachers can move from schools several times during their careers. In the case of our cohort, as observed in Table 1, almost two-thirds (N=2223) of the teachers moved from a school to another at least once during the observed period, and 31% of the cohort were in the same school where they were allocated at the time of admission and did not move from one school to another over the eight years of observation, that is, they neither left the system nor moved from one school to another.

TABLE 1
DESCRIPTIVE ANALYSIS OF THE DEPENDENT VARIABLE

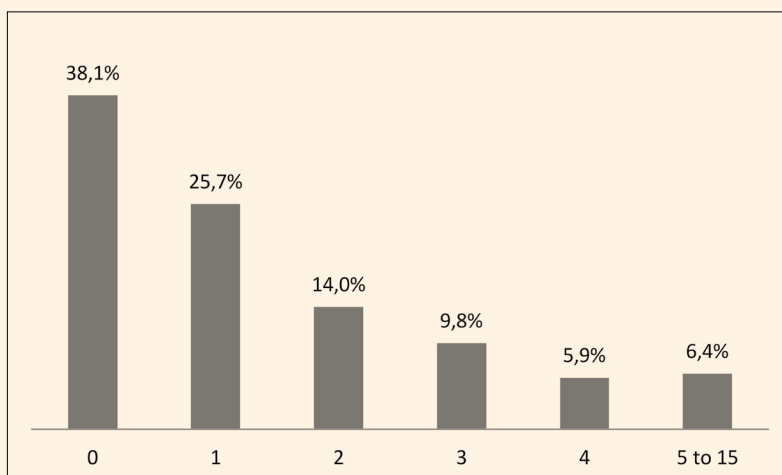
MOVED FROM ONE SCHOOL TO ANOTHER	N	%
Yes	2.223	62,0
No	1.130	31,0
Left system without switch schools (1)	241	7,0
Total	3.594	100,0

(1) Excluded from the mobility analyses.

Source: Authors' elaboration based on Magister data.

During the eight years of monitoring, we observed 5264 movements¹¹. That means, on average, each of these teachers switched school 2.4 times; if we consider the total number of teachers in the cohort (including those who did not move), the average is 1.3 transfers per teacher.

FIGURE 1
PROPORTION OF TEACHERS BY NUMBER OF TRANSFERS IN THE ANALYZED PERIOD



Source: Authors' elaboration based on Magister data.

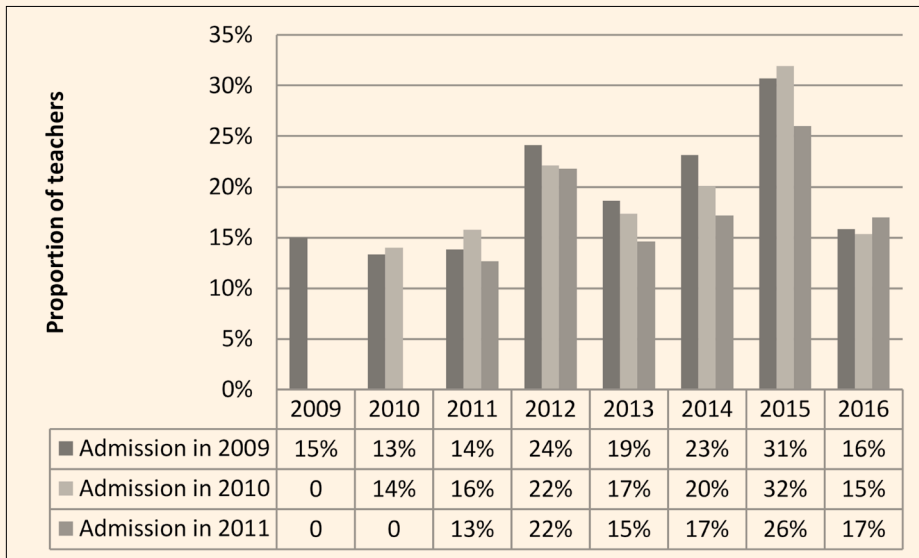
Figure 1 shows the proportion of teachers by the number of times they moved from a workplace to another during the period analyzed. We observed that 25.7% of the teachers who moved did so only once. Conversely, near 6.4% of these teachers switched school five times or more. Considering only those teachers who switched school at least once in the study period, there were half of them (49.5%) who moved for one to three times.

Figure 2 shows the proportion of teachers who moved from one school to another per year between 2009 and 2016, controlling for the year of admission. As the cohort studied comprised teachers who moved more than once in the period,

¹¹ As in the database it was impossible to differentiate between transfer from one school to another and leave of absence, we removed the schools where the teacher was assigned for less than 10 days, in order to avoid overestimation of mobility.

the sum of the percentages is not equal to 100%. We observe that the proportion of teachers who moved from their place of work in the year they entered the system is similar for the different years of admission. Similarly, looking at each follow-up year, the variations with respect to the year of admission are smaller than the variations between one year and another.

FIGURE 2
PROPORTIONS OF TEACHERS WHO MOVED FROM ONE SCHOOL TO ANOTHER PER YEAR, CONTROLLING FOR THE YEAR OF ADMISSION



Source: Authors' elaboration based on Magister data.

It is worth mentioning that teachers of our cohort were only able to participate in public tenders for transfer from the 2015 school year onwards. The teachers who were admitted in 2011 could only participate from 2017 onwards, and therefore could not have moved from one school to another through public tenders for transfer in the period analyzed. In 2015, the increase in mobility was great for the groups regardless of their date of admission. In 2016, there was a drop, again, regardless of the date of admission. Thus, the pattern of teacher mobility observed in the analyses is more associated with assignments than with public tenders for transfer and, in some cases that we could not identify, with licenses¹².

Tables 2 and 3 present the descriptive statistics of independent variables of the characteristics of teachers and schools.

With regard to gender, we can observe that our cohort is composed mostly of females. Four teachers did not have their gender identified. Since the study was conducted with teachers in the first segment, the low number of male teachers was already expected. Even today, few men opt for educational courses

¹² The databases that we received permission to use did not allow us to identify the reason for the transfer or periods of leave.

that enables the professional to teach in Early Childhood Education and in the early years of Elementary Education¹³ (JAEGER; JACQUES, 2017). The 2016 School Census data indicated that men represented only 10 per cent of SME-RJ's first segment and early childhood education teachers.

TABLE 2
DESCRIPTIVE STATISTICS OF THE INDEPENDENT VARIABLES USED IN THE LOGISTIC REGRESSION MODELS THAT REFER TO TEACHERS' CHARACTERISTICS

		N	%	VALID %		
Gender	Male	92	2,6	2,6		
	Female	3.498	97,3	97,4		
	Total valid	3.590	99,9	100		
	Missing	4	0,1			
	Total	3.594	100			
Educational Level	High School	1.130	31,4	31,5		
	Higher education and graduate	2.461	68,5	68,5		
	Total valid	3.591	99,9	100		
	Missing	3	0,1			
	Total	3.594	100			
		N	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
Age		3223	19	91	34,8	9,22

Source: Authors' elaboration based on Magister data and School Census 2012.

Regarding schooling, 69% of the teachers in the cohort had completed higher education at the time of their admission, with 17% of the cohort having completed some graduate course (*Stricto* or *Lato sensu*) and about 31% having completed only secondary education. We treated this variable as a dichotomy because the difference between the graduate category and higher education was not statistically significant in all analyses.

Age was a variable constructed from the date of birth at the time of admission. Information on the date of birth of 371 teachers was not found. Teachers up to 39 years of age represented about 71% of the cohort (of which 34% were teachers up to 29 years of age).

The IDEB is a continuous numerical variable that indicates the development index of basic education for the school. The test evaluates 5th and 9th grade students, thus we opt to use de index with the outcome of 5th grade. We use exactly the results disclosed by INEP for the years 2009, 2011, 2013, and 2015. For the years that do not have an evaluation, we indicate the result of the previous year. For example, for year 2016, the index indicated was same as that in 2015. We emphasize that many school units in which the teachers of our cohort

¹³ In Brazil, in addition to graduation in pedagogy, there are professional high school courses with teacher training.

have taught do not participate in this evaluation because they do not offer the grade evaluated.

TABLE 3
DESCRIPTIVE STATISTICS OF VARIABLES INDEPENDENT OF THE CHARACTERISTICS OF THE FIRST SCHOOL

	N	MINIMUM	MAXIMUM	MEAN STD.	DEVIATION
Socioeconomic Status Index (SESI)	3.352	-3,04	2,99	-0,34	0,86
Management Complexity Index (MCI)	3.352	-1,98	3,01	0,72	0,85
IDEB	3.346	1,3	8,7	5,33	0,77
Annual Performance Award (PAD)	2.834	0	7	1,72	1,31

Source: Authors' elaboration based on Magister data.

The impact of the Annual Performance Award (PAD) is observed through a variable that indicates the number of times the school received the PAD until the year in which the teacher change school. For teachers who have not churning, the reference year is 2016, the last year we observed.

This variable intends to capture the impact of school accountability policy, since, as argued by Ladd (2001), accountability policies that do not make a socioeconomic control, potentially generate a sense of injustice among teachers and end up increasing inequalities between schools. According to the author, teachers would tend to move to schools with greater odds of earning bonuses, thus maximizing their financial gains (financial factor) and disassociating their image from schools with low performance (social factor).

The socioeconomic status index (SESI) is an indicator constructed using information from the Student Bank of the Administrative Management System from 2009 to 2013 to establish the socioeconomic status of the student served by the school. We used the variables that indicated the parents' education level, the students' ethnic group, and the social registration number (SRN)¹⁴ of the parent and of the students. With the proportion of these variables per school, a factorial analysis was performed¹⁵ to construct this index.

The management complexity index (MCI) was inspired by the index created by INEP, but with modifications that were made by considering the particularities of the system and the education level analyzed in this study (INSTITUTO NACIONAL DE ESTUDOS E PESQUISAS EDUCACIONAIS ANÍSIO TEIXEIRA – INEP, 2014). The data used were microdata from the School Census between 2009 and 2016. The variables used to create this indicator were school size, which was created from the number of enrollments and indicates the number of stages and modalities of teaching in the school, and another variable that indicates how many shifts the

¹⁴ Social registration number is a proxy for poverty, since it is necessary to receive assistance from cash transfer programs, either federal or municipal.

¹⁵ In all the years observed (2009 to 2013), the analysis generated only one factor with values ranging from 1.4 to 1.7, corresponding to 48% to 57% of variance, and Cronbach's alpha ranging from 0.43 to 0.61.

school operates. Thus, as in the socioeconomic status index, a factorial analysis was performed¹⁶ whose result was considered as the management complexity index.¹⁷

For INEP, this index seeks to contextualize the educational offer, considering factors that impact the way the school is managed (INEP, 2014). For us, this variable indicates levels of challenges faced by schools. We assume that teachers wish to teach in less complex schools.

All variables have been arranged corresponding to the year of entry and the year of exit from each school. The decision for this arrangement was made because teachers may move from the same school in different years, and the indicators vary over time. For example, if a teacher moved from one school to another in 2015, it is better to compare the indicators for 2015 with those for 2009. Moreover, the decision was made because many schools were created after 2009, while many others underwent a restructuring, that made them stop offering first segment classes, and this affected their indicators. For the schools where teachers did not leave until the end of the monitoring, the reference year for departure was 2016.

Table 4 presents the results of the logistic regressions carried out using the variables presented above. We used the method of insertion in three blocks: in the first, we used the characteristics of the teachers; in the second, we added the characteristics of the schools without the IDEB; and in the third, we incorporated all the variables. The IDEB was only inserted in the latter model, since several schools do not have the indicator; therefore, the model that include this variable show a considerable loss of cases.

Model 1 includes only the variables related to teacher's characteristics. Gender and education level were not statistically significant in the multivariate model. Teacher's age, in turn, showed a significant association indicating that the older the teacher, the lower the odds of moving from a school. Thus, as explained above, as the increase in age represents a decrease in the odds of moving, we subtracted 0.977 from 1 and found that the odds of the teacher moving from one school to another decrease by about 0.02 or 2% for each year of increased age¹⁸. This result remains constant for models 3 and 4.

¹⁶ In all the years analyzed (2009 to 2016), the analysis generated only one factor with values ranging from 1.8 to 2.3, corresponding to 61% to 76% of variance, and Cronbach's alpha ranged from 0.67 to 0.82.

¹⁷ For more details on the construction of the variables, see Carrasqueira, 2018.

¹⁸ When the odds ratio is less than 1, it can be interpreted as: when a unit of x is added, the odds of y is n of what it would be if x did not increase (VOGT, 2007). So, to be more understandable, we calculate 1-n so that it can be interpreted as: the addition of a unit of x decreases the odds of y by 1-n.

TABLE 4
ESTIMATES (AND ODDS) OF THE FOUR LOGISTIC REGRESSION MODELS PRODUCED TO ESTIMATE THE PROBABILITY OF THE TEACHER MOVING FROM ONE SCHOOL TO ANOTHER

	MOBILITY ANALYSIS (1)			
	MODEL 1	MODEL 2	MODEL 3	MODEL 4
TEACHER'S CHARACTERISTICS				
Gender: female	-0,335 (0,715)		-0,365 (0,694)	-0,27 (0,763)
Education level: higher education	0,114 (1,121)		0,109 (1,115)	0,147 (1,158)
Age in years	-0,023** (0,977)		-0,023** (0,977)	-0,025** (0,976)
SCHOOL'S CHARACTERISTICS				
Socioeconomic Status Index		-0,384** (0,681)	-0,379** (0,685)	-0,465** (0,628)
Management Complexity Index		-0,135* (0,874)	-0,164** (0,849)	-0,295** (0,745)
Annual Performance Award (PAD)		-0,801** (0,449)	-0,792** (0,453)	-0,866** (0,420)
IDEA				0,125 (1,133)
Constant	1,791**	2,163**	3,313**	2,869**
Number of valid cases	2.996	3.346	2.990	2.519

(1) The value outside parentheses is the estimation of the Beta (log of odds). The value in parentheses is the exponential of the Beta (odds).

** Significant at 1%; * significant at 5%.

Source: Authors' elaboration based on SME-RJ data.

Model 2 includes only the variables related to schools' characteristics without considering IDEB. The negative SESI indicates that the increase of one point in the socioeconomic status of the school decreases the odds of the teacher switch to school by 32%. The number of times the school won the PAD was significant and indicated that the number of PADs won by the school is associated with a decrease in the odds of teachers moving from school. In this case, each PAD would decrease the odds of moving from school by 55%.

The MCI showed the same pattern, indicating that the higher the complexity, the lower the odds of the teacher moving from one school to another. The relationship indicates that an increase of one point in the MCI of the school would lower the odds of the teacher moving by about 13%. This result may be due the restructuring of the system. Schools that have lost classes to suit one segment may have been left with idler teachers, who have been assigned to other schools, while the more complex schools have retained all their classes and do not have "to borrow" their teachers.

Model 3 uses the variables of teachers' and schools' characteristics, without considering the IDEB. Teachers' characteristics behave in the same way as in model 1, and again, only age is statistically significant. Moreover, apart from little variation in their betas, schools' characteristics show associations similar to those observed in model 2, indicating an increase of one SESI point decreasing the odds of moving from one school to another by 32%; an increase of one MCI

point decreasing the odds of moving from one school to another by 15%; and each PAD won by the school decreasing the odds of the teacher moving from one school to another by 55%.

The last model (model 4) includes the IDEB of the schools of origin/first occupancy of teachers. As in previous models, the only significant characteristic of the teacher is age, which indicates that for each year of increased age, the odds of the teacher moving from one school to another fall by 0.02 times, i.e., the odds of moving from one school to another fall by 2%.

Another more intuitive way to interpret the results is to use predicted probabilities of typical individuals, estimated by the model. For the calculation of predicted probability, the characteristics of interest variates in their values, while we kept constant the other characteristics – categorical variables were fixed in their medians and continuous variables were fixed in their means. The calculation of the predicted probabilities performed in this work was based on the result of model 4. With this, we can compare the probabilities of the teacher moving from one school to another according to the variation of a characteristic.

We then observed the change in the probabilities of teacher mobility predicted by the model for teachers of different ages. Comparing teachers aged 20, 30, 40, and 50, the predicted probabilities of moving from one school to another are 80%, 76%, 71%, and 65%, respectively. Thus, we can see that by controlling the other variables, youngest teachers are much more likely to switch schools than eldest teachers are.

The SESI indicates that an increase of one point in the socioeconomic level of the school decreases the odds of the teacher moving from one school to another about 37% compare to stay in the same school. Similar to age, we calculated the predicted probabilities by the model for teachers in schools of different SES, keeping the other variables constant. According to the estimated model (model 4), teachers who are in schools with SESI one standard deviation above the average are likely to changing school by 65%, while schools with SESI one standard deviation below the average are 80% likely to churning.

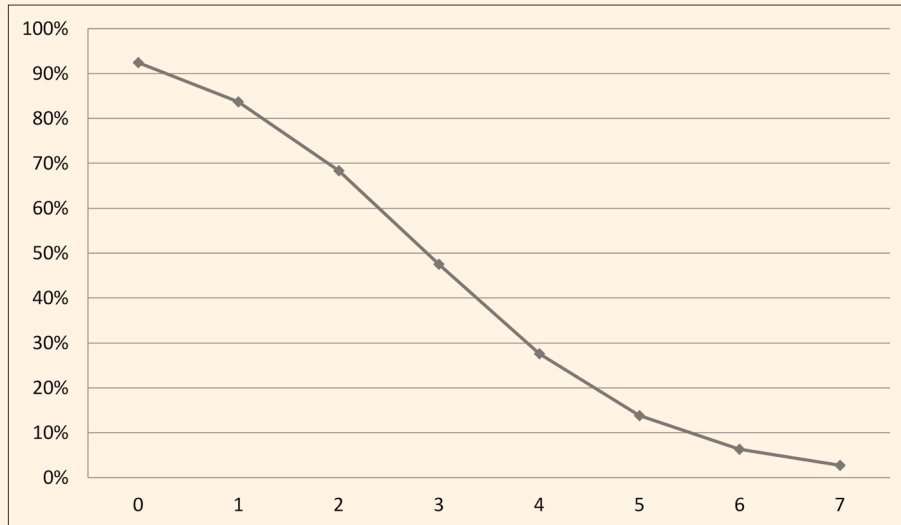
The MCI is significant in both models, but its beta varied greatly between models 3 and 4, indicating that an increase of one point in MCI decreased the odds of the teacher switch school by 15-25%. Observing the predicted probabilities one more time, teachers in schools whose MCI was one standard deviation above the average would be 68% likely to churning, while schools with MCI one standard deviation below the average would be 78% likely to move.

Each PAD that the school won reduced the odds of the teacher moving to another school by 58%. Again, we used the predicted probabilities to better exemplify the effect of this variable, keeping all other variables constant and observing only the effect predicted by the model for the variable number of times that the school with teachers assigned received a PAD.

Figure 3 shows the probability of a teacher moving to another school, which range from 92% for teachers who were in schools that never won a PAD to 3% for those whose school of origin won the PAD seven times. This result

makes it even more clear how this variable has a strong impact on the likelihood of moving from one school to another. Finally, the IDEB was not statistically significant.

FIGURE 3
PREDICTED PROBABILITIES OF MOVE FROM ONE SCHOOL TO ANOTHER IN RELATION TO THE NUMBER OF TIMES THE SCHOOL HAS WON THE ANNUAL PERFORMANCE AWARD.



Source: SME. The author, 2018.

These results are consistent with the literature discussed in this article. As compared to teachers' characteristics, the characteristics of the school of origin seem to be more associated with the phenomenon of mobility and can therefore be assumed to have a greater impact on the decision to move from or remain in a school.

Age may be associated with several factors. For example, schools may prefer "to borrow" less experienced teachers, or, has been seen in the labor market in general, younger professionals are more disposed to change their role or profession (CORSEUIL *et al.*, 2013). On the other hand, if we consider aspects of the context under study, age may be associated with teachers' knowledge about the educational system, considering that there was a reasonable number of teachers in our cohort (N=813) who were taking up their second-hire. Furthermore, another hypothesis is that teachers with more time of activity have better placements in the public tender and choose schools with a more favorable profile, leaving fewer choices for teachers who are worst placed. Allensworth, Ponisciak, and Mazzeo (2009), when investigating school and teachers' characteristics associated with turnover, found small differences in terms of ethnic group, gender, or education level of the teacher, and found that younger teachers were more unstable.

The impact of the PAD may be associated with the incentives of wage subsidies. Schools that earn PAD more times appear more likely to retain their teachers, while schools that do not (or have earned fewer times) are more likely

to lose their teachers to other schools. Ladd (2001) observed a similar pattern in South Carolina, where teachers moved to schools where they were most likely to earn bonuses.

However, we believe that, in addition to financial incentives, this variable may be related to school climate, since a good school climate may favor the school to mobilize to improve its performance and win the PAD. Thus, the teacher's retention at a school may be associated not only with financial incentives but also with a better school climate/more attractive school environment.

Allensworth, Ponisciak, and Mazzeo (2009) also investigated the impact of the school climate and found results that indicate that the school climate may be more important in the teachers' decision to move from one school to another than students' socioeconomic characteristics. The IDEB, despite reflecting the school climate (CANDIAN; REZENDE, 2013), shows some disadvantages in relation to the PAD in our study. The main disadvantage is that although for a school to earn the PAD it only needs to achieve its goal, an analysis using IDEB would imply, for example, that a school with low IDEB that earned the PAD would be below a school with medium or high IDEB that did not earn the PAD. In this sense, winning the PAD would be more appropriate to determine the school climate than the IDEB, which is highly influenced by the student's SES (ALVES; SOARES, 2013; KOSLINSKI; PORTELA; ANDRADE, 2014).

The parameters estimated for the socioeconomic status of students showed similar trends to those observed in the international and national literature on the subject. In Italy, Barbieri, Rossetti, and Sestito (2010) found a result similar to ours: that is, the low performance of students – which may be associated with school climate and SES – and the student's socioeconomic status increased the odds of teachers moving from the school where they were. In the USA, Boyd *et al.* (2008), West and Chingos (2009), and Clotfelter *et al.* (2004) found patterns of turnover that corroborate the finding that teachers' mobility is affected by the socioeconomic characteristics of the environment around the school and its students.

All Brazilian studies observed that schools with the highest turnover rate were those located in peripheries, regions of high vulnerability, and with students with low SES. In this study, turnover was not observed – for that we would need to look at the inflow and outflow of teachers from the schools. However, we understand that mobility and turnover are interconnected.

In this study, we could identify some of the factors associated with teacher mobility, which are certainly related to teacher turnover in schools. This is important to understand which factor teachers consider in their decision to stay in a school or not, and how to make schools more attractive to teachers.

FINAL CONSIDERATIONS

Our results showed a pattern similar to that of the studies mentioned in this article. We observed, for example, that about 2/3 of the cohort teachers moved

from one school to another at least once during the eight years in which we observed mobility. With regard to the associated factors, among the teachers' characteristics that we analyzed, only age was associated with mobility, indicating that older teachers are less likely to move from one school to another. This means that, as observed by research in other contexts, schools' characteristics are more associated with mobility than are teachers' characteristics.

Schools' characteristics, except for IDEB, are associated with mobility. The increase in SESI reduced the odds of teachers moving from one school to another, indicating that schools that serve students of lower socioeconomic status suffer more from teacher turnover. The increase in the school's MCI also decreased the odds of transfer. At first, this result seems counter-intuitive since it is understood that being less complex would be an advantage for the school in terms of organization. However, since the system has been restructured some schools to serve only one stage or segment of teaching, it may have forced teachers in schools that have become less complex to move from one unit to another.

The variable that indicates the number of times schools won the PAD had a very high impact on the probability of mobility, which indicates that this policy, which aimed to increase student learning, was exacerbating inequality in the education system. Schools with difficulty in achieving their goals would be less able to retain - and attract - teachers, thus amplifying their difficulties. In terms of inequalities in educational opportunities, the results indicate that schools that serve students with greater social and educational vulnerability are those that suffer most from a lack of teachers and high teacher turnover.

Further studies may investigate factors that we could not observe in this study. There may be a school climate index, which would be more accurate than the number of times the school has won the PAD. In the same way, violence in the school environment should be a factor of great motivation for teachers to move from one school to another. Observing the MCI after the end of the system restructuring may suggest whether the assumptions about complexity are right or whether other factors, such as school climate, overlap. Moreover, qualitative studies would be important to investigate the function of mobility from the point of view of teachers and schools.

The lack of regulations on assignments between the schools of the SME-RJ makes it difficult to control this practice, which takes place informally without assessing the needs of students. The Education Departments need to monitor the mobility and turnover of teachers in order to have subsidies to find measures that ensure stability of the teaching staff.

Studies such as that of Akiba, LeTendre, and Scribner (2007) have found that students with low performance and low socioeconomic status are more affected by teachers. That is, teachers are more important for the learning of these students than for that of students with high performance and high socioeconomic status. These authors also argue that a good distribution of teachers among schools can be a determining factor in reducing inequalities among students. This argument is corroborated by the study of Rao and Jani (2011), which was conducted in

Malaysia, and the study of Luschei, Chudgar, and Rew (2013), which compared the educational systems of South Korea and Mexico. In both studies, the results indicate that a distribution of teachers that focuses on the most vulnerable students and avoids the patterns we found in Rio de Janeiro is favorable to equity. That is, systems that encourage teachers to remain in schools serving low-performing and low socioeconomic students and that regulate mobility in such a way as to prevent schools with an unfavorable profile from suffering from high turnover tend to be less unequal educational systems.

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