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Tuition fees and social segregation: lessons from a natural experiment at the University of Paris 9-Dauphine

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ABSTRACT

Using a natural experiment, a sharp rise in tuition fees in some of the programmes at the University of Paris 9-Dauphine, we study the impact of tuition fees on students' pathways, and outcomes. We apply an optimal matching method to the national database of students' registrations (SISE) to define a typology of pathways. We then use a nonordered multinomial logit model to evaluate the impact of the rise in tuition fees on the types of pathways selected by the university. We show that there is a significant impact on these pathways. The increase in tuition fees reduces geographic and social mobility, thereby accentuating the phenomena of social segregation. Furthermore, contrary to what some of the studies assert, the rise does not appear to encourage greater effort: we find no impact on the graduation success rate.

I. Introduction

Increases in tuition fees have been a major recent trend in higher education in many developed countries (OECD 2014). In some countries, university tuition fees are long-established and have been the subject of research on the effect of tuition fees on the access to higher education, the pursuit of studies and the outcomes for students. In France, on the contrary, university tuition fees are set by the government, at a level that makes them almost free, contrary to the practice in most English-speaking countries.

In this article, we study the first experience of increased tuition fees in a French public university – the University Paris 9-Dauphine (Dauphine, hereinafter) – and we assess the effect of these tuition fees on the students' academic pathways selected by this university and consequently on the characteristics of the student populations concerned. Dauphine was the first university to obtain the status of *grand établissement* (prestigious research and higher education institution). This status, acquired in 2004, allows it to create what are called *diplômes* de *grand établissement* (DGEs), master's degree programmes for which the university is free to set the tuition fees (Moulin 2014). Some of the national master's degree courses (for which the tuition fees are still set by the public authorities) were

therefore simply transformed into *Master's level DGEs* (without any modification to the supply of courses), for which the university sets the tuition fees. At Dauphine, the scale of tuition fees ranges from 0 to 4000 euros per year depending on the parents' income. The first courses concerned began in 2010/11.

Although Dauphine can be considered as an experiment in a new system, the subject of this article – the link among university tuition fees, student pathways and outcomes – is particularly important in the new French university context. Having been given greater autonomy, French universities are facing a lack of financial resources; there is a strong temptation to collect additional funds by asking students to participate in their tuition costs. The subject is also important from a theoretical viewpoint: the results presented in the literature are often contradictory about the effects of tuition fees. It is therefore possible that context plays a decisive role in the effects of tuition fees. From this perspective, a detailed study of France, with its institutions and conceptions of higher education that differ so greatly from those of the English-speaking countries, should be rewarding. In addition to this unusual national setting, our approach is original in that we consider the whole academic pathway, not just the access to

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education as a function of its cost. To our knowledge, this global approach is unique in the literature. And yet it seems difficult to exclude *a priori* the existence of path dependency, particularly at an advanced level of education like the master's degree. This path dependency is expressed through the modes of selection used by the university and the applications and past choices made by students.

To study students' pathways, we use an optimal matching method (Abbott and Forrest 1986). This is based on a calculation of distances between trajectories, on the basis of which we establish a typology of student pathways. Using an unordered multinomial logit model, we then seek to determine the extent to which the type of trajectory can be related to the socio-economic characteristics of the students and the extent to which the tuition fees increase at Dauphine might have changed the types of pathways favoured for admission to these master's degrees at Dauphine. Lastly, we study the effect of this tuition fees increase on graduation outcomes. For some authors (e.g. Gary-Bobo and Trannoy 2008), a rise in success rates should be expected when tuition fees are increased: higher tuition fees lead to greater self-selection of students, who are more exacting as regards the quality of the services provided and more motivated (to avoid wasting the financial resources invested in their studies). From this perspective, we evaluate the effects of the tuition fees increase on outcomes, using the difference-in-differences (DID) method adapted for a nonlinear model (Puhani 2012).

In the second section, we present a review of the literature on the impact of tuition fees on student pathways and results. The third section describes our database. The fourth section sets out our methodology. The results are presented in section five. Finally, section six concludes and suggests some avenues for future research.

II. Review of the literature on tuition fees, student pathways and outcomes

The relation between tuition fees and students' decisions has been widely studied in the literature. The different studies that have been made examine the impact of tuition fees on student enrolment in higher education, the choice of study courses and the outcomes.

Many studies have shown that tuition fees rises are associated with a reduction in participation. In the UK, for the period 1992 to 2007, Dearden, Fitzsimons, and Wyness (2011) estimate that an increase in the level of tuition fees of £1,000 has a negative impact of 3.9% on participation. The works of Hübner (2012) and Dwenger, Storck, and Wrohlich (2012) show also a fall in enrolment in the German Länder, which had introduced tuition fees in 2005. In earlier works, Leslie and Brinkman (1987) already highlighted converging results (an increase of $100 in the net cost of higher education in the US causing an average fall in participation of about 1.8%), which can also be found in subsequent studies (Hemelt and Marcotte 2011; Kane 1994; St. John 1990; Rouse 1994).

Other research papers have debated the relative impact of tuition fees according to the social characteristics of the population. On US data, Mcpherson and Schapiro (1991) find that lower-income students are disproportionately affected, whereas Ellwood and Kane (2000) or Cameron and Heckman (2001) do not. The latter argue that problems in the access to financial and cultural resources (which exacerbate inequalities) exert their influence much earlier, during infancy. Canadian data lead to the same contradictions: Christofides, Canada, and Hoy (2001) and Fortin (2005) find no specific effect related to parents' income or socio-economic status, in contrast to the findings of Coelli (2009), Frenette (2005), Kwong et al. (2002) and Neill (2009).

Some authors have found that an increase in education costs modifies the choice of study courses for disadvantaged students, towards institutions that are less prestigious and/or closer to home (Hutchings 2003; Callender and Jackson 2005). Students from disadvantaged backgrounds are more likely than well-off students to perceive tuition fees as a debt rather than as an investment. Their decisions concerning higher education (particularly their choices or where and what to study) appear to be more constrained by financial pressure, especially debt fear (Callender and Jackson 2008; Pennell and West 2005). This debt fear relating to the increase in tuition fees heightens the students' anxiety, leading them to consider a much narrower range of study options than before (Wilkins, Shams, and Huisman 2013). Dietrich and Gerner (2012) show that disadvantaged students reject general university curricula in favour of vocational courses, with possible downstream effects on employment (Cameron and Heckman 2001; Field 2009). In addition to social

categories, gender can interact with the effect of tuition fees on student pathways. Alecke, Burgard, and Mitze (2013) and Dwenger, Storck, and Wrohlich (2012) find larger negative effects on men. In other contexts, Card and Lemieux (2000) and Lörz, Schindler, and Walter (2011) find that pathways of female students are more negatively affected by tuition fees.

The success rates of students have also been analysed in the theoretical literature (Flacher, Harari-Kermadec, and Moulin 2013), but relatively few empirical studies address this question. Garibaldi et al. (2012) and Fricke (2014) find that tuition fees reduce the length of study needed to obtain a degree in Italy and Switzerland, respectively. Huang (2012) finds a negative effect of tuition fees on the graduation rate in the US, at least for studies lasting 4 years (normal duration) and 5 years, while for 6 years the effect is neutral. According to Heineck, Kifmann, and Lorenz (2006), studying data for Germany, the reduction in the length of studies needed for graduation is only valid in certain disciplines, while the probability of success is lower in others.

The variety of results about the impact of tuition fees highlights a debate about the existence, nature and scale of phenomena of students' *segregation* (defined as the phenomena that, over the whole population of potential students, tend to favour certain subpopulations to the detriment of others) and on the achievement rate related to the imposition of tuition fees. By focusing on the French case, this article aims to contribute to the debate on the impact of tuition fees in higher education.

III. The data

Our data are the result of a process of matching between the SISE[1] and the AGLAE[2] database of the French Ministry of Higher Education and Research (MESR).[3] The SISE databases are produced by the studies management software of French establishments and provide information about students and their studies. The SISE databases have been running since 1995 and the field relating to 'universities'[4] comprises about two-thirds of the students in higher education.

We are interested in students enrolled in 2009/10 and 2010/11 in initial education[5] in the second year of the master's in economics and management at Dauphine. Indeed, 2010/11 is the first academic year in which the new tuition fees policy applied. For the previous years, as for the M2 of 2010/11 for the national degree, the tuition fees remained negligible (237 euros).

Matching of the SISE-universities databases over several years allows us to track the academic pathways of 2331 students for these two cohorts.

Table 1 presents the characteristics of our sample. There is a majority of women (54.1% of the total sample, versus 45.9% male students) and French students (75.2% of the total sample, versus 24.8% foreign students), their proportion being higher in the DGE than in the national degree (81.4% versus 68.4% for the academic year 2010/11). The majority of students are from the Île de France region (80.2%), coming from geographical areas marked by the over-representation of students from the social category 'very well-off' (as defined by the DEPP (*Direction de l'Évaluation*, de la *Prospective et* de la *Performance*)). In 2010/11, they accounted for 60.5% and 59.3% of students in DGE and in the almost-free national degree (nearly twice the average – 32% – for this social category and similar degrees in France). Likewise, the share of students with scholarships on social criteria is only 14.2%, compared with 21.8% at the national level for M2 in economics and management.

IV. Methodology

We consider students' pathways with the help of an optimal matching method.[6] To do so, we determine a measure of distance between trajectories in order to build a typology of students according to their pathways. We then evaluate the impact of the

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[1]*Système d'Information sur le Suivi de l'Étudiant*. We use the 'universities-enrolments' and 'universities-results' databases.

[2]*Application de Gestion du Logement et de l'Aide à l'Étudiant*.

[3]The matching between these databases is based on the encrypted National Student Identifier (INE).

[4]The MESR distinguishes between the fields of universities, engineering schools, management schools, ENS (*Écoles Normales Supérieures*) and private higher education.

[5]In this article we do not consider students in apprenticeship or in lifelong education, because: (i) the payment of their tuition fees by their employer belongs to a completely different approach to that of initial education, and (ii) the existence of those options is not specific to Dauphine.

[6]Sequential analysis is not limited to optimal matching methods. Many other methods exist and could have been used in this work. We chose these methods because the results obtained during the classification stage were more robust and more relevant to our subject. The clusters obtained allow us to describe more coherently the diversity of trajectories leading to enrolment in the second year of a master's at Dauphine. See Studer (2012) for a comparison of the advantages and disadvantages of the different measures of distance.

Table 1. Socio-economic characteristics of students in M2 in economics and management at Dauphine by year and by type of master's.

	2009/10 (n = 1139)			2010/11 (n = 1192)			Total	France
	Future national degree (n = 539)	Future DGE (n = 600)	Total (n = 139)	National degree (n = 519)	DGE (n = 673)	Total (n = 1192)	(n = 2331)	(n = 49717)
Socio-economic classification								
Very well-off	56.0	60.2	58.2	59.3	60.5	60.0	59.1	32.0
Well-off	10.0	10.0	10.0	10.4	11.1	10.8	10.4	11.9
Average	14.8	14.3	14.6	17.3	16.6	17.0	15.8	18.1
Disadvantaged	19.1	15.5	17.2	12.9	11.7	12.2	14.7	37.9
Scholarship on social criteria								
No scholarship	90.5	84.7	87.5	86.5	82.5	84.2	85.8	78.2
Scholarship	9.5	15.3	12.6	13.5	17.5	15.7	14.2	21.8
Sex								
Female	53.3	56.3	54.9	53.0	53.6	53.3	54.1	53.3
Male	46.8	43.7	45.1	47.0	46.4	46.6	45.9	46.7
Nationality								
French	69.2	79.3	74.5	68.4	81.4	75.7	75.2	61.3
Foreign	30.8	20.7	25.5	31.6	18.6	24.2	24.8	38.7
Geographical origin								
Paris	40.5	39.8	40.1	40.7	43.5	42.2	41.2	7.6
Seine et Marne	2.9	2.1	2.5	1.9	1.7	1.8	2.1	
Yvelines	3.9	8.0	6.0	4.8	6.5	5.7	5.9	
Essonne	2.0	3.8	2.9	4.0	3.2	3.6	3.3	
Hauts de Seine	14.7	14.2	14.4	16.4	14.0	15.0	14.7	
Seine Saint Denis	4.3	2.3	3.3	4.2	2.5	3.3	3.3	
Val de Marne	7.4	6.5	6.9	7.1	5.4	6.1	6.5	
Val d'Oise	2.4	2.0	2.2	3.9	3.9	3.9	3.1	
Île de France								14.0
Outside the Île de France	21.9	21.2	21.5	17.0	19.2	18.2	19.8	78.3
Age								
≤ 22	24.1	32.2	28.4	24.7	25.4	25.1	26.7	22.9
[23;24]	48.2	46.3	47.2	46.2	57.8	50.1	26.7	41.3
≥ 25	27.6	21.5	24.4	29.1	16.8	22.2	23.3	35.8

Source: Calculations based on the SISE universities (enrolments and results) and AGLAE – MESR databases (extracted on 15 March 2013).

In 2009/10, as the master's DGE had not yet been introduced, we have identified the master's courses that obtained DGE status the year after, we refer to as 'future DGE', while those that still led to the national degree in 2010/11 are entitled 'future national degree'. The socio-economic categories used here are those of the student's 'parent of reference'. Geographical origin refers to the parents' *département* of residence. The category 'outside the Île de France' comprises students from elsewhere in France, from abroad and those for whom the information is not available.

introduction of tuition fees on students' pathways using a multinomial logit model on their trajectories.

Optimal matching methods

Optimal matching methods were imported into the social sciences under the impetus of the works of Abbott and his co-authors (Abbott 1995; Abbott and Forrest 1986; Abbott and Hrycak 1990). These methods are based on the use of a measure of distance between sequences (between pathways in this article) that allows observing similarities and differences, from which a typology can then be deduced. The produced typology can be used to identify and study the regularities between trajectories.

To compare trajectories, they are rewritten as sequences of states (Abbott and Forrest 1986). In our case, a state corresponds to one enrolment at one level and at one university: for example, being enrolled in the first year of the master's at Dauphine. In the following, the states that we consider are

defined by a combination of the level of study and the establishment in which the student is enrolled. We distinguish the level 'bachelor' (*licence* in French), which designates enrolment in one of the three years of the bachelor course (bachelor 1, 2 or 3), the level 'M1' and the level 'M2'. These three levels correspond to the possible levels at which students can be selected, in particular at Dauphine. The sequence of states followed by the student forms his or her trajectory in higher education. The distance between two trajectories can then be calculated as the minimum sum of the costs of operations of insertion, deletion or substitution of states by which one of the trajectories can be transformed into the other. The important parameter is the difference between the cost of substitution and the sum of the cost of insertion and deletion. Operations of insertion-deletion (*indel*) deform the time structure of sequences to allow common subsequences to emerge, while operations of substitution conserve the time structure of sequences so that elements can be compared at constant date

(Lesnard and De Saint Pol 2006; Robette 2011). To compare trajectories before and after the rise in tuition fees, we need to conserve the time structure while at the same time allowing the distance to be small between sequences that are very similar but which belong to these two different cohorts. We therefore set the cost of an *indel* operation at half the maximum cost of substitution in order to compare the trajectories of students while taking into account the contemporaneity of sequences and the order of states (Robette 2011). The substitution costs are determined on the basis of the transition rates observed. Thus, one state is close to another and has a low substitution cost if the transition between these two states is frequently observed in the data.[7] This widely used solution avoids the problem of substitution costs being chosen arbitrarily.

To build a typology (i.e. partition of sequences), we compared a wide range of methods of classification[8] and finally chose Ward's method that minimizes intra-cluster variance and maximizes inter-cluster variance. Then, we group the trajectories into n clusters, with n ranging from 2 to 15, and compare these partitions with the help of different measures of quality (see Studer 2012). Ward's method consists in building clusters in such a way as to the 4-cluster partition it leads to with our data is optimum for almost all the quality measures (Figure A1 in the Appendix).

The multinomial logit model and marginal effects

To determine the relation between the typical trajectories (Y_i) brought to light by the above analysis and the socio-economic variables (denoted x_i), we use an unordered multinomial logit model. The probability that a student (i) will follow a pathway of type j is modelled by

$$P_j = \text{Prob}(Y_i = j|x_i)$$
$$= \frac{e^{\beta'_j x_i}}{1 + \sum_{k=1}^{J} e^{\beta'_k x_i}} \text{ for } j = 1, \ldots, J \quad (1)$$

We estimate the marginal effects of the different variables on the probability that the student i follows the pathway j (see Greene 1993 for details):

$$\delta_i = \frac{\partial P_j}{\partial x_i} = P_j\left(\beta_j - \sum_{k=0}^{J} P_k\beta_k\right)$$
$$= P_j\left(\beta_j - \bar{\beta}\right) \quad (2)$$

Analysis of success: DID and nonlinear models

We use the introduction of tuition fees in some of the master's programmes at Dauphine in 2010/11 as a natural experiment to evaluate the effects of this policy on students' success rate. The database comprises 2477 students. We consider those who repeat the M2 as two different trajectories (one leading to failure and the other to success or another failure).

We model success R_i of student i with a probit model including socio-economic variables x_i, treatment D_i (with $D_i = 1$ if student i is enrolled in a DGE programme with high fees, and 0 if enrolled in a low fees national degree) and time t_i (with $t_i = 0$ before the introduction of DGE, in 2009/10, and 1 afterwards, in 2010/11):

$$\text{Prob}(R_i = 1) = \Phi(\alpha + \gamma D_i + \rho t_i + \tau D_i t_i + \theta x_i + \varepsilon_i) \quad (3)$$

where Φ is the distribution function of a Gaussian and ε_i is a random error term.

The strategy of identification of the effect of fees on success is based on the DID method. The students enrolled in the DGE programme are the treatment group. The national degree programme in the same discipline (economics and management) with unchanged tuition fees constitutes a natural control group. One important assumption in the DID estimation strategy is that the two groups are comparable. We report in Table A2 in the Appendix the differences in means values between the treatment and control groups using a t-test.

The binary nature of R_i calls for specific treatment in order to analyse it by the DID method. Surprisingly, it is relatively frequent in the literature to forego this precaution (see for example Hübner 2012), at the risk of obtaining erroneous results. This is because nonlinearity invalidates the use of the difference to cancel the fixed-group effect or the time effect. Here we favour the approach used by

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[7]The matrix of substitution costs is presented in Table A1 in the Appendix.
[8]In addition to Ward's method finally chosen, we considered the following methods: nearest neighbour method, farthest neighbour method, average, median, centroid, mcquitty, beta-flexible, Diana and partitioning around medoids.
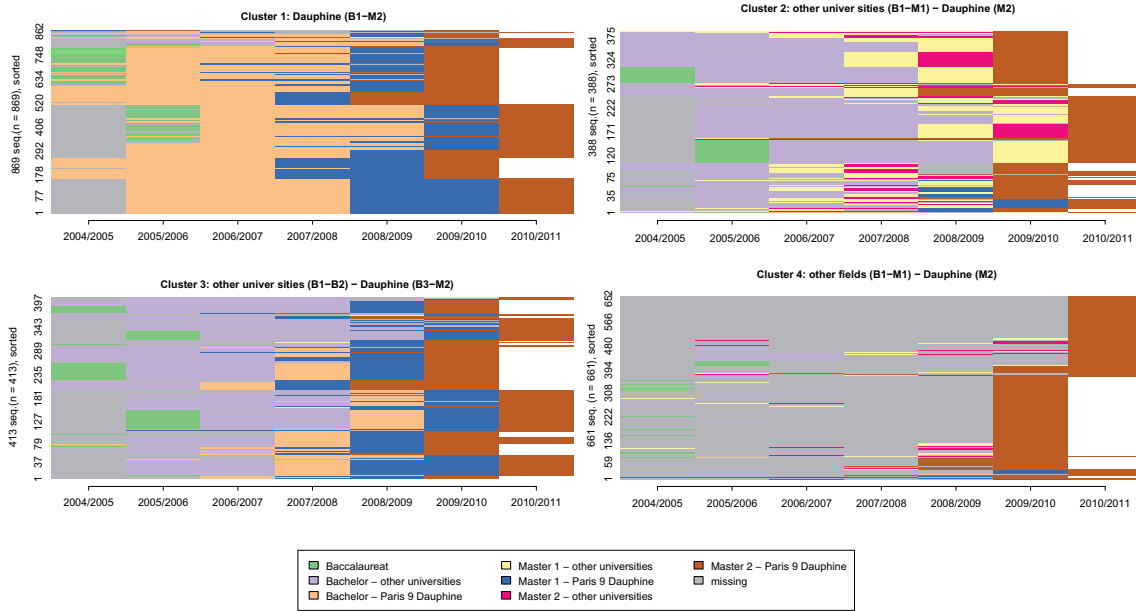
Figure 1. Typical pathways of students in M2 at Dauphine.
Source: Calculations based on the databases of SISE universities (enrolments and results) and AGLAE – MESR (extracted on 15 March 2013).

Puhani (2012), which, to our knowledge, has already been the subject of several works on similar questions (see for example Dietrich and Gerner 2012; or Dwenger, Storck, and Wrohlich 2012). The treatment effect is linked to the coefficient τ of the interaction term between treatment and year $D_i t_i$ (Puhani 2012). More precisely, this effect is equal to the difference between the second difference of the conditional expectation of the effect observed for the treated group $\left(R_i^1\right)$ after the introduction of the treatment and the second difference of the conditional expectation of the expected effect in the absence of treatment (i.e., of the counterfactual, R_i^0):

$$
\tau = \frac{\Delta^2 E\left[R_i^1 | D_i, t_i, x_i\right]}{\Delta D_i \Delta t_i} - \frac{\Delta^2 E\left[R_i^0 | D_i, t_i, x_i\right]}{\Delta D_i \Delta t_i}
$$
$$
= \Phi(\alpha + \gamma + \rho + \tau + \theta) - \Phi(\alpha + \gamma + \rho + \theta)
$$

(4)

V. Results

In this section we present the typology of student pathways obtained before turning our attention to the determinants of these pathways. We then analyse more specifically the effects of the introduction of tuition fees on these pathways and on student outcomes.

Typology of student pathways at Dauphine

Using the Ward algorithm, we can identify four groups of trajectories leading to the M2 in economics and management at Dauphine in 2009/10 and 2010/11. These different groups are represented in Figure 1 and their characteristics are detailed in Table 2. Figure 1 presents, by group, the individual pathways of the students. The x-axis represents time and the y-axis plots the trajectories (ranked according to their distances from the most typical pathway). Each of the parallel horizontal segments corresponds to an individual trajectory. The colours make it easier to distinguish the states in which each student is situated.

The first group represents more than one-third of the total sample and contains the trajectories of students who have followed all (or nearly all) of their higher education pathway at Dauphine. These pathways are very linear (mainly: pass the *baccalauréat*, enrol for a three-year bachelor course and then enrol for a year in M1 before joining the M2, possibly after a 12-month work placement – which appears in the trajectory as a second M1). In this first group, students from a very well-off background are over-represented by comparison with our total sample (67.6% versus 59.1% for the whole sample) and female students as well (58.1% versus 54.1% on average). Most of the students come from very prosperous *départements* close to the university:

Table 2. Socio-economic characteristics of students in the M2 in economics and management at Dauphine by typical pathway.

Independent variables	Cluster 1: Dauphine (B1-M2) (n = 869)	Cluster 2: other universities (B1-M1) – Dauphine (M2) (n = 388)	Cluster 3: other universities (B1-B2) – Dauphine B3-M2 (n = 413)	Cluster 4: other fields (B1-M1) – Dauphine (M2) (n = 661)	Total (n = 2331)
Socio-economic categories					
Very well-off	67.6	50.3	56.9	54.6	59.1
Well-off	9.7	11.9	11.4	10.0	10.4
Average	1.5	18.8	16.5	16.6	15.8
Disadvantaged	9.3	19.1	15.3	18.8	14.7
Scholarship on social criteria					
No scholarship	86.2	79.4	77.5	94.3	85.8
Scholarship	13.8	20.6	22.5	5.7	14.2
Sex					
Female	58.1	51.6	48.7	53.7	54.1
Male	41.9	48.5	51.3	46.3	45.9
Nationality					
French	87.1	83.5	80.9	51.0	75.2
Foreign	12.9	16.5	19.1	49.0	24.8
Geographical origin					
Paris	45.9	34.8	35.1	42.7	41.2
Seine et Marne	2.8	3.8	1.2	0.9	2.1
Yvelines	9.7	3.3	6.3	2.1	5.9
Essonne	3.6	2.8	4.1	2.7	3.3
Hauts de Seine	16.0	7.2	17.2	15.9	14.7
Seine Saint Denis	3.4	4.1	2.7	2.9	3.3
Val de Marne	5.8	8.3	6.5	6.5	6.5
Val d'Oise	3.7	4.4	2.7	1.7	3.1
Others	9.0	31.2	24.2	24.7	19.8
Age					
≤ 22	36.0	21.7	32.9	13.5	26.7
[23;24]	54.0	52.3	55.2	40.4	50.0
≥ 25	10.0	26.0	11.9	46.1	23.3

Source: Calculations based on the SISE universities (enrolments and results) and AGLAE – MESR databases (extracted on 15 March 2013).

45.9% from Paris, 9.8% from Yvelines and 16% from Hauts-de-Seine. Most of the students (90%) are aged 25 or under and have therefore had uninterrupted school careers (apart from a possible 'gap' year).

The second group, representing 16.6% of our sample, is composed of students who studied in another French university before joining Dauphine for the M2. These pathways, less homogeneous than those of cluster 1, display the following pattern: pass the *baccalauréat*, then complete a three-year bachelor course followed by a year of M1 in another French university before changing establishment to join the M2 at Dauphine. Unlike the student trajectories of the previous group, those of cluster 2 are often less linear, because of a repeated year or a change in direction. The share of students from a very well-off social category is slightly lower than average (50.3% versus 59.1% on average), but still higher than in the population of M2 in economics and management students in other French universities (32%). Students from a disadvantaged background are more likely to be in this group (19.1% versus 14.7% on average). The share of students

from outside the Île de France region is higher than in the other groups (33.9% versus 19.4% on average). Lastly, French nationality students are over-represented (92.7% versus 75.2%). This type of pathway, which could be interpreted as a sort of academic social climbing, is in fact a simple migration from the regions to Paris, at an equivalent social level, and pertains to the reproduction of elites at the national level.

The third group, representing 17.2% of the sample, is quite similar to the previous group. It is mainly composed of students who began their studies in another university before joining Dauphine for the last year of their bachelor course[9] for their first year of their master's. The characteristics of these students are quite close to the average values for the whole sample. Most of them come from a very well-off background (56.9% versus 59.1% on average), there are slightly more men (51.4% versus 45.9% on average), they are predominantly of French nationality (85.6% versus 75.2% on average) and, to a lesser extent, from Paris (35.3% versus 41.4% on average). This is the group with the highest proportion of scholarship holders (22.5% versus 14.2%

[9]This characteristic can be largely ascribed to the fact that some of these students spent two years in preparatory classes for the *grandes écoles* (parallel to their enrolment at university) before joining Dauphine to complete their bachelor course.

for the sample as a whole). Compared with the students of the previous group, these students appear to have trajectories of a more linear nature in higher education, and they join Dauphine at an earlier stage in their studies. Again, the students who study in another French university before joining Dauphine are much more socio-economically well-off than the average for students of M2 in economics and management at the national level.

The last group, representing 24.4% of the total sample, comprises students who joined the M2 at Dauphine after spending most of their higher education pathway outside the SISE 'universities' field, meaning they may have studied abroad or in French institutions outside universities, or interrupted their studies (probably for a wage-earning activity). The situation of these students in the year before joining the M2 at Dauphine[10] is presented in Table 3. This situation in the year before joining the M2 varies considerably according to the type of master's degree for which they enrol. The students who chose the fee-paying master's degree were more likely to come from engineering or management schools (in the year 2010/11, for example, 22.8% of these students were enrolled in management schools and 17% in engineering schools the previous year, compared with 12.5% and 9%, respectively, for the students in this group who chose the nonfee-paying master's at Dauphine). Conversely, the students who chose to enrol in the nonfee-paying M2 came mainly from universities (43% versus 22.8% for students enrolled in the fee-paying DGEs). On average, the students in this group are older than those of the other groups (46.1% were aged over 25, compared with 23.3% on average). This is partly explained by the high proportion of trajectories in this group marked by an interruption and then a return to education (19.7%). The proportion of foreign students is much higher than in the other groups (49% versus 24.8% on average). The share of students holding a scholarship is smaller in this group (5.7% versus 14.2% in the sample as a whole and 21.8% for all the students in M2 in economics and management in France for the same period). This can be attributed in particular to the fact that foreign students resident in France for less than two years[11] are not eligible for the same scholarships.[12] Lastly, the proportion of students from a disadvantaged social category is slightly higher in this group (18.8% versus 14.7% on the average).

Socio-economic characteristics, tuition fees and student trajectories

The attribution of each student to a typical pathway enables us to measure the impact of the main socio-economic variables on the probability of a student belonging to one of the typical pathways. The results of the estimation are presented in Table 4.

The results of the estimations show that the students in the fee-paying master's had a higher probability of coming from the type 4 pathway (+8.3%), composed of trajectories in which the students have come from fields of higher education

Table 3. Situation in the previous year for the students in cluster 3.

	2009/10 (n = 346)			2010/11 (n = 315)			Total
Situation in previous year	National Master's in 2010/11 (n = 166)	DGE Master's in 2010/11 (n = 180)	Total (n = 346)	National master's (n = 144)	DGE master's (n = 171)	Total (n = 315)	(n = 661)
University (excl. IUT, IUFM, ING UNIV)	38.6	17.2	27.5	43.1	22.8	32.1	29.7
Management school	10.8	17.8	14.5	12.5	22.8	18.1	16.2
Engineering school	10.2	21.1	15.9	9.0	17.0	13.3	14.7
Foreign establishment	17.5	17.2	18.7	17.3	13.2	14.6	15.7
Other establishment in France	4.8	4.4	4.6	6.3	0	2.9	3.8
Other SISE establishment	0	0	0	0.7	0.6	0.6	0.3
Return to studies	18.1	22.2	20.2	15.3	22.2	19.1	19.7

Source: Calculations based on the SISE universities (enrolments and results) and AGLAE – MESR databases (extracted on 15 March 2013).
The previous situation of the student is obtained by matching the SISE 'universities-enrolment' and 'universities-results' databases; the latter contains the variable informing about the student's situation in the previous year (type of course followed). The situation designates the type of establishment attended the previous year.

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[10]We obtained the situation of students in the previous year by matching the SISE 'universities-enrolment' and 'universities-results' databases.
[11]Foreign students can only apply for a CROUS scholarship (*Centre Régional des Oeuvres Universitaires et Scolaires*) if they have been living in France for 2 years and their 'parent of reference' has completed a statement of means in France.
[12]Scholarships on social criteria for students of French nationality are granted by the CROUS, whereas those for which foreign students can apply are granted by the Ministry of Foreign Affairs.

Table 4. Estimation of multinomial logit model on typical student pathways.

Socio-economic variables	Cluster 1: Dauphine (B1-M2)	Cluster 2: other universities (B1-M1) – Dauphine (M2)	Cluster 3: other universities (B1-B2) – Dauphine B3-M2	Cluster 4: other fields (B1-M1) – Dauphine (M2)
Socio-economic category				
Very well-off (ref)	-	-	-	-
Well-off	−0.064*	0.056*	0.016	−0.008
	(0.036)	(0.029)	(0.029)	(0.036)
Average	−0.090***	0.055**	0.000	0.035
	(0.031)	(0.024)	(0.025)	(0.030)
Disadvantaged	−0.155***	0.084***	0.015	0.056†
	(0.036)	(0.026)	(0.027)	(0.032)
Scholarship on social criteria				
No scholarship (ref)	-	-	-	-
Scholarship	0.023	0.052*	0.096***	−0.172***
	(0.034)	(0.025)	(0.024)	(0.038)
Sex				
Female (ref)	-	-	-	-
Male	−0.057***	0.003	0.045***	0.009
	(0.022)	(0.018)	(0.017)	(0.021)
Nationality				
French (ref)	-	-	-	-
Foreign	−0.192***	−0.082***	−0.000	0.275***
	(0.024)	(0.024)	(0.023)	(0.023)
Geographical origin				
Paris (ref)	-	-	-	-
Île de France	−0.025	−0.004	0.025	0.003
	(0.023)	(0.021)	(0.020)	(0.024)
Outside Île de France	−0.349***	0.129***	0.053**	0.167***
	(0.033)	(0.023)	(0.024)	(0.028)
Age	−0.081***	0.025***	−0.027***	0.082***
	(0.008)	(0.005)	(0.006)	(0.006)
Type of master's				
National (ref)	-	-	-	-
Fee-paying	0.039	−0.066***	−0.056**	0.083***
	(0.030)	(0.025)	(0.024)	(0.031)
Year				
2009 (ref)	-	-	-	-
2010	0.002	0.025	0.048**	−0.074***
	(0.028)	(0.022)	(0.022)	(0.028)

Source: Calculations based on the SISE universities (enrolments and results) and AGLAE – MESR databases (extracted on 15 March 2013).
The reference group used in the estimation is cluster 1. In the estimation of the model we have grouped together the départements of the Île de France in order to measure the effects related to geographical distance from Dauphine. Interpretation: the estimated marginal effect for the students defined by the active mode indicates the influence of this mode on the student pathways selected by Dauphine with respect to the students defined by the mode of reference. The SDs (in brackets) are calculated using the Delta method (see Greene 1993).
*, ** and *** denote statistical significance at the 10, 5 and 1% levels, respectively.

other than universities, and a lower probability of coming from the type 2 and type 3 pathways (−6.6% and −5.6%, respectively), characterized by previous studies in another French university than Dauphine. Thus, the introduction of tuition fees at Dauphine led to a greater likelihood to select students who had not previously studied at university or abroad, to the detriment of students having studied at universities in France before being admitted to the M2. It did not have an impact on internal selection by Dauphine.

Being from a socio-economic category other than 'very well-off' reduces the probability of a student belonging to cluster 1 (from −6.4% to −15.5%). Being male also reduces the probability of belonging to cluster 1 (by −5.7% compared with female

students). This result recalls those of Chenard, Doray, and Francoeur (2007), who highlighted the existence of different trajectories for men and women in Canadian higher education. One plausible explanation of this phenomenon is the existence of social conformism, which conditions the pathways of men and women in education and so leads them to take different paths (Baudelot and Establet 1992; Duru-Bellat 2004).

We observe that the probability of belonging to cluster 2 is positively affected by age (by +2.5%) – consistently longer trajectories and more frequent changes of university characterizing this group – by belonging to disadvantaged background (+8.4%) – highlighting the fact that students of different social origins following different pathways before ending up

in the M2 at Dauphine. Of the students selected, those from the very well-off social category are more likely to have followed linear trajectories (cluster 1), while students from the disadvantaged social category have longer, less-linear trajectories. Students belonging to cluster 2 are characterized by a significantly higher probability of having a scholarship (+5.2%), of being French (−8.2% for foreign students) and of not coming from the Île de France region (+12.9%).

The students who belong to cluster 3 join Dauphine earlier than those of cluster 2 (age having a negative effect on the probability of being in this group, by −2.7%), because of their trajectories being more linear. Scholarship holders are more likely to belong to cluster 3 (+9.6%), as well as French students from outside the Île de France and foreign students (+5.3%). Note also that male students have a higher probability of being in this group (+4.5%). Less students with this type of pathway are being selected when fees increase, and the introduction of tuition fees appears to be unfavourable to men, consistent with the literature on the relation between gender and tuition fees, which has emphasized the fact that the trajectories of men are more easily modified than those of women following the introduction of tuition fees (Alecke, Burgard, and Mitze 2013; Dwenger, Storck, and Wrohlich 2012).

Lastly, students belonging to cluster 4 have a lower probability of being selected among scholarship holders (−17.2%), which can be explained by the fact that foreign students (who are not eligible for scholarships on social criteria) are much more likely to belong to this group (+27.5% compared with French nationals). The high proportion of foreign students in this group suggests, in line with the results of Dotterweich and Baryla (2005), that the relatively low cost of studies at Dauphine (compared with universities in other countries) is likely to have a positive impact on these students' decision to come to France. This phenomenon can be attributed to the fact that for many foreign students, paying and taking out a loan for one's studies is a norm that has been integrated (unlike French students, for whom studies are almost free). Lastly, age has a positive impact on the probability of being in this group, which is consistent with the fact that the pathways in this group include 19.7% of students who are returning to studies after an interruption and 15.7% of students from foreign universities (in which the processes and timing of studies are different).

Through these results, it appears quite clearly that tuition fees have modified the types of pathways selected by Dauphine and consequently the nature of the populations admitted to the master's programmes concerned. The mechanism of segregation generated by the introduction of tuition fees at Dauphine is therefore a cumulative mechanism: the introduction of tuition fees leads to the admission to these master's programmes of less students from pathways characterized by a higher probability of coming from a disadvantaged background, of having a scholarship on social criteria and of being French.

Results of the DID estimation of the effect of tuition fees on success

For all that, do these tuition fees lead to an improvement in student outcomes, as some of the literature affirms? Table 5 presents the results of the estimation using the probit DID model (Puhani 2012). Columns in Table 5 present the results of the estimation of marginal effects of the probit DID model using the forward method.

Whatever the specification used, our results bring to light a significant difference between the two types of master's, although this cannot be attributed to the rise in tuition fees. Even if the probability of success is significantly higher in the treatment group than in the control group, the introduction of tuition fees has had no effect on the graduation rate: the success rate in the more prestigious (future fee-paying) master's programmes, which was higher in 2009/10, evolved in 2010/11 in parallel to the success rate observed in the master's that remained nonfee-paying. A crucial assumption in the DID strategy is that the outcome in treatment and control groups follows the same trend in the absence of the treatment (called 'common trend assumption'). To test this assumption, we display in Figure 2 the success rate among treatment, control and counterfactual groups from 2009 to 2010. We show that there is a parallel evolution in the success rates of the treatment and control groups, and that the evolution of the success rate of the counterfactual (the assumed evolution of the treated group in the absence of treatment) is identical to that of the control group.

The results presented in Table 5 indicate the effects of the different covariables used on the probability of success of the master's students at

Table 5. DID estimation, probability of graduation, probit model (marginal effects).

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment group	0.238***	0.236***	0.222***	0.221***	0.220***	0.220***	0.218***	0.219***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Time indicator	0.017	0.013	0.008	0.008	0.008	0.010	0.009	0.012
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Interaction effect	0.029	0.031	0.036	0.018	0.018	0.018	0.018	0.018
	(0.031)	(0.031)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Socio-economic category	–	–	–	–	–	–	–	–
Very well-off (ref)								
Well-off	–	0.001	−0.016	−0.017	−0.015	−0.016	−0.018	−0.011
		(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Average	–	−0.014	−0.037*	−0.037*	−0.035*	−0.040*	−0.044**	−0.042**
		(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Disadvantaged		−0.056***	−0.085***	−0.086***	−0.076***	−0.076***	−0.081***	−0.068***
		(0.020)	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)	(0.021)
Scholarships	–	–	–	–	–	–	–	–
No scholarship (ref)								
Grade 0	–	–	0.163***	0.163***	0.148**	0.136**	0.137**	0.127**
			(0.059)	(0.059)	(0.059)	(0.059)	(0.059)	(0.058)
Grade 1	–	–	0.011*	0.012*	0.095*	0.086	0.085	0.075
			(0.057)	(0.058)	(0.057)	(0.057)	(0.058)	(0.057)
Grade 2	–	–	0.185**	0.187**	0.174**	0.172**	0.170**	0.157*
			(0.084)	(0.084)	(0.084)	(0.085)	(0.086)	(0.085)
Grade 3	–	–	0.190***	0.191**	0.178**	0.169**	0.166**	0.156**
			(0.080)	(0.080)	(0.079)	(0.077)	(0.078)	(0.077)
Grade 4	–	–	0.208*	0.211*	0.196	0.203	0.197	0.180
			(0.123)	(0.124)	(0.122)	(0.125)	(0.123)	(0.122)
Grade 5	–	–	0.241***	0.240***	0.225***	0.217***	0.217***	0.207***
			(0.063)	(0.063)	(0.062)	(0.062)	(0.062)	(0.062)
Grade 6	–	–	0.193***	0.194***	0.185***	0.186***	0.193***	0.181***
			(0.060)	(0.060)	(0.060)	(0.060)	(0.061)	(0.061)
Sex	–	–	–	–	–	–	–	–
Female (ref)								
Male	–	–	–	−0.019	−0.023	−0.023	−0.020	−0.017
				(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Nationality	–	–	–	–	–	–	–	–
French (ref)								
Foreign	–	–	–	–	−0.043***	−0.042***	−0.062***	−0.061***
					(0.016)	(0.016)	(0.024)	(0.024)
Geographical origin	–	–	–	–	–	–	–	–
Paris (ref)								
Seine et Marne	–	–	–	–	–	−0.035	−0.039	−0.047
						(0.045)	(0.045)	(0.045)
Yvelines	–	–	–	–	–	0.034	0.031	0.022
						(0.034)	(0.034)	(0.034)
Essonne	–	–	–	–	–	0.039	0.039	0.036
						(0.044)	(0.044)	(0.044)
Hauts de Seine	–	–	–	–	–	−0.007	−0.010	−0.011
						(0.021)	(0.021)	(0.021)
Seine Saint Denis	–	–	–	–	–	−0.010	−0.011	−0.015
						(0.039)	(0.039)	(0.039)
Val de Marne	–	–	–	–	–	0.025	0.027	0.025
						(0.030)	(0.030)	(0.030)
Val d'Oise	–	–	–	–	–	0.018	0.010	0.004
						(0.044)	(0.044)	(0.044)
Outside the Île de France region	–	–	–	–	–	0.055***	0.051**	0.047**
						(0.020)	(0.021)	(0.021)
Baccalauréat stream	–	–	–	–	–	–	–	–
Sciences (ref)								
Literary	–	–	–	–	–	–	0.044	0.051
							(0.044)	(0.044)
Economics	–	–	–	–	–	–	0.031*	0.031*
							(0.018)	(0.018)
Technological STT	–	–	–	–	–	–	0.042	0.078
							(0.078)	(0.078)
Other technological	–	–	–	–	–	–	−0.205	−0.165
							(0.145)	(0.145)
Vocational	–	–	–	–	–	–	−0.079	−0.043
							(0.139)	(0.139)
Exempt	–	–	–	–	–	–	0.042	0.055**
							(0.028)	(0.028)
Age	–	–	–	–	–	–	–	−0.009***
								(0.003)

Source: Calculations based on the SISE universities (enrolments and results) and AGLAE – MESR databases (extracted on 15 March 2013).
DID estimator relies on Puhani (2012)'s approach. SDs (in brackets) are calculated using the Delta method.
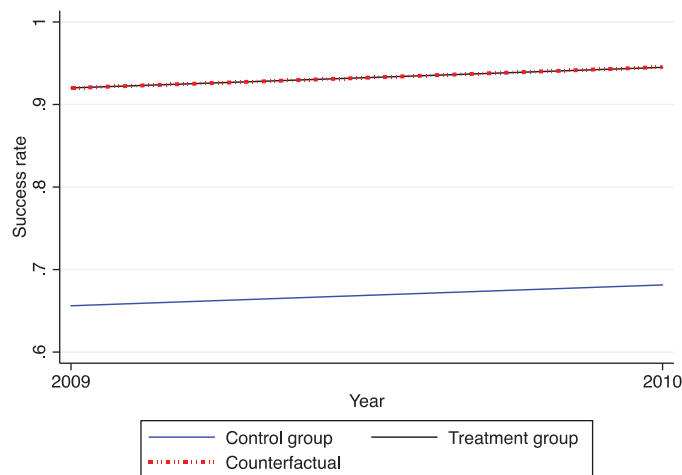*, ** and *** denote statistical significance at the 10, 5 and 1% levels, respectively.

Figure 2. Evolution of success rates in the master's programmes, according to whether or not they became fee-paying in 2010/11.
Note: Our data do not allow us to go forward the academic year 2009 /10.
Source: Calculations based on the databases of SISE universities (enrolments and results) and AGLAE – MESR (extracted on 15 March 2013).

Dauphine. Belonging to the average or disadvantaged social categories has a negative effect on the probability of a student graduating (−4.2% and −6.8%, respectively), compared with belonging to the very well-off category. In keeping with the results of Fack and Grenet (2015), having a scholarship has a positive effect on the probability of success (in particular for the poorest students corresponding to grades 5 or 6 scholarships – +20.7% and +18.1%, respectively, compared with a nonscholarship holder). Contrary to the results usually proposed in the literature, we do not find any gender effect on the probability of success (which is probably specific to the population studied). Foreign students are 6.1% less likely to graduate than French students. Lastly, age has a negative effect on the probability of success, but only to a very limited degree (−0.9%).

VI. Conclusion

Introducing or raising tuition fees is an increasingly common practice, both in France and abroad. To our knowledge, this is the first article to analyse the first experience of a large rise in tuition fees in the French university system, through the case of M2 programmes in economics and management at Dauphine. Its originality also lies in the method proposed, which allows us to consider student pathways in their entirety. We have studied the effects of the introduction of tuition fees not only on the pathways of students selected by the university, but also on their graduation rates.

The methodology used allowed us to identify four types of pathways and to bring to light the potential effects of segregation and inequality on student pathways generated by the introduction of tuition fees, and the absence of any positive effect of these elite programmes on graduation rates.

More precisely, we have shown that the introduction of tuition fees has had contrasting effects on the pathways of students selected by Dauphine. The pathways that procure the lowest probability of access to the fee-paying master's degree are those with a relatively high proportion of students from disadvantaged social backgrounds and of scholarships on social criteria and with a low proportion of foreign students. Conversely, the pathways giving the highest probability of access to these fee-paying M2 programmes are those followed by the students from the most well-off social categories. Added to which, pathways with time spent outside the university system also favour enrolment in these M2 programmes, probably because the students who follow these pathways are more familiar with fee-paying studies.

The revelation of this segregating effect of the rise in tuition fees at Dauphine is all the more interesting because the rise was progressive. Scholarship holders, although not directly concerned by the rise in tuition fees, are indirectly affected, since the academic pathways they follow are less likely to lead to one of these prestigious master's degree now they are fee-paying. This result emphasizes the need to analyse the complex mechanisms that cause students from disadvantaged

backgrounds to be penalized by the introduction of tuition fees (Flacher and Harari-Kermadec 2013; Lecouteux and Moulin 2015), even when these tuition fees are determined according to the parents' income. More generally, it also raises questions about the specificity of Dauphine in the French university landscape before drawing conclusions as to whether the experiences of this establishment are more widely applicable. Its prestigious status as a quasi 'grande école' and its particularly prosperous catchment area constitute one of the most favourable contexts for the apparently 'successful' introduction of tuition fees (along with that of Sciences Po Paris). And yet, if a segregation effect can already be identified within the setting of this experiment, despite the fact that the tuition fees are determined according to the parents' income, it is highly probable that this effect will be much stronger if such a policy is extended to the national level. Finally, beyond the question of segregation effects, and as suggested by Flacher, Harari-Kermadec, and Moulin (2013), it is essential to consider the issue of the introduction or increase in tuition fees within a broader context, taking into account the institutional frameworks specific to each country (see Moulin 2015).

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Disclosure statement

References

Abbott, A. 1995. "Sequence Analysis: New Methods for Old Ideas." Annual Review of Sociology 21: 93–113. doi:10.1146/annurev.so.21.080195.000521.

Abbott, A., and J. Forrest. 1986. "Optimal Matching Methods for Historical Sequences." Journal of Interdisciplinary History 16 (3): 471–494. doi:10.2307/204500.

Abbott, A., and A. Hrycak. 1990. "Measuring Resemblance in Sequence Data: An Optimal Matching Analysis of Musicians' Careers." American Journal of Sociology 96 (1): 144–185. doi:10.1086/229495.

Alecke, B., C. Burgard, and T. Mitze 2013. "The Effect of Tuition fees on Student Enrollment and Location Choice - Interregional Migration, Border Effects and Gender Differences." Ruhr Economic Papers, 0404.

Baudelot, C., and R. Establet. 1992. Allez les filles ! Paris: Le Seuil.

Callender, C., and J. Jackson. 2005. "Does the Fear of Debt Deter Students from Higher Education?" Journal of Social Policy 34 (4): 509–540. doi:10.1017/S004727940500913X.

Callender, C., and J. Jackson. 2008. "Does the Fear of Debt Constrain Choice of University and Subject of Study?" Studies in Higher Education 33 (4): 405–429. doi:10.1080/03075070802211802.

Cameron, S., and J. Heckman. 2001. "The Dynamics of Educational Attainment for Black, Hispanic, and White Males." Journal of Political Economy 109 (3): 455–499. doi:10.1086/321014.

Card, D., and T. Lemieux 2000. "Dropout and Enrollment Trends in the Post-War Period: What Went Wrong in the 1970s?" NBER Working Paper, 7658.

Chenard, P., P. Doray, and E. Francoeur. 2007. Les transitions scolaires dans l'enseignement postsecondaire : formes et impacts sur les carrières étudiantes. Montréal, QC: Centre interuniversitaire de recherche sur la science et la technologie, UQAM.

Christofides, L., J. Canada, and M. Hoy. 2001. "Family Income and Postsecondary Education in Canada." Canadian Journal of Higher Education 31 (1): 177–208.

Coelli, M. 2009. "Tuition Fees and Equality of University Enrolment." Canadian Journal of Economics 42 (3): 1072–1099. doi:10.1111/j.1540-5982.2009.01539.x.

Dearden, L., E. Fitzsimons, and G. Wyness 2011. "The Impact of Tuition fees and Support on University." Institute for Fiscal Studies Working Paper, W11/17.

Dietrich, H., and H. Gerner. 2012. "The Effects of Tuition Fees on the Decision for Higher Education: Evidence from a German Policy Experiment." Economics Bulletin 32 (3): 2407–2413.

Dotterweich, D., and E. Baryla. 2005. "Non-Resident Tuition and Enrollment in Higher Education: Implications for Tuition Pricing." Education Economics 13 (4): 375–385. doi:10.1080/09645290500251631.

Duru-Bellat, M. 2004. L'école des filles. Quelles formations pour quels rôles sociaux? Paris: L'Harmattan.

Dwenger, N., J. Storck, and K. Wrohlich. 2012. "Do Tuition Fees Affect the Mobility of University Applicants? Evidence from a Natural Experiment." Economics of Education Review 31 (1): 155–167. doi:10.1016/j.econedurev.2011.10.004.

Ellwood, D., and T. Kane. 2000. "Who is Getting a College Education? Family Background and the Growing gaps in Enrolment." In *Securing the Future: Investing in Children from Birth to Colleges*, edited by Danziger, S. and J. Waldfogel, 283–324, New York: Russell Sage Foundation.

Fack, G., and J. Grenet. 2015. "Improving College Access and Success for Low-Income Students: Evidence from a Large Need-based Grant Program." *American Economic Journal: Applied Economics* 7 (2): 1–34.

Field, E. 2009. "Educational Debt Burden and Career Choice: Evidence from a Financial Aid Experiment at NYU Law School." *American Economic Journal: Applied Economics* 1 (1): 1–21.

Flacher, D., and H. Harari-Kermadec. 2013. "Tuition Fees, Self-Esteem and Social Heterogeneity." *Education Economics* 21 (2): 191–210. doi:10.1080/09645292.2011.561630.

Flacher, D., H. Harari-Kermadec, and L. Moulin. 2013. "Faut-il (vraiment) augmenter les frais d'inscription à l'université?" *Revue française d'économie* 27 (3): 145–183.

Fortin, N. 2005. "Rising Tuition and Supply Constraints: Explaining Canada-US Differences in University Enrolment Rates." In *Higher Education in Canada*, edited by Beach, C., R. Boadway, and M. McInnis, 369–413. Montreal, QC: McGill-Queen's University Press.

Frenette, M. 2005. "L'incidence des frais de scolarité sur l'accès à l'université: résultats de la vaste déréglementation des frais de scolarité des programmes professionnels." Statistics Canada Research Paper Series, 264.

Fricke, H. 2014. "Tuition Fees and Student Achievement - Evidence from a Differential Raise in Fees." Beiträge zur Jahrestagung des Vereins für Socialpolitik 2014: Evidenzbasierte Wirtschaftspolitik, Hamburg, September 7–10.

Garibaldi, P., F. Giavazzi, A. Ichino, and E. Rettore. 2012. "College Cost and Time to Complete a Degree: Evidence from Tuition Discontinuities." *Review of Economics and Statistics* 94 (3): 699–711. doi:10.1162/REST_a_00195.

Gary-Bobo, R., and A. Trannoy. 2008. "Efficient Tuition Fees and Examinations." *Journal of the European Economic Association* 6 (6): 1211–1243. doi:10.1162/jeea.2008.6.issue-6.

Greene, W. 1993. *Econometric Analysis*. 6th ed. New York: Prentice Hall.

Heineck, M., M. Kifmann, and N. Lorenz. 2006. "A Duration Analysis of the Effects of Tuition Fees for Long-Term Students in Germany." *Journal of Economics and Statistics* 226 (1): 82–109.

Hemelt, S., and D. Marcotte. 2011. "The Impact of Tuition Increases on Enrollment at Public Colleges and Universities." *Educational Evaluation and Policy Analysis* 33 (4): 435–457. doi:10.3102/0162373711415261.

Huang, Y. 2012. "The Influence of Tuition Changes on Retention and Graduation Rates." 37th Annual Conference - Association for Education Finance and Policy, Boston, MA, March 15–17.

Hübner, M. 2012. "Do Tuition Fees Affect Enrollment Behavior? Evidence from a "Natural Experiment" in Germany." *Economics of Education Review* 31 (6): 949–960. doi:10.1016/j.econedurev.2012.06.006.

Hutchings, M. 2003. "Financial Barriers to Participation." In *Higher education and Cocial Class: Issues of Exclusion and Inclusion*, edited by Archer, L., M. Hutchings, and A. Ross, 155–174. London: Routledge Falmer.

Kane, T. 1994. "College entry by Blacks since 1970: The Role of College Costs, Family Background, and the Returns to Education." *Journal of Political Economy* 102 (5): 878–911. doi:10.1086/261958.

Kwong, J., I. Dhalla, D. Streiner, R. Baddour, A. Waddell, and I. Johnson. 2002. "Effects of Rising Tuition Fees on Medical School Class Composition and Financial Outlook." *Canadian Medical Association Journal* 166 (8): 1023–1028.

Lecouteux, G., and L. Moulin. 2015. "To Gain or Not to Lose? Tuition Fees for Loss Averse Students." *Economics Bulletin* 35 (2): 1005–1019.

Leslie, L., and P. Brinkman. 1987. "Student Price Response in Higher Education: The Student Demand Studies." *The Journal of Higher Education* 58: 181–204. doi:10.2307/1981241.

Lesnard, L., and T. De Saint Pol. 2006. "Introduction aux methodes d'appariement Optimal (Optimal Matching Analysis)." *Bulletin de méthodologie sociologique* 90: 5–25. doi:10.1177/075910630609000103.

Lörz, M., S. Schindler, and J. Walter. 2011. "Gender Inequalities in Higher Education: Extent, Development and Mechanisms of Gender Differences in Enrolment and Field of Study Choice." *Irish Educational Studies* 30 (2): 179–198. doi:10.1080/03323315.2011.569139.

Mcpherson, M., and M. Schapiro. 1991. "Does Student Aid Affect College Enrollment? New Evidence on a Persistent Controversy." *American Economic Review* 81 (1): 309–318.

Moulin, L. 2014. "Frais d'inscription dans l'enseignement supérieur : enjeux, limites et perspectives." PhD thesis, University of Paris 13.

Moulin, L. 2015. "Frais d'inscription dans l'enseignement supérieur et régimes d'État-providence: une analyse comparative." *Éducation et sociétés* 36 (2): 119–141. doi:10.3917/es.036.0119.

Neill, C. 2009. "Tuition Fees and the Demand for University Places." *Economics of Education Review* 28 (5): 561–570. doi:10.1016/j.econedurev.2009.01.002.

OECD. 2014. *Education at a Glance 2014: OECD Indicators*. Paris: OECD Press.

Pennell, H., and A. West. 2005. "The Impact of Increased Fees on Participation in Higher Education in England." *Higher Education Quarterly* 59 (2): 127–137. doi:10.1111/hequ.2005.59.issue-2.

Puhani, P. 2012. "The Treatment Effect, the Cross Difference, and the Interaction Term in Nonlinear "Difference-in-Differences" Models." *Economics Letters* 115 (1): 85–87. doi:10.1016/j.econlet.2011.11.025.

Robette, N. 2011. *Explorer et décrire les parcours de vie: les typologies de trajectoires*. Les Clefs pour… Paris: CEPED.

Rouse, C. 1994. "What to Do after High School: The Two-Year versus Four-Year College Enrolment Decision." In *Choices and Consequences: Contemporary Policy Issues in Education*, edited by Ehrenberg, R., 59–88. Ithaca, NY: ILR Press.

St. John, E. P. 1990. "Price Response in Enrollment Decisions: An Analysis of the High School and beyond Sophomore Cohort." *Research in Higher Education* 31 (2): 161–176. doi:10.1007/BF00992260.

Studer, M. 2012. "Étude des inégalités de genre en début de carrière académique à l'aide de méthodes innovatrices d'analyse de données séquentielles." PhD thesis, University of Geneva.

Wilkins, S., F. Shams, and J. Huisman. 2013. "The Decision-Making and Changing Behavioural Dynamics of Potential Higher Education Students: The Impacts of Increasing Tuition Fees in England." *Educational Studies* 39 (2): 125–141. doi:10.1080/03055698.2012.681360.

Appendix

Table A1. Matrix of substitution and insertion-deletion costs of the optimal matching.

	Baccalaureat	BAs universities	BAs Dauphine	M1 universities	M1 Dauphine	M2 universities	M2 Dauphine	Outside SISE universities
Baccalaureat	0	1.53	1.47	2	2	2	2	2
BA universities	1.53	0	1.84	1.79	1.94	1.97	1.99	2
BA Dauphine	1.47	1.84	0	2	1.59	2	2	2
M1 universities	2	1.79	2	0	1.95	1.68	1.49	2
M1 Dauphine	2	1.94	1.59	1.95	0	1.92	1.24	2
M2 universities	2	1.97	2	1.68	1.92	0	1.31	2
M2 Dauphine	2	1.99	2	1.49	1.24	1.31	0	2
Outside SISE universities	2	2	2	2	2	2	2	0

Source: Calculations based on the SISE universities (enrolments and results) and AGLAE – MESR databases (extracted on 15 March 2013).
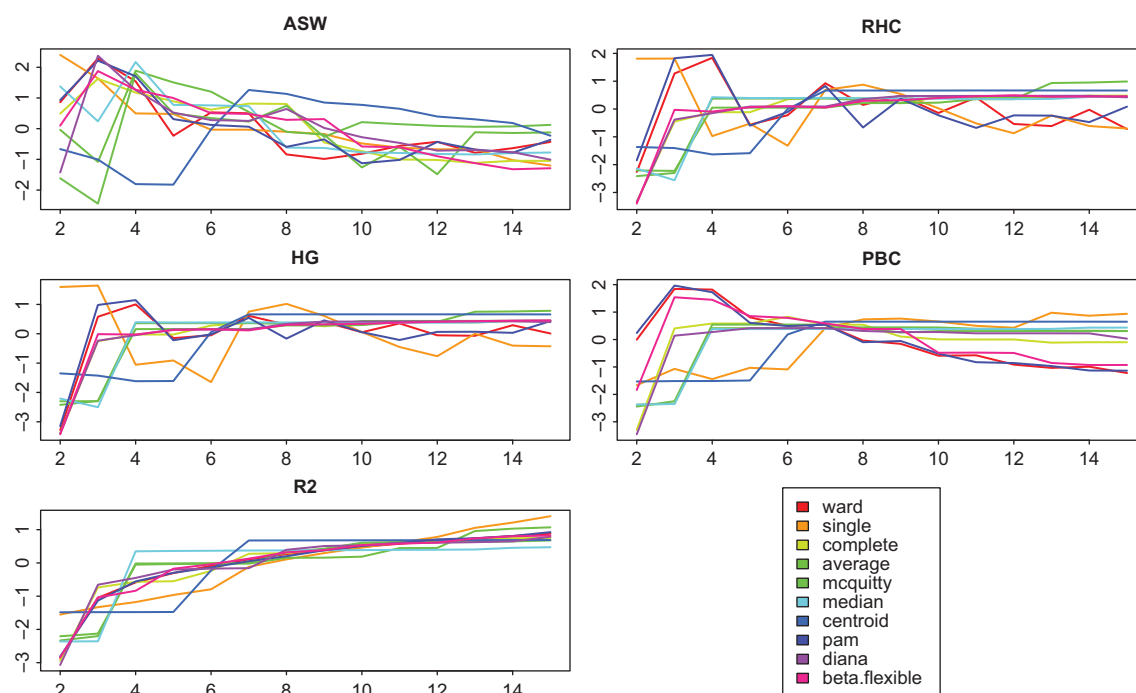

Figure A1. Evaluation of quality measures depending on the number of groups and clustering procedures.

Source: Calculations based on the databases of SISE universities (enrolments and results) and AGLAE – MESR (extracted on 15 March 2013).

Table A2. Differences in means values between treatment and control groups.

Variables	D_0	D_1	$D_0 – D_1$
Very well-off	0.577	0.604	−0.027
	(0.015)	(0.132)	(0.020)
Well-off	0.103	0.104	−0.001
	(0.009)	(0.008)	(0.012)
Average	0.157	0.156	0.001
	(0.011)	(0.010)	(0.015)
Disadvantaged	0.164	0.137	0.027
	(0.011)	(0.009)	(0.014)
No scholarship	0.884	0.832	0.052***
	(0.010)	(0.010)	(0.014)
Grade 0	0.019	0.041	−0.022***
	(0.004)	(0.005)	(0.007)
Grade 1	0.014	0.034	−0.019***
	(0.004)	(0.005)	(0.006)
Grade 2	0.012	0.013	−0.001
	(0.003)	(0.003)	(0.004)
Grade 3	0.013	0.015	−0.002
	(0.003)	(0.003)	(0.005)
Grade 4	0.005	0.012	−0.006
	(0.002)	(0.003)	(0.004)
Grade 5	0.028	0.030	−0.002
	(0.005)	(0.005)	(0.007)
Grade 6	0.025	0.023	0.002
	(0.005)	(0.004)	(0.006)
Female	0.467	0.454	0.013
	(0.015)	(0.013)	(0.020)
Male	0.533	0.546	0.013
	(0.015)	(0.013)	(0.020)
French (ref)	0.676	0.793	−0.117***
	(0.014)	(0.011)	(0.018)
Foreign	0.318	0.205	0.112***
	(0.014)	(0.009)	(0.018)
Paris	0.406	0.415	−0.009
	(0.015)	(0.013)	(0.020)
Seine et Marne	0.025	0.020	0.005
	(0.005)	(0.004)	(0.006)
Yvelines	0.045	0.071	−0.026***
	(0.006)	(0.007)	(0.010)
Essonne	0.031	0.035	−0.005
	(0.005)	(0.005)	(0.007)
Hauts de Seine	0.153	0.146	0.007
	(0.011)	(0.010)	(0.014)
Seine Saint Denis	0.043	0.025	0.018*
	(0.006)	(0.004)	(0.007)
Val de Marne	0.072	0.060	0.013
	(0.008)	(0.006)	(0.010)
Val d'Oise	0.030	0.029	0.001
	(0.005)	(0.005)	(0.007)
Outside the Île de France region	0.195	0.197	−0.002
	(0.012)	(0.011)	(0.016)
Scientific	0.486	0.522	−0.037
	(0.015)	(0.014)	(0.020)
Literary	0.033	0.033	0.001
	(0.005)	(0.005)	(0.007)
Economics	0.248	0.287	−0.039*
	(0.013)	(0.012)	(0.018)
Technological STT	0.010	0.011	−0.001
	(0.003)	(0.003)	(0.004)
Other technological	0.002	0.001	0.001
	(0.001)	(0.001)	(0.002)
Vocational	0.001	0.003	−0.002
	(0.001)	(0.001)	(0.002)
Exempt	0.220	0.142	0.078***
	(0.012)	(0.009)	(0.015)
Age	24.071	23.647	0.424***
	(0.080)	(0.068)	(0.104)

Source: Calculations based on the SISE universities (enrolments and results) and AGLAE – MESR databases (extracted on 15 March 2013).
*, ** and *** denote statistical significance at the 10, 5 and 1% levels, respectively.