Teacher mobility: can financial incentives help disadvantaged schools to retain their teachers?

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Abstract

This paper studies teacher mobility in France using unique matched teacher-school data. All tenured teachers in lower secondary schools are included in the analysis. Some institutional features of the French educational system are particularly interesting for analyzing the effect of non-pecuniary factors on mobility decisions: completely centralized wage setting; explicit and centralized mobility rule setting; career-based system where teachers are civil servants and rarely quit. Moreover, a specific program implemented in 1990 which awarded bonuses to teachers in some disadvantaged areas ("Zones d'Education Prioritaire") give the opportunity to evaluate the impact of this type of financial incentives. We find that teachers tend to switch when they work in schools with a high share of less able students, of students from minorities and/or of students from economically disadvantaged background. In addition, teachers who do not work in the region where they were born are more likely to move. Besides, it seems that teachers tend to prefer working with colleagues of roughly the same age. Finally, regarding the pecuniary factors, it appears that the incentives driven by the bonuses have had some unexpected negative effects: they had a small positive effect on retaining the youngest teachers in ZEP schools, but on the contrary, made the most experienced teachers leave more often.

Introduction

Assessing the determinants of teacher mobility is of obvious interest in countries like the US and the UK, where some schools in urban areas have difficulties recruiting and retaining teachers. In France, recruitment and career management of teachers of the public sector are almost entirely planned at the national level. Yet, even if this system and the fact that teaching is still an appealing job in France ensure that no school has to deal with a shortage of teachers, some features of the distribution of teachers among the schools are similar to those of countries with more decentralized systems. Schools in disadvantaged schools, in particular, face a higher mobility of their teachers, and have less experienced teachers in their staffs than the other schools.

This allocation of teachers across schools is a potential source of inequity for students. Teacher quality is a difficult empirical issue and the link between the quality of teachers and their observable characteristics still need to be investigated. Yet it seems that teacher experience has a positive effect on student attainment, at least at the beginning of their careers.[2] High mobility of teachers in disadvantaged schools is often accompanied by a larger proportion of inexperienced teachers than in other schools, the teachers leaving being the ones that are experienced. Thus the mobility of teachers in disadvantaged schools probably has a negative impact on educational attainment in these schools and it is important to understand its determinants.

Several empirical studies have shown that teachers' preferences are influenced by non-pecuniary factors such as student characteristics.[3] Some other papers, such as Murnane and Olsen (1989, 1990) and Dolton and van der Klaauw (1995, 1999), focus on the link between pay and the decision to quit. These studies generally find that higher teacher pay reduces the probability that teachers leave the profession, particularly once differences in alternative earnings opportunities are taken into consideration. In a recent paper, Hanushek, Kain and Rivkin (2004) investigate the factors that affect the probabilities that teachers switch or exit the public schools entirely. The results indicate that teacher mobility between districts is much more strongly related to characteristics of the students, particularly race and achievement, than to salary, although salary exerts a modest impact once compensating differentials are taken into account.

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[2] Rivkin, Hanushek and Kain (2005) find that beginning teachers and to a lesser extent second and third year teachers in mathematics perform significantly worse than more experienced teachers. A recent study on that topic (Clotfelter, Ladd and Vigdor, 2006) finds significant returns to teacher experience in both math and reading.

[3] See, among others, Greenberg and Mc Call (1974), Murnane (1981), Hanushek, Kain and Rivkin (2004), Falch and Ronning (2004), Falch and Strom (2005), Boyd, Lankford, Loeb, and Wyckoff (2005).

In this paper, we will take advantage of very large datasets on all teachers in secondary schools in France in order to identify the factors influencing teachers' mobility. French educational system has several interesting features that can alleviate some difficulties for estimating the determinants of the teacher supply.

First, teachers' salaries are identical, in respect to their qualification and their number of years of experience, with the exception of specific bonuses, which will be described later. Such wage rigidity can facilitate the identification of non-pecuniary determinants.

Second, French teachers rarely leave the teaching system during their working life. In France, the public school sector is run on a national basis. Almost all teachers are civil servants, recruited through competitive examinations. These examinations require at least a three-year-university degree and in general, there are several candidates for one job. Those who succeed mostly make their careers as teachers. There are very few layoffs so the few who quit choose their leaving. Thus our estimation of the probability of leaving should not be affected by involuntary quits.

Third, the mobility rules are relatively clear. The system of job assignment depends on teachers' choices. When the choices of different teachers are the same, the final assignments depend mostly on the experience. Thus the rules governing the demand side are known and the interpretation of the reduced-form estimates of the probability of moving is more straightforward than in most of the other studies.[4]

Finally, in 1990, a specific program was introduced in France, which put an end to the policy of wages independent of the school where the teachers work. This program awarded bonuses to teachers in some disadvantaged schools. These schools are part of a program set up in 1982, still enforced, the "zones d'éducation prioritaire" (ZEP), education priority zones (Benabou, Kramarz, Prost, 2005): several schools, in selected zones, are specially treated with extra financial aid. Extra resources are mainly used to gradually lower the class size. Since 1990, partly because of a large turnover in these schools, bonuses are paid to all employees of the schools with the bulk going to teachers. These bonuses amounted to €300 per year, meaning a 2%

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[4] Falch and Strom (2005) already emphasized the advantage of analyzing European labor markets for teachers with centralized pay bargaining. In this case, the econometric estimation of the impact of non-pecuniary factors of teacher mobility should be less biased by omitted variables linked to wages. Yet, the Norwegian system studied in their paper is even more flexible than the French system, in the sense that hiring decisions are made by each principal. So the reduced-form estimation of the mobility reflects a mix of the preferences of the principals and the teachers. In our French case, this problem is avoided since the rules of job assignment are strictly defined: a teacher faces the same constraints as all other teachers of the same experience.

- 2.5% wage increase for a novice teacher; around 1% for the most experienced teachers; the double in 1991; and the triple in 1992.

This paper evaluates the effect of these bonuses through difference-in-differences estimation. It is important to know if this program has lowered the turnover in ZEP schools since this kind of financial incentives is relatively easy to implement.

The results of the estimation of the probability of moving confirm those of precedent studies: teachers tend to switch when they work in schools with a high share of less able students, of students from minorities and/or of students from economically disadvantaged background. In addition, teachers who do not work in the region where they were born are more likely to move. Besides, teachers tend to prefer having colleagues of the same age. Regarding the pecuniary factors, it appears that the incentive driven by the bonus was not sufficient to thwart the taste of teachers for other schools than the ones in the ZEP and even had unexpected negative effects on the more experienced teachers.

1. Institutional Features

1.1. The French Teacher Employment System

In France, the teacher employment system is divided into the public sector and the private one, which gathers approximately 20% of secondary students. Certification requirements differ across sector (even if they are supposed to be based on the same standards). Hence, during their career, teachers mostly remain in one of those sectors. This study will focus on teachers in public sector because of the lack of availability of data on private schools.

Referring to a typology described in a recent OECD report (OECD, 2005), teacher employment systems can be divided into two types: "career-based" and "position-based". Position-based public services tend to focus on selecting the best-suited candidate for each position, which often imply movements from teaching to other jobs and sometimes later return to teaching; Canada, Sweden, Switzerland and the United Kingdom, for example, present many of the features of a position-based service. On the contrary, in career-based systems, teachers are generally expected to stay in the public service throughout their working life. France can be classified in career-based systems, as well as Japan, Korea and Spain.

In France, recruitment of secondary teachers is based on national competitive examinations. These examinations predominantly focus on the academic knowledge of the subject. Different

types of examinations lead to different certificates of qualification: "agrégation" (teachers are "agrégés"), "CAPES" (teachers are "certifiés"), and "CAPLP" (teachers are vocational education teachers). Students can take these examinations if they have at least a three-year university degree, except for the "agrégation", which requires at least a four-year university degree. Teachers with some other qualifications ("chargés d'enseignement (CE)", "adjoints d'enseignement (AE)", "professeurs d'enseignement général de collège (PEGC)") are present in our period (around 1990) but these categories are bound to gradually disappear. These categories of qualification have a widely recognized hierarchy. At the top of this hierarchy is the "agrégation", the highest and the most prestigious certificate. Based on this hierarchy, qualifications lead to different career conditions: different compensation, less working hours for the "agrégés", only lower secondary schools for the PEGCs who are also the only teachers who have to teach two different subjects.

When the students pass the examinations, they become civil servants in traineeship and spend one year of professional training. After their traineeship, young teachers get tenure and are assigned as full professors to a secondary education school through a broad system which allows also senior teachers to request, once a year, a transfer. This job assignment system allocates teachers to schools with free slots according to teachers' choices. School principals have almost no possibility to choose the teachers they want or even to prevent some teachers to come. To decide between teachers who would like to have a slot in the same school, a point scale specifies a number of points attached to each person according to different characteristics. The teacher with the highest number of points gets priority. This point scale is rather complicated and depends on the family situation, the type of qualification, the seniority in the school and the seniority in teaching, and also a mark given by the administration. Yet the whole system is scrutinized by unions which favor a rather "egalitarian" system, meaning that unequal treatments can stem from seniority and qualification, but not from personal characteristics such as ability or motivation. Finally, partly because of the pressure coming from unions, the mark given by the administration is also well correlated with seniority. As well, the overall point scale is very well correlated with seniority; family-related factors also play a role, but only to a lesser extent.

Hence, new teachers tend to be served after more senior ones and to get the least popular schools. So mobility is high among young teachers but after several years, they tend to settle down, because they got the region of their wishes or because their family situation increased dramatically the cost of the mobility.

It is worth noting that this system may lead to similar features than more decentralized systems, where schools can decide whom they want to hire, if we assume that teachers' inner

ability is very difficult to observe and that school principals think experience and qualification are the best proxies for ability. In the US, for instance, Greenberg and McCall (1974) notice that "usually the rationing of the preferred assignments is by education and experience, the more experienced and educated teachers being awarded the best assignments".

Finally, the mobility resulting from this system lead to a clear allocation: the more experienced teachers are located in high socioeconomic status schools while schools in disadvantaged areas often face difficulties in retaining skilled teachers. This unequal teacher allocation stems from a system where better-credentialed teachers are favored combined with teachers' preferences for high socioeconomic status schools.

On this topic, the French system has two interesting features: teachers rarely leave the education system and they are barely forced to switch to another school. Indeed, another kind of teachers lends some flexibility to this system. They are temporary teachers ("maîtres-auxiliaires"), recruited directly by the regional head of the education administration, without any examination. They can be assigned a different school whenever needed and they can be dismissed. Given this flexibility of temporary teachers, tenured French teachers are rarely forced to transfer. This is an advantage for assessing teachers' preferences. Indeed, mobility of tenured teachers should mirror their preferences, constrained though by the availability of open slots and the number of points they have, those depending a little on their certificate of qualification, and mainly on their number of years of experience, and their seniority in the current school.

In addition to that, before 1990, only personal interests and characteristics of the schools drove teachers' choices; no financial matters interfered since compensations were only based on seniority and qualification. Yet, in 1990, a unique source of differential compensation among schools took place: since then, teachers in some disadvantaged areas, the education priority zones, receive a bonus. This will allow us to evaluate the impact of financial incentives on teachers' mobility.

1.2. The Bonuses in the Education Priority Zones ("Zones d'Education Prioritaire", ZEP)

First established in 1982, the ZEP program is a compensatory education policy that directs extra attention to disadvantaged schools.[5] The ZEPs, or education priority zones, include both

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[5] A lot of developed countries have adopted compensatory education policies. It is the case in the US since 1965 with the Title I program. In Great Britain, the Education Priority Areas experiment of the early 1970's followed the Plowden report. This program has re-emerged in 1997-1998 as Education Action Zones and Excellence in Cities. Other countries have similar programs (for instance Portugal and Belgium).

primary schools (1^{rst} to 5th grades) and lower secondary establishments (6th to 9th grades), plus a small number of upper secondary schools (10th to 12th grades). In particular, the ZEPs in 1982 covered approximately 8% of lower secondary schools students in the country.

Initially, the main goal of the ZEP program was to foster specific initiatives in the most disadvantaged zones through more flexibility given to regional heads of education and through additional resources. This program was rather supported by teacher unions and in some ZEP schools, educational teams were particularly active. The program was originally meant to be temporary, with the zones established for a limited statutory term of 4 years. Over time, the program was not only maintained but substantially expanded, with many new zones created in 1989, 1990, 1994 and 1999. It is now the main policy in France directed at helping students from disadvantaged backgrounds.

These zones are mainly chosen in respect to the socio-economic backgrounds of their populations. In 1982 the regional heads of the education administration were thus asked to select zones according to the following criteria for the student population: parents' social and professional backgrounds, parents' rate of unemployment, fraction of students who are not native French speakers and fraction of students having repeated a grade (a very large fraction of French students repeated at least once in those years). In later years many new zones were created, according to a procedure that left considerable discretion to the regional heads of the education administration in making decisions that were loosely based on indicators such as the shares among parents of blue-collar workers, unemployed workers, and high-school dropouts, the fraction of families with at least one non-European member, and 3rd grade test scores in a national student evaluation.

The ZEP status is associated with extra resources for the selected schools. But, again, considerable discretion was given to the regional heads of the education administration in the amount of extra resources given to ZEP schools. The French education system is very centralized and the ZEP program was the first one whose aim was to give relative freedom of action to local authorities. One of the drawbacks was that the information about the extra resources was not collected at the centralized level.

The extra-resources given to ZEP schools at the end of the eighties were assessed in Benabou, Kramarz, Prost (2005). It appears that the extra resources comprised additional hours of teaching and, since 1990, bonuses. Yet the decrease in class size was quite small and very

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For assessments of the impact of these policies, see for instance for the UK Machin, McNally, and Meghir (2004), for the US van der Klaauw (2006) and for France Benabou, Kramarz, Prost (2005).

progressive: class size decreased by 0.2 students per year following the granting of ZEP status in the 1989 and 1990 waves (relative to non-ZEP schools). Moreover, there is no obvious change in the population. The socioeconomic composition of the student body following a school's classification as ZEP seems to have been rather stable, except for an increase in the number of non-French students in some ZEP schools during the eighties and despite a progressive reduction in enrollments.

Finally, the largest change in the additional resources for ZEP schools occurred in September 1990, when bonuses were awarded to teachers in priority areas. These bonuses are fixed amounts, thus represent a larger wage increase for less experienced teachers than for more experienced ones. In 1990, these bonuses amounted to €25 per month which represented a 2% - 2.5% wage increase for a novice teacher, and a 0.8% - 1.3 % increase for the most experienced teachers, depending on the qualification. In September 1991, these bonuses doubled to €52 per month and increased again in 1992 up to €79.

2. The Data

The data we use for this study are derived from national administrative records maintained by the French Ministry of Education. We link two main sets of database: one database on teachers in public secondary schools and one dataset on public secondary schools.

2.1. Teacher Dataset

The main data source is an administrative database on all teachers in French public secondary schools ("enquête annuelle sur le service des enseignants du second degré public"). These data are based upon mandatory school reports of the teachers' working hours. They contain information on about 350,000 teachers in 7,600 public high schools for each year for the school years from 1987-1988 to 1992-1993. They include an identifier that corresponds to the teacher and an identifier that corresponds to the school.

The information on the teacher encompasses the year and month of birth, the region ("département"[6]) of birth, the gender, the administrative grade which determine the teacher's salary, the type of qualification, and the seniority in this qualification. We also know which

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[6] There are 97 different départements in France, excluding overseas territories. In the 1990 Census, the average French département had 600,000 inhabitants. The département at the 10th (resp. 90th) decile of the size distribution had 250,000 (resp. 1,000,000) inhabitants. In the following, we will use sometimes region instead of département.

subject matter he/she teaches and the number of hours worked in the school (for each subject matter if necessary). The years of experience can be approximated through the administrative grade[7], which is well correlated to seniority in teaching. Unfortunately, there is no information about the family situation of the teachers.

Some teachers work in several schools; in this case, there are several observations for each teacher. We keep only one observation, the job in the school where the teacher works the longest per week.

Thanks to the teacher identifier, these data are made longitudinal through matching over time. As the data are exhaustive on all teachers in secondary schools, it is possible to describe teachers' mobility across high schools. Yet teacher identifier is sometimes misreported. Data entry errors in this identifier occur (for example exchange of two digits or error in one of the digits, and so forth). Thus, particular attention was given to this matching since flow statistics are potentially sensitive to miscoded identifiers (see for instance Abowd and Vilhuber, 2005). Statistical matching techniques were used to reduce the likelihood of missed record linkages due to miscoded personal identifiers. On the other hand, school identifier should be less often misreported so we assumed that it does not suffer from coding errors.

This treatment happened to matter. Without taking care of the possibility of miscoding, there are in 1988 10.0% of teachers in secondary schools who switch, and 14.7% who leave (meaning that theirs identifiers are not present in the 1988-1989 dataset). When matching techniques are used, there are 10.3% who switch and 8.3% who leave.

When a teacher is present one year and then missing, we do not know the reason of his or her absence. The reasons may be: resignation, retirement, promotion to an administrative position (often after passing a competitive examination), on leave, job at a university. As far as we know, very few public statistics exist on the share of teachers who leave the school system. Cros and Obin (2003) write that in 2002, only 3.7% of teachers in secondary schools stopped teaching in a secondary school: 3.0% correspond to retirements, 0.1% deceases, 0.1% resignations and layoffs, 0.3% promotions, 0.2% leavings for teaching in a university. In our data, the share of teachers leaving is higher since there are also temporary leaves. This share may also be overestimated. The conservative nature of our matching leads probably to few false match rates, but there are also probably some true matches who were not found. It is difficult to know in which extent this happens without any statistics allowing some comparisons.

In addition, the information about the administrative grade and the seniority in the certificate of qualification is missing for about 5% and 9% of the observations. The missing

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[7] Actually, this grade is the one used as proxy for teacher seniority in the mobility point scale.

administrative grades are imputed with the median grade of teachers with same qualification and same age. The missing seniorities in qualification are imputed with the median seniority of teachers with same qualification, same age and same grade.

Finally, thanks to the school identifier, characteristics on schools are computed through means of characteristics of teachers in each school, weighted by the number of hours they work in each school. This gives us school-level variables such as number of hours, share of young teachers or share of teachers according to their qualification.

For this study, we focus on teachers in lower secondary schools (6th to 9th grades) because there are few ZEPs amongst upper secondary schools. This paper studies mobility of around 160,000 tenured teachers each year from 1988 to 1992. These teachers work in 5,000 public schools, corresponding to 2,500,000 students. Summary statistics are given in Table 1. In 1987-1988, 38% of tenured teachers in lower secondary schools are male; the median teacher is 40 and has between 16 and 20 years of experience. 54% of those teachers do not work in the educational region where they were born.

2.2. School Dataset

The FSE administrative files (Fichiers Standards Enrichis) of the Ministry of Education constitute our source of school-level data. Every year, all school principals fill out a detailed questionnaire on the characteristics of each grade in their establishment. This includes information on class size, nationalities of students, number of students having repeated each grade, number of students having lunch at the school's cafeteria, and language courses chosen. Each statistic is measured by grade. These data are exhaustive for the period 1987-1988 to 1992-1993 and cover both public and private schools; we shall focus here on public-sector secondary schools (6th grade to 9th grade). Thanks to the school identifier, these FSE files are linked to the teacher datasets and also to another set of files from the Ministry of Education which identify which establishments are located in a priority zone.

Summary statistics are given in Table 2. Teachers work in schools with on average 644 students, a mean class size of 24.8 students, and a ratio of student per teacher of 14.7.

Unfortunately, the data do not contain direct information on the parents' socioeconomic status or any measure of the educational ability of the students. Yet some variables can be used as proxies for this. On the contrary to the US or the UK, lunches in France are subsidized for everybody but there are no free-lunch programs. Some of the students who do not have lunch at school have lunch at home because the family income is large enough so that the mother (or

father) does not work. But the majority of the students who do not have lunch at school are children who cannot afford to pay for the lunches. So the fraction of students not having lunch at school is in France a proxy for poor economic conditions for the population of the school. On average, teachers work in schools where 47% of the students do no have lunch at school.

Students' nationality is also an indicator for the economic background. The majority of the immigrants come from North Africa (4.3% of all the students), the second region being Southern Europe (3.2%).

The language chosen as a first foreign language by the children is in some extent related to the information of the parents about the educational system: as German is supposed to be harder to learn than English or Spanish, it is one of the main ways in which "better" students, or those with informed parents, sort themselves into more selective classes. Yet this indicator is also linked to the region of the school since German is more often learned in regions near Germany and Spanish near Spain. 86% of the students learn English as their first foreign language, 13% German and 1% other language.

The average age of the students is a good indicator of the mean ability in the school. Indeed, in France, a large part of students repeat at least one grade during their schooling. Table 2 shows that schools have on average 43% of 6th grade students who are older than usual (more than 11 years-old). It means that these students have repeated a grade during elementary or primary school or have repeated the 6th grade. And finally, the indicator ZEP is a proxy for disadvantaged zones since these priority areas were mainly chosen according to socio-economic criteria (see Table 2).

3. The Results

3.1. Teachers' Mobility

At the end of the school year 1987-1988, 9% of tenured teachers leave their secondary school for another one and 6% of them quit the secondary school system. Table 1 shows the specific characteristics of those teachers who transfer and those who leave. As expected, the probability of transferring is decreasing with the age and the experience. On the opposite, teachers who leave the system are more likely to be seniors: one of the reasons for quitting is obviously retirement.

Teachers who currently work in another educational region than the one where they were born have a higher propensity of switching to another school. And more precisely, this is also the

case for teachers who work in another département than their birth one (educational regions encompass several départements).

The model estimated for explaining teacher mobility is a logit model:

$$P_{it} = L(\alpha + \beta X_{it} + \chi Z_{j(i,t)t} + \rho ZEP_{j(i,t)} + \gamma_t + \gamma_{region})$$

where $L(.)$ represents the logistic distribution, P_{it} is the probability of switching or of leaving the secondary school system for the teacher i at the year t, explained by his individual characteristics (X_{it}), the characteristics (Z_{jt}) of the school $j(i)$ where he works during the school year $(t-1)-t$, a dummy variable ZEP_{jt} depicting whether a school is in a ZEP or not (this variable is constant for a given school), year fixed effects and fixed effects for the region. The standard errors are corrected for within-school clustering. Some schools acquired the status ZEP in 1989 or 1990. Yet we want a dummy variable constant over time locating those schools where bonuses were awarded in 1990, so ZEP_{jt} can be equal to 1 even if the school is not yet in a priority zone.

It is important to include region fixed effects. It is known that teachers tend to prefer some regions, especially the south of France or Paris. These fixed effects will also control for permanent different cost of living across regions, which can yield to different real wages even with same nominal wages for all teachers.

Table 3 presents the results for the estimation of the probability of switching or leaving; Table 3a (resp. Table 3b) gives estimates for individual covariates (resp. school covariates). Male teachers are less likely to switch but not to leave. Less experienced teacher move more in both cases, except that the most experienced teachers have a slight larger probability to leave (retirement). This is confirmed by the age effect: older teachers are much more likely to leave. On the contrary, when controlling for the experience, younger and older teachers transfer less than individuals between 41 and 50, except for teachers under 25. Besides, teachers working in several schools transfer more than other teachers, probably to get an easier situation in only one establishment (but surprisingly, they are less likely to leave).

Finally, many teachers prefer to work where they were born. Hence teachers who do not work in the same region as where they were born are more likely to move. This seems to be a common feature with the US: Boyd et al. (2005) find that most teachers accept jobs close to their own schooling location; with Norway: Falch and Ronning (2004) find that teachers working in the same labor market region as born are less likely to move from their school; and with Italy:

Barbieri, Rossetti and Sestito (2010) find that the distance between teachers' place of birth and place of work is one of the main driving forces for teacher mobility.

Concerning school characteristics, the results confirm those of other studies: teachers tend to leave schools gathering more minority students, more students from a disadvantaged background and more students with less educational achievement. Thus, teachers switch more often when they are in a school with a large share of students not having lunch at school or a large share of 6th grade students being older than usual. They also have a larger probability of moving when there are more students with an African nationality. On the opposite, they leave less often with Asian students, which, in the French context, can be explained by the fact that Asian immigrants live less in disadvantaged areas, and also perhaps by the subjective idea that Asian children are good students.[8] As our controls for the socio-economic background are rather limited, it is difficult to conclude if these coefficients reflect teacher preferences for non-foreign students or just preferences for economically advantaged children.

Surprisingly, the coefficient for ZEP schools is slightly negative, meaning that all else equal, teachers are less likely to switch when they are in a priority area. This could be the sign that under some unobservable characteristics (for instance the socio-economic status of the parents), these establishments are not as difficult as can be depicted by such variables as students' nationalities or their ages. This negative coefficient could also show that some persons of the teaching staff in ZEP schools were volunteers for working in difficult areas as it is said to have been the case at the beginning of the ZEP program. This last explanation finds some support when the ZEP effect is estimated separately according to the age of the teachers (Table 4). The coefficient is not significant for teachers under 30. It is negative for older teachers and especially for the seniors (above 51). So, older teachers may have made the voluntary choice to stay in these schools. Many reasons could explain that some teachers are volunteers for teaching in ZEP schools: they feel involved in the ZEP program, there is an interesting school project, the challenge of teaching students in such areas is fulfilling. However it seems that this is no more the case with younger teachers which is coherent with the idea which led to the implementation of the bonuses: young teachers are often forced to start their careers in some ZEP schools but they rarely choose to stay, so that the turnover in these schools is high.

In addition, the school size and the class size affect the propensity to leave. Teachers leave less large schools, and schools with large classes. Yet, these coefficients probably reflect

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[8] In fact, several studies on student achievement show that all being equal, children with a foreign nationality, African or other, get a better achievement at school than French students.

other characteristics not controlled by the observables, since large schools, with large classes, are often the best schools, in urban areas (which are, in France, preferable to suburbs).

The composition of the teaching staff seems to have an impact on the probability of switching.[9] Table 4 shows different patterns in respect to the age of the teachers. It seems that teachers prefer working in schools with other teachers of roughly the same age. Young teachers leave less often schools with other teachers under the age of 40 and more often schools with senior teachers. More generally, it seems that teachers under 40 leave less schools with teachers under 40, and leave more schools with teachers over 40. The opposite is less clear. These results do not seem to be driven by endogeneity problems since schools with a high proportion of young teachers are more difficult schools, and should be left by all teachers, were our observable variables not sufficient to take into account the different reasons of teacher mobility.

3.2. Teacher Sorting Across Schools

Mobility pattern show preferences for advantaged schools. As teachers are constrained in their mobility by their seniority in teaching, this should lead to a sorting of teachers across schools in respect with their age. Table 5 depicts this sorting. While their experience grows, teachers move to schools with fewer students who do not have lunch at school, fewer North-African students and fewer students having repeated a grade before their 7th grade. In addition, whereas 22% of teachers under 25 are in a ZEP school, only 12% of teachers above 51 work in a priority zone.

Geographically, the pattern is also very stratified. In particular, regions in the south of France are very attractive for teachers: only 6% of teachers under 25 work in the south compared to 33% of teachers above 51. Paris is also very attractive. The pattern is less clear for rural areas and suburbs of Paris. There is also no systematic sorting based on class size or number of students in the school.

Surprisingly, the pattern is much less clear in respect to certificates of qualification. The "agrégés", the most qualified teachers, work in schools with more students who do not have lunch at school, and schools with more North-African students. Yet they also work in better schools according to the number of students who repeated a grade before their 7th grade. This pattern is the result of the mobility rules which gives a little more preferences to the more qualified

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[9] Falch and Strom (2005) already study how the composition of teachers affects the propensity to quit. However, they focus on the share of temporary teachers and do not analyze the "mating" of teachers based on their age.

teachers, but also to some other rules, determined by the regional heads of educational administration, which attribute some slots in some schools to teachers with specific qualifications. It is also worth noting that the "agrégés" have the possibility to require jobs only in upper secondary schools and thus to avoid lower secondary schools. So those who work in lower secondary schools may have specific reasons to do that (preferences given to the region instead of the age of the children for instance). For instance, the "agrégés" work more often in Paris or in the suburbs of Paris. They may be ready to accept more difficult schools, in exchange to being close to Paris, where there are more opportunities for their careers in upper secondary schools.

3.3. Effect of the Bonuses in ZEP Schools

Finally, the effect of being in a ZEP school on teacher mobility is estimated interacted with year indicators, in order to assess the impact of the bonuses through difference-in-differences estimates. Bonuses for teachers were established in ZEP schools on September 1990 but the fact that bonuses were to be given was known before teachers made their mobility decisions during the school year 1989-1990. So bonuses can have had an impact as soon as 1990. In our regression, it should be captured by a dummy variable for teachers in ZEP schools in 1990, 1991 and 1992. Supplementary effects in 1991 and 1992 should be captured with other ZEP effect interacted with the dummy variables for the year 1991 and 1992.

So the model estimated is:

$$P_{it} = \quad L(\alpha + \beta X_{it} + \chi Z_{j(i,t)t} + \gamma_t + \gamma_{region}$$
$$+ \rho ZEP_{j(i,t)} + \rho_{90} ZEP_{j(i,t)} * 1_{t>=90} + \rho_{91} ZEP_{j(i,t)} * 1_{t>=91} + \rho_{92} ZEP_{j(i,t)} * 1_{t>=92})$$

where ρ_{90} (resp. ρ_{91} and ρ_{92}) give difference-in-differences estimates of the ZEP effects in 1990 (resp. 1991 and 1992).

Results are shown in Table 6a for the probability of switching and Table 6b for the probability of leaving the secondary school system. When no covariates are added, the probability of switching when being in a ZEP is positive during all the period and increases in 1990 and 1992. When individual covariates are included, the coefficient for the permanent effect decreases and the coefficient for 1990 is not significant any more; they were probably larger because those schools gather more young people with a high propensity to leave. When school covariates are included, we find again that teachers transfer less from ZEP schools than from similar (in respect with our observable characteristics) schools. Nothing different is significant in 1990 and 1991. The coefficient in 1992 is still positive and significant. So it seems that the bonuses did not have

any impact in 1990 and 1991 and had even adverse effects in 1992. The pattern on the probability of leaving is roughly the same.

There could have had heterogeneous effects of being in a ZEP schools. So the regression of the probability of switching was also estimated separately according to the age of the teachers (Table 7a). We would expect that if bonuses have an effect, this effect would be larger on less experienced teachers since the bonus is a fixed sum. There is indeed a negative and slightly significant coefficient in 1992 for teachers under 25. On the contrary, the coefficients are significantly positive for teachers above 30. This means that bonuses helped retain some less experienced teachers after 1992, when the bonuses had tripled, but had negative effects on the more experienced teachers.

Other heterogeneous effects were estimated, splitting the ZEP effect into two effects depending on whether the priority zone is located in the suburb of Paris or not (Table 7b). ZEP schools in the suburb of Paris are supposed to be the most difficult places for teaching. Our estimation shows that bonuses were not sufficient to encourage teachers to stay in those schools. The coefficient in 1991 is even positive, showing that the situation may have gotten worse this year. In the other regions, the coefficient of the ZEP effect is positive in 1991.

These surprising effects of the bonuses can have several explanations. In their assessment of a similar program in North Carolina, Clotfelter, Glennie, Ladd and Vigdor (2008) find that most principals and teachers in the affected schools thought that a bonus of $1,800 would be too small to affect teacher behavior; in fact, they find no positive impact on teacher retention rates. We can wonder if in the ZEP program, the amounts of the bonuses were large enough. Even further, if too small, these bonuses may have had a "labeling" effect: they gave the signal that these schools were difficult enough so that financial compensations were given. Besides, Clotfelter, Glennie, Ladd and Vigdor (2008) insist on the quality of the implementation of the program. One weakness of the ZEP program may be its lack of credibility; it is important that the agents think that the bonuses are permanent enough so that it is worth staying. Unfortunately this program is politically sensitive and is often a central subject in the debates on education policies; these debates can be interpreted as threats on the durability of the program.

3.3. An Insight in the ZEP future

Table 8 gives the same statistics as Table 5 for the year 2000. It shows that the situation deteriorated in the ZEP schools, as in 2000 35% of teachers under 25 are in a ZEP school, instead of 22% in 1989, whereas the percentage of teachers above 51 is rather similar (14% versus 12%).

The share of young teachers is so large in the ZEP schools that we can wonder whether the budget for these schools is actually larger than in the other schools. Table 9 shows that it is the case, thanks to the smaller class sizes.

4. Conclusion

The large datasets we used allowed us to measure the mobility of all French teachers in lower secondary schools from 1987 to 1992, and more specifically to evaluate the impact of the additional compensation implemented in 1990 in ZEP schools. The results confirm those of many other studies: teachers tend to leave schools gathering more minority students, more students from a disadvantaged background and more students with less educational achievement. Yet these characteristics may be linked to those of the neighborhoods, and this study does not allow making the distinction between a preference for advantaged neighborhoods or advantaged schools. In further research, we will study this topic, matching school data with Census data on local amenities. In addition, the results show that teachers who do not work in the region where they were born are more likely to move and that teachers tend to prefer working with colleagues of roughly the same age.

There is no strong evidence that the bonuses in the ZEP schools decreased the turnover in those schools, except on less experienced teachers. Turnover even increased among more experienced teachers and among teachers in ZEP schools located in the suburb of Paris. This may be due to the negative signal attached to the bonuses.

This result confirms the conclusions in Hanushek, Kain and Rivkin (2004): teachers are much more influenced by student characteristics than by financial factors. The French program shows that financial incentives must be used very carefully to retain teachers in disadvantaged schools. Obviously, the magnitude of the bonuses is of great importance. The lack of impact of the French program stem from the amount of these bonuses: between 1% and 1.5% of the mean wage in 1990, the double in 1991, the triple in 1992. It shows that the cost of such policy has to be large to be efficient.

Working on teacher workloads could be more efficient. This is a hypothesis since our data did not allow us to show if teachers prefer smaller classes or not. Yet, according to several surveys, teachers in ZEP schools do not ask for additional compensation, but mainly for less working hours during the week. We also know that class size progressively decreased in the ZEP schools during the nineties (Benabou, Kramarz, Prost, 2005). On the long term, this may have

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been a better incentive for teachers to stay than the bonuses. Another incentive was also implemented later in the nineties. Yet this last incentive is rather paradoxical: teachers staying three to five years in a ZEP school gain a lot of points for the point scale ruling the mobility so they can mainly choose the school they want after these few years in a ZEP school. Unfortunately, the administrative data used in this paper cannot be made longitudinal from 1993 to 1997 because of the absence of the teacher identifier during this period. So, further research on the same data would have to study periods starting after 1998.

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Table 1: Summary Statistics on Teachers during School Year 1987-1988

Teacher characteristic	All Teachers	Share of teachers transferring, according to each characteristic	Share of teachers leaving, according to each characteristic
Male teacher	38%	8%	6%
Teacher experience			
0-1 year (Grades 1-2)	4%	33%	15%
2 years (Grade 3)	3%	27%	10%
3-5 years (Grade 4)	5%	23%	10%
6-8 years (Grade 5)	7%	18%	8%
9-11 years (Grade 6)	10%	13%	6%
12-15 years (Grade 7)	14%	9%	5%
16-20 years (Grade 8)	18%	6%	4%
21-25 years (Grade 9)	13%	5%	4%
>25 years (Grades 10-11)	26%	3%	7%
Age			
Under 25	1%	29%	15%
Between 26 and 30	8%	21%	9%
Between 31 and 40	42%	12%	6%
Between 41 and 50	37%	5%	4%
Between 51 and 58	10%	3%	9%
Above 59	1%	2%	49%
Seniority in the qualification	11		
Born in a foreign country	7%	13%	8%
Born in overseas territories	0.3%	16%	9%
Do not work in their birth educational region	54%	11%	7%
Do not work in their birth "département"	66%	11%	7%
Qualification			
Agrégé	2%	18%	7%
Certifié	37%	9%	6%
CE, AE	14%	23%	9%
PEGC	43%	5%	5%
Vocational education teacher	4%	8%	9%
Multi-schools (number of schools)	1.05		
Transfer	9%		
Leaving	6%		
Number of observations	164,622		

Table 2: Summary Statistics on Schools during School Year 1987-1988

School characteristic	All schools	ZEP schools
Rural area	3%	1%
Semi-rural area	7%	2%
Paris and suburb	15%	14%
Number of students	644	673
Percent female students	50%	51%
Percent students not having lunch at school	47%	68%
Percent boarders	1%	0%
Percent students whose nationality is		
French	91.2%	80.8%
North African	4.3%	11.3%
Central or South African	0.4%	0.9%
Asian	0.4%	1.1%
South European	3.2%	5.5%
North European	0.3%	0.4%
Percent students learning as first language		
English language	86%	87%
German language	13%	11%
Other language than English or German language	1%	2%
Percent students coming from a private school	2%	1%
Percent 6th grade students according to their age:		
younger than usual	3%	1%
usual age	55%	45%
older than usual	43%	54%
Mean class size	24.8	24.3
Mean student / teacher ratio	14.7	14.1
ZEP	15%	
Number of teachers	164,557	24,220
Number of schools	4,807	634

Note: Means of school characteristics, weighted by the number of teachers in each school.

Table 3a: Logit Estimation of Probability of Switching and Leaving (Individual Covariates)

	Probability teachers switch (versus stay in the same school)			Probability teachers leave (versus stay in the secondary school system)		
	Coef	**StdErr**	**Marginal prob.**	**Coef**	**StdErr**	**Marginal prob.**
Year 1989	0,06 **	(0,02)	{0,003}	0,05 **	(0,02)	{0,003}
Year 1990	-0,06 **	(0,02)	-{0,002}	0,08 **	(0,02)	{0,004}
Year 1991	0,04 **	(0,02)	{0,002}	0,13 **	(0,03)	{0,008}
Year 1992	-0,02	(0,02)	-{0,001}	0,87 **	(0,05)	{0,062}
Individual characteristics:						
Male teacher	-0,17 **	(0,01)	-{0,007}	-0,01	(0,01)	{0,000}
Teacher experience (omitted= 16-20 years)						
0-1 year (Grades 1-2)	1,55 **	(0,03)	{0,135}	0,95 **	(0,04)	{0,079}
2 years (Grade 3)	1,33 **	(0,03)	{0,104}	0,74 **	(0,04)	{0,056}
3-5 years (Grade 4)	1,10 **	(0,03)	{0,078}	0,59 **	(0,03)	{0,042}
6-8 years (Grade 5)	0,82 **	(0,02)	{0,051}	0,42 **	(0,02)	{0,028}
9-11 years (Grade 6)	0,58 **	(0,02)	{0,032}	0,29 **	(0,02)	{0,018}
12-15 years (Grade 7)	0,31 **	(0,02)	{0,015}	0,10 **	(0,02)	{0,006}
21-25 years (Grade 9)	-0,27 **	(0,02)	-{0,010}	-0,07 **	(0,02)	-{0,004}
>25 years (Grades 10-11)	-0,54 **	(0,02)	-{0,018}	0,10 **	(0,02)	{0,006}
Age (omitted= between 41 and 50)						
Under 25	0,02	(0,03)	{0,001}	0,20 **	(0,04)	{0,012}
Between 26 and 30	-0,17 **	(0,02)	-{0,007}	0,01	(0,03)	{0,000}
Between 31 and 40	-0,05 **	(0,01)	-{0,002}	0,05 **	(0,02)	{0,003}
Between 51 and 58	-0,31 **	(0,02)	-{0,011}	0,47 **	(0,02)	{0,031}
Above 59	-0,45 **	(0,08)	-{0,016}	2,90 **	(0,03)	{0,466}
Seniority in the qualification	-0,08 **	(0,00)	-{0,003}	-0,04 **	(0,00)	-{0,002}
(Seniority in the qualification)^2	0,00 **	(0,00)		0,00 **	(0,00)	
Born in a foreign country	0,04 **	(0,02)	{0,002}	0,02	(0,02)	{0,001}
Born in overseas territories	0,37 **	(0,08)	{0,018}	0,02	(0,07)	{0,001}
Do not work in birth educational region	0,07 **	(0,02)	{0,003}	0,15 **	(0,02)	{0,008}
Do not work in birth "département"	0,22 **	(0,02)	{0,010}	0,07 **	(0,02)	{0,004}
Qualification (omitted=certifié)						
Agrégé	0,36 **	(0,02)	{0,018}	0,31 **	(0,03)	{0,020}
CE, AE	0,59 **	(0,01)	{0,033}	0,24 **	(0,02)	{0,015}
PEGC	-0,31 **	(0,01)	-{0,011}	0,15 **	(0,01)	{0,009}
Vocational education teacher	-0,50 **	(0,03)	-{0,017}	0,26 **	(0,03)	{0,016}
Multi-schools (number of schools)	0,44 **	(0,02)	{0,019}	-0,11 **	(0,02)	-{0,006}
School covariates	Yes			Yes		
Region fixed effects	Yes			Yes		
Number of observations	728 714			786 892		
Pseudo R2	0,14			0,10		

Note: Logit estimation. Standard errors have been corrected for within-school clustering. *, ** denote significance at the 10% and 5% levels. Teacher mobility is observed from 1988 to 1992. School characteristics are those of the current year for the teacher considered (for instance characteristics of the school where the teacher works during the school year 1987-1988 and mobility occuring, or not, in September 1988).

Table 3b: Logit Estimation of Probability of Switching and Leaving (School Covariates)

	Probability teachers switch (versus stay in the same school)			Probability teachers leave (versus stay in the secondary school system)		
	Coef	StdErr	Marginal prob.	Coef	StdErr	Marginal prob.
School characteristics:						
Rural area	0,10 **	(0,04)	{0,005}	0,05	(0,05)	{0,003}
Semi-rural area	0,07 **	(0,03)	{0,003}	0,04	(0,04)	{0,002}
Paris and suburb	-0,10 **	(0,05)	-{0,004}	-0,04	(0,05)	-{0,002}
Number of students in the school (/1000)	-0,13 **	(0,05)	-{0,006}	-0,06	(0,05)	-{0,004}
Percent female students	0,48 **	(0,23)	{0,020}	-0,07	(0,34)	-{0,004}
Percent students not having lunch at school	0,15 **	(0,04)	{0,006}	0,09 *	(0,05)	{0,005}
Percent boarders	-0,39 **	(0,17)	-{0,016}	0,33 *	(0,17)	{0,019}
Percent students whose nationality is (omitted=French)						
North African	0,43 **	(0,17)	{0,018}	-0,13	(0,20)	-{0,007}
Central or South African	1,50 **	(0,78)	{0,063}	2,12 *	(1,20)	{0,118}
Asian	-1,24 **	(0,61)	-{0,052}	-0,53	(0,77)	-{0,029}
South European	-0,42	(0,31)	-{0,018}	0,21	(0,33)	{0,012}
North European	-1,42 *	(0,87)	-{0,060}	-1,12	(0,92)	-{0,062}
Percent students learning as first language (omitted=English)						
German language	-0,11	(0,11)	-{0,005}	0,01	(0,12)	{0,001}
Other language than English or German language	0,56	(0,41)	{0,024}	-0,33	(0,37)	-{0,018}
Percent students coming from a private school	-0,30	(0,31)	-{0,013}	0,60 *	(0,36)	{0,033}
Percent 6th grade students younger than usual	-0,44 *	(0,27)	-{0,019}	-0,54	(0,34)	-{0,030}
Percent 6th grade students with usual age	-0,73 **	(0,12)	-{0,031}	-0,69 **	(0,13)	-{0,038}
Mean class size	-0,04 **	(0,01)	-{0,002}	0,02 **	(0,01)	{0,001}
Mean student / teacher ratio	0,00	(0,01)	{0,000}	-0,01 *	(0,01)	-{0,001}
ZEP	-0,04 *	(0,02)	-{0,002}	-0,02	(0,03)	-{0,001}
Percent male teachers	-0,24 **	(0,08)	-{0,010}	-0,30 **	(0,10)	-{0,017}
Percent of teachers aged (omitted= between 41 and 50)						
Under 30	-0,19 *	(0,11)	-{0,008}	0,39 **	(0,14)	{0,022}
Between 31 and 40	-0,16 **	(0,07)	-{0,007}	0,25 **	(0,09)	{0,014}
Between 51 and 58	0,19 *	(0,11)	{0,008}	0,46 **	(0,13)	{0,025}
Above 59	0,11	(0,40)	{0,005}	-0,38	(0,41)	-{0,021}
Percent of teachers whose qualification is (omitted=certifié)						
Agrégé	0,12	(0,41)	{0,005}	0,60	(0,36)	{0,033}
CE, AE	-0,18	(0,12)	-{0,008}	0,03	(0,14)	{0,002}
PEGC	-0,13 *	(0,08)	-{0,006}	-0,16 *	(0,09)	-{0,009}
Vocational education teacher	0,70 **	(0,26)	{0,030}	-0,70 **	(0,30)	-{0,039}
Non-certified teacher	-0,18	(0,19)	-{0,007}	-0,07	(0,21)	-{0,004}
Primary school teacher	-0,45 **	(0,22)	-{0,019}	0,35	(0,27)	{0,019}
Individual covariates	Yes			Yes		
Year fixed effects	Yes			Yes		
Region fixed effects	Yes			Yes		
Number of observations	728 714			786 892		
Pseudo R2	0,14			0,10		

Note: Logit estimation. Standard errors have been corrected for within-school clustering. *, ** denote significance at the 10% and 5% levels. Teacher mobility is observed from 1988 to 1992. School characteristics are those of the current year for the teacher considered (for instance characteristics of the school where the teacher works during the school year 1987-1988 and mobility occuring, or not, in September 1988).

Table 4: Logit Estimation of Probability of Switching for Different Teacher Age

Teacher age	Under 25		Between 26 and 30		Between 31 and 40		Between 41 and 50		Above 51	
	Coef	StdErr	Coef	StdErr	Coef	StdErr	Coef	StdErr	Coef	StdErr
School characteristics:										
Percent of teachers aged										
(omitted= between 41 and 50)										
Under 30	-1.02 **	(0.38)	-0.58 **	(0.19)	0.07	(0.12)	0.07	(0.16)	0.06	(0.41)
Between 31 and 40	-0.80 **	(0.29)	-0.05	(0.14)	-0.18 **	(0.07)	-0.07	(0.09)	0.19	(0.23)
Between 51 and 58	0.15	(0.48)	0.64 **	(0.22)	0.30 **	(0.12)	0.22 *	(0.13)	-0.46	(0.30)
Above 59	3.24 **	(1.68)	0.62	(0.73)	-0.04	(0.37)	0.07	(0.41)	0.27	(0.82)
ZEP	-0.03	(0.08)	0.01	(0.04)	-0.07 **	(0.02)	-0.02	(0.03)	-0.17 **	(0.07)
Individual covariates	Yes		Yes		Yes		Yes		Yes	
Other school covariates	Yes		Yes		Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes		Yes		Yes	
Region fixed effects	Yes		Yes		Yes		Yes		Yes	
Number of observations	8,669		46,881		248,408		322,539		102,200	
Pseudo R2	0.06		0.06		0.11		0.08		0.06	

Note: Logit estimation. *, ** denote significance at the 10% and 5% levels.

Table 5: School Characteristics According to Certain Teacher Characteristics during School Year 1987-1988

	Teacher age				
School characteristic	Under 25	Between 26 and 30	Between 31 and 40	Between 41 and 50	Above 51
Percent students not having lunch at school	50.8%	48.4%	47.2%	47.0%	49.0%
Percent students with North African nationality	5.1%	5.0%	4.5%	4.1%	4.2%
Percent 6th grade students older than usual	46.5%	45.0%	43.3%	41.7%	40.4%
ZEP	21.8%	18.3%	15.6%	13.4%	12.3%
Rural and semi-rural area	10.0%	11.6%	11.4%	9.5%	6.0%
South of France	5.7%	10.1%	19.1%	30.8%	33.4%
Suburbs of Paris	16.8%	21.9%	17.2%	13.1%	15.4%
Paris	1.0%	1.7%	1.7%	2.2%	4.5%
Percent of teachers aged under 30	19.6%	17.7%	12.0%	9.3%	8.4%
Mean class size	24.9	24.8	24.7	24.8	24.9
Number of students in the school	662	643	638	644	660

	Teacher qualification				
School characteristic	Agrégé	Certifié	CE, AE	PEGC	Vocational education teacher
Percent students not having lunch at school	51.1%	49.8%	48.3%	44.6%	51.0%
Percent students with North African nationality	5.2%	4.6%	4.7%	3.8%	5.0%
Percent 6th grade students older than usual	41.6%	41.9%	43.1%	42.7%	45.1%
ZEP	15.1%	14.7%	15.8%	13.7%	21.7%
Rural and semi-rural area	3.7%	5.0%	9.0%	15.7%	5.1%
South of France	21.0%	24.9%	23.2%	24.7%	17.6%
Suburbs of Paris	28.3%	18.1%	18.8%	12.1%	16.8%
Paris	5.3%	2.8%	2.3%	1.6%	1.2%
Percent of teachers aged under 30	11.5%	10.7%	12.0%	11.0%	13.1%
Mean class size	25.1	25.0	24.8	24.6	24.8
Number of students in the school	687	675	655	605	701

Note: Means of school characteristics, weighted by the number of teachers in each school having the specified experience or qualification.

Table 6a: ZEP Effects on Probability of Switching

	Probability teachers switch (versus stay in the same school)							
	Coef	**StdErr**	**Coef**	**StdErr**	**Coef**	**StdErr**	**Coef**	**StdErr**
ZEP (whatever year)	0.19 **	(0.03)	0.06 **	(0.02)	-0.08 **	(0.03)	-0.08 **	(0.03)
ZEP * year >= 1990	0.06 *	(0.03)	0.06	(0.04)	0.04	(0.04)	0.05	(0.04)
ZEP * year >= 1991	0.00	(0.04)	0.00	(0.04)	-0.01	(0.04)	-0.01	(0.04)
ZEP * year >= 1992	0.12 **	(0.04)	0.12 **	(0.04)	0.11 **	(0.04)	0.12 **	(0.04)
Individual covariates	No		Yes		Yes		Yes	
School covariates	No		No		Yes		Yes	
Year fixed effects	Yes		Yes		Yes		Yes	
Region fixed effects	No		No		No		Yes	
Number of observations	728,781		728,781		728,714		728,714	
Pseudo R2	0.00		0.13		0.13		0.14	

Note: Logit estimation. Standard errors have been corrected for within-school clustering. *, ** denote significance at the 10% and 5% levels. Teacher mobility is observed from 1988 to 1992. School characteristics are those of the current year for the teacher considered (for instance characteristics of the school where the teacher works during the school year 1987-1988 and mobility occuring, or not, in September 1988).

Table 6b: ZEP Effects on Probability of Leaving

	Probability teachers leave (versus stay in the secondary school system)							
	Coef	**StdErr**	**Coef**	**StdErr**	**Coef**	**StdErr**	**Coef**	**StdErr**
ZEP (whatever year)	0.08 **	(0.03)	0.04	(0.03)	-0.06 *	(0.04)	-0.13 **	(0.04)
ZEP * year >= 1990	0.05	(0.05)	0.05	(0.05)	0.05	(0.05)	0.05	(0.05)
ZEP * year >= 1991	0.01	(0.05)	0.02	(0.05)	0.02	(0.05)	0.02	(0.06)
ZEP * year >= 1992	0.20 **	(0.09)	0.21 **	(0.10)	0.22 **	(0.10)	0.24 **	(0.10)
Individual covariates	No		Yes		Yes		Yes	
School covariates	No		No		Yes		Yes	
Year fixed effects	Yes		Yes		Yes		Yes	
Region fixed effects	No		No		No		Yes	
Number of observations	786,965		786,965		786,892		786,892	
Pseudo R2	0.01		0.06		0.07		0.10	

Note: Logit estimation. Standard errors have been corrected for within-school clustering. *, ** denote significance at the 10% and 5% levels. Teacher mobility is observed from 1988 to 1992. School characteristics are those of the current year for the teacher considered (for instance characteristics of the school where the teacher works during the school year 1987-1988 and mobility occuring, or not, in September 1988).

Table 7a: Heterogeneous ZEP Effects on Probability of Switching

Teacher age	Under 25		Between 26 and 30		Between 31 and 40		Between 41 and 50		Above 51	
	Coef	StdErr	Coef	StdErr	Coef	StdErr	Coef	StdErr	Coef	StdErr
ZEP (whatever year)	0.01	(0.10)	0.02	(0.05)	-0.10 **	(0.03)	-0.06	(0.04)	-0.34 **	(0.10)
ZEP * year >= 1990	-0.03	(0.17)	-0.03	(0.08)	0.04	(0.05)	0.06	(0.06)	0.19	(0.15)
ZEP * year >= 1991	0.10	(0.19)	0.01	(0.10)	0.01	(0.06)	-0.07	(0.07)	-0.12	(0.16)
ZEP * year >= 1992	-0.29 *	(0.17)	0.05	(0.10)	0.15 **	(0.06)	0.12 *	(0.07)	0.41 **	(0.15)
Individual covariates	Yes		Yes		Yes		Yes		Yes	
Other school covariates	Yes		Yes		Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes		Yes		Yes	
Region fixed effects	Yes		Yes		Yes		Yes		Yes	
Number of observations	8,669		46,881		248,408		322,539		102,200	
Pseudo R2	0.06		0.06		0.11		0.08		0.06	

Note: Logit estimation. *, ** denote significance at the 10% and 5% levels.

Table 7b: Heterogeneous ZEP Effects on Probability of Switching

	Probability teachers switch (versus stay in the same school)	
	Coef	StdErr
Paris suburb interacted with:		
ZEP (whatever year)	-0.09	(0.06)
ZEP * year >= 1990	-0.02	(0.08)
ZEP * year >= 1991	0.19 **	(0.09)
ZEP * year >= 1992	-0.08	(0.09)
Elsewhere than Paris suburb interact with:		
ZEP (whatever year)	-0.08 **	(0.03)
ZEP * year >= 1990	0.06	(0.04)
ZEP * year >= 1991	-0.06	(0.05)
ZEP * year >= 1992	0.17 **	(0.05)
Individual covariates	Yes	
School covariates	Yes	
Year fixed effects	Yes	
Region fixed effects	Yes	
Number of observations	728,714	
Pseudo R2	0.14	

Note: Logit estimation. Standard errors have been corrected for within-school clustering. *, ** denote significance at the 10% and 5% levels.

Table 8: School Characteristics According to Certain Teacher Characteristics during School Year 2000-2001

School characteristic	Teacher age				
	Under 25	Between 26 and 30	Between 31 and 40	Between 41 and 50	Above 51
Percent students not having lunch at school	52,7%	46,8%	43,0%	41,4%	40,2%
Percent students with North African nationality	5,5%	4,2%	3,6%	3,0%	2,9%
Percent 6th grade students older than usual	2,0%	2,1%	2,2%	2,3%	2,4%
ZEP	35,1%	28,2%	21,2%	16,2%	14,2%
Rural and semi-rural area	7,4%	10,9%	10,5%	9,6%	9,0%
South of France	10,0%	16,0%	22,9%	24,1%	29,2%
Suburbs of Paris	40,6%	23,5%	16,2%	14,3%	12,3%
Paris	1,2%	1,2%	1,7%	2,3%	2,6%
Percent of teachers aged under 30	30,1%	25,6%	18,3%	16,0%	14,8%
Number of students in the school	608	591	602	615	619

Table 9: Mean wage per school

	ZEP	Non-ZEP	ZEP/Non-ZEP
Mean wage per school (without ZEP bonuses)	2652,55	2912	91%
Mean wage per school (with ZEP bonuses)	2764	2912	95%
Mean wage per student	221	202	109%
Number of students per teacher	13	14	88%