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Education, job and return migration of French University graduates

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Abstract

Using French surveys of six generations between 1998 and 2013, we examine the migration of university students and graduates by describing their evolving spatial patterns. Trivariate sequential and truncated probit model indicates highly educated youths tend to stay in the same region for higher education. Although they remain the majority profile, Non-Migrants decrease in proportion over the generations. The increase in mobility is partly captured by the rise in Return Migrants. It demonstrates the relational anchorage of graduates and the risk for territories to engage in attractivity policies.

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1. Introduction

Regional economic development is now largely associated with migration of students for higher education and graduates for employment. Accumulation of human capital attributable to universities' contribution is possible not only when students are attracted to the region for their higher education, but also when graduates stay to work in the university region. The share of the highly educated population in a region has been viewed as a key determinant of economic development. For Winters (2011), the growth of US smart cities is both the result of the in-migration of university students and the retention of university graduates. In the same way, Florida *et al.* (2006) and Shearmur (2007) discuss the interest of territories to attract skilled and creative people.

The retention of highly educated human capital increases the possibility of regional development but is made difficult by the higher migration propensity of high skilled people. It can be explained by their ability to take advantage of the opportunities offered by different locations, by their adaptability to different jobs, and by their willing to migrate over longer distances to achieve higher human capital return (Buenstorf *et al.*, 2016; Dotti *et al.*, 2013; Faggian and McCann, 2008; Faggian *et al.*, 2017). Thus, higher education and access to employment of young graduates are both considered to be important factors responsible for changing the population distribution through migration patterns. An extensive literature has focused on the spatial (re)allocation of human capital through the evolving distribution of higher education institutions and the migration patterns of graduates. But a neglected aspect in this empirical literature is the longitudinal perspective of migration behavior: most studies are based on a single year of observation which does not capture the evolving role of migration determinants over time. Using six available waves of surveys, the purpose of this paper is thus twofold: 1) describe mobility trends among higher education students and graduates, and their evolution over time, 2) identify the determinants of mobility behavior.

We propose to contribute to the literature by providing on the French case a dynamic analysis of the mobility patterns. The data used come from six Céreq[1] generation surveys (1998, 2001, 2004, 2007, 2010 and 2013): a representative population of school leavers in France is interviewed three years after the date of graduation (the 2010 generation was interviewed in 2013, for example). We have reached a database of graduates by aggregating the data from these six generation surveys for higher education graduates. For each generation, the data include spatial variables to reconstruct the geographical trajectory of individuals (location in primary school, location of the higher education institution where they obtained their last diploma, and location three years later). We estimate a trivariate *probit* model to examine the determinants of migration patterns defined from Faggian's classification (Non-Migrant, Late Migrant, University Stayers, Repeat Migrant and Return Migrant).

The article is organized as follows. Section 2 gives details about the French higher education case. Section 3 describes the data used and some indicators. Section 4 details the econometric strategy. Section 5 gives the main results and section 6 concludes.

[1] Céreq is the French Center for Research on Education, Training and Employment.

2. Migration of graduates in France

In the mid-1990s, more than 40% of an age group graduated from higher education, compared to only 20% in the 1970s. This quantitative massification is now accompanied by a political will to diversify geographically and socially. The early 2000s is characterized by a stagnation of the university population at around 2% of the French population. A logic of competition between universities to attract students was then put in place, with the creation of major university centers that aimed to be competitive on an international scale. Li and Lowe (2016) describe the same competitive process in the UK.

For a long time, the supply on the "market" of higher education was very concentrated in the large French cities, mainly the regional capitals. To relieve the overcrowding of existing universities during the 1980s, new universities have been created, often multidisciplinary. In addition to these university infrastructures, nearly 200 university technical institutes have been created throughout France. The reform of the 1990s made it possible to ensure the democratization of access to higher education through better networking of the territory.

This movement to democratize higher education (objective of 80% access for an age group to the baccalaureate level) also aims to take better account of the distance to the educational equipment and the cost of distance travel (financial costs linked to daily travel, means of transport, housing, and psychological costs linked to the distance of family and friends). This spatial planning policy by rebalancing university facilities in France is in a way in contradiction with the ideology of geographical mobility since the establishment of antennas and a local higher education offer limits the needs of student migration.

Changes in region are more frequent when entering the labor market than when entering university or during studies, since inter-regional migration affects 28% of graduates entering the labor market, 11% of bachelor's graduates enrolling in university and only 6% of students during their studies. The idea that mobility is an integral part of the university curriculum concerns only a small proportion of students, suggesting that the regional training offer meets the expectations of the greatest number of people (Baron and Perret, 2006).

3. Dataset and indicators

We mobilize microdata from six Céreq generation surveys (1998, 2001, 2004, 2007, 2010 and 2013), in which youths who left the French education system were observed over a three-year period. These youths, representative of the whole generation of school leavers in France, are interviewed three years after graduation (the 2010 generation was interviewed in 2013, for example). We have kept only higher education graduates and reached a database of 81,763 people[2] by aggregating the data from six generation surveys. In France, *Baccalauréat* (Bac), is the national exam taken at the end of secondary school, and a prerequisite for admission to university. The population of higher education graduates refers to four levels of education, according to the number of years of study after the *Baccalauréat*: Bac+2 (i.e. the Bac graduates who studied a further two years) corresponds to technological degrees; Bac+3 corresponds to *Licence* degree, i.e. Bachelor; Bac+5 corresponds to *Master* degree, i.e. Master; Bac+8 corresponds to *Doctorat* degree, i.e. PhD.

We distinguish between long higher education cycle (those who studied a further five years or more) and short higher education cycle (those who studied until three years after Bac). Long

[2] 53,453 short cycle graduates and 28,310 long cycle graduates. Each respondent is assigned a weighting coefficient. After weighting, the 81,763 respondents represent 1,671,045 people. Table 3 in appendix gives the distribution of the sample by generation and diploma level.

cycle graduates are trained to apply for managerial positions with high responsibility, while short cycle graduates are trained for intermediate professions with more prescribed missions. It is well documented that the level of education strongly influences both migration likelihood and job earnings. Therefore, all descriptive statistics and econometric estimations will be performed for the two sub-groups.

For each generation, the data include spatial variables to reconstruct the geographical trajectory of individuals: first, the location in primary school i.e. a proxy of the place of origin; second, the location of the higher education institution where they obtained their last degree; third, the location of employment three years later. With this triple information, we can engage in a sequential analysis of migration behavior of French higher education graduates from origin to higher education [*Education Mobility*], and then from higher education to employment [*Job Mobility*]. For a student applicant, a first migration decision consists in considering university courses in different institutions and cities. On leaving higher education, the university graduate has to make a second migration decision when conducting a labour market search. Information on three points of the trajectory also makes it possible to track returns [*Return Mobility*] in the case of a succession of two mobilities.

From a geographical point of view, the data from the generation surveys are representative at the regional level, which is why we opt for an interregional analysis of migration. In other words, interregional mobility corresponds to a change of administrative region. Following Faggian *et al.* (2007), we classify graduates according to the result of these two separate migration choices, i.e. the prior migration of students to higher education, and the subsequent migration of graduates to the labor market, and the integration of return or not (Table 1).

1. *Repeat Migrant* [Yes, Yes, No]: this category moves away from the domicile area for higher education and then moves again on leaving university to enter employment in an area different from both the domicile and education areas.
2. *Return Migrant* [Yes, Yes, Yes]: this category enters higher education in an area that is different from his/her domicile area but then returns to the domicile area to enter employment.
3. *University Stayer* [Yes, No, No]: this category moves away from the domicile region for higher education, but then stays in this same region for employment.
4. *Late Mover* [No, Yes, No]: this remains in the domicile area for higher education but then moves away upon graduation to another region for employment.
5. *Non-migrant* [No, No, No]: this category enters higher education in the same area as his/her domicile and then subsequently enters into employment in the same area again.

This categorization into five subgroups is rather more satisfying than simple distinction between migrants and stayers, which remains traditional in migration studies. This means that they do not distinguish between repeat, return and late migrants - who all migrate to work - on one side and university stayers and non-migrants - who do not migrate to work - on the other. Several studies (DaVanzo, 1983; Faggian et al., 2007) show that repeat and return migrants have different characteristics, so grouping them would conceal some interesting patterns.

4. Econometric strategy and specification

4.1 Econometric specification

Our objective is to identify the determinants of mobility behavior. Unlike Faggian's empirical approach, determinants of migration patterns are not modelized by a multinomial logit model. Because this modeling choice does not allow to consider correlation between migrations, we estimate a trivariate *probit* model. Furthermore, we generalize the model proposed by Dupray

and Vignale (2019) which estimate the education mobility and the return migration and the one proposed by Ma, Kang and Kwon (2017) which estimate the three equations (education mobility, job mobility and return) separately.

We characterized the migration model by three dichotomous variables.

- *E* takes the value 1 if we observe education mobility and 0 otherwise. The decision to migrate is determined by the positive latent variable $E^* = X_E\beta_E + u_E$[3].
- *J* takes the value 1 if we observe job mobility and 0 otherwise. The decision to migrate is determined by the positive latent variable $J^* = X_J\beta_J + E\beta_{JE} + u_J$. β_{JE} measures the effect of education mobility on job mobility.
- *R* takes the value 1 if we observe a return to the region of origin and 0 otherwise. This variable is defined only for people who have already achieved the two previous mobilities (*E*=1 and *J*=1). The decision to return is determined by the positive latent variable $R^* = X_R\beta_R + u_R$. This variable is observed just when an education mobility is done.

Each latent variable *V (V=E,R,J)* depends on observed variables X_V (β_V is the vector of parameters to be estimated) and a random error term u_V, which is supposed to follow a normal standard distribution. The three measurement error terms are distributed following a trivariate normal distribution of means 0 and variance-covariance matrix Σ with:

$$\Sigma = \begin{bmatrix} 1 & \sigma_{EJ} & \sigma_{ER} \\ \sigma_{EJ} & 1 & \sigma_{RJ} \\ \sigma_{ER} & \sigma_{RJ} & 1 \end{bmatrix}$$

Five likelihood contributions associated with the five sequential migration patterns *(M_s, s=1,…,5)* can be defined:

Migration pattern	Contribution to the likelihood function
Return migrant:	$P(E=1,J=1,R=1\|X_E,X_J,X_R) = \Phi_3(X_E\beta_E, X_J\beta_J, X_R\beta_R; \sigma_{EJ}, \sigma_{ER}, \sigma_{RJ})$
Repeat migrant:	$P(E=1,J=1,R=0\|X_E,X_J,X_R) = \Phi_3(X_E\beta_E, X_J\beta_J, -X_R\beta_R; \sigma_{EJ}, -\sigma_{ER}, -\sigma_{RJ})$
University stayer:	$P(E=1,J=0\|X_E,X_J) = \Phi_2(X_E\beta_E, -X_J\beta_J; -\sigma_{EJ})$
Late migrant:	$P(E=0,J=1\|X_E,X_J) = \Phi_2(-X_E\beta_E, X_J\beta_J; -\sigma_{EJ})$
Non migrant:	$P(E=0,J=0\|X_E,X_J) = \Phi_2(-X_E\beta_E, -X_J\beta_J; \sigma_{EJ})$

Φ_k $(k = 2,3)$ is the cumulative distribution function of a bivariate (*k=2*) and trivariate (k=3) from a normal distribution function with the associated correlation coefficients. The likelihood function is given in the Appendix. The maximum likelihood was obtained using the function optim of the R software.

This model is a recursive, simultaneous equations model. As demonstrated by Maddala (1983), the endogenous nature of the left-hand side of the first equation (education mobility) on the right-hand side of the second equation (insertion mobility) can be ignored in formulating the log-likelihood because joint probability contributions can be written as product of conditional and marginal probabilities (see Greene, 2012, p. 786). By construction, an exclusion restriction is not needed because the identification of the parameters can be driven by the nonlinearity in the bivariate (or trivariate) probit model (see Wooldridge, 2010, p. 596). For linear regression models, it is necessary to manipulate sample moments that do not converge to the necessary population parameters in the presence of simultaneity. In these models, some problems of

[3] Index *i* for the student is omitted to simplify notation.

overidentification can appear. So, because we estimate simultaneously a three-equations nonlinear model by maximizing the log-likelihood, we can ignore the simultaneity unlike in linear regression models and the problem of overidentification. However, it is better to use an exclusion restriction (see Wooldridge, 2010, p. 596) and a condition of identifying the parameter associated with education mobility (β_{JE}) and the correlation coefficient (σ_{EJ}), which are estimated simultaneously, is that at least one variable in X_E (the instrumental variables) is not included in X_J (see Maddala, 1983, p. 120 and p. 123). We cannot use the two-stages method for probit equations in which we first obtain the probit maximum likelihood estimates the first equation and we substitute $\Phi\left(X_E\widehat{\beta_E}\right)$ for E because this method do not produce consistent parameter estimators. The reason is once again the nonlinearity of the model, the two-stage method is correct for explained continuous variable for the second equation, not for indicator function (see Maddala, 1983 p. 123 or Wooldridge, 2010, p. 597).So, concerning estimation strategy, we exploit spatial and temporal heterogeneity as instrumental variable. For the education mobility equation, we include the rate of supply of master in the region of origin. For the job mobility equation, we consider three variables: the rate of permanent jobs, the rate of executive jobs and the housing rental costs per square meter in the region of education. For the return mobility equation, we take these three variables for the region of origin[4].

4.2 Explanatory variables

The main independent variables considered to explain mobility are educational variables (diploma, fields, academic delay); socio-economic variables (professional situation and origin of parents, gender, family situation, work during university studies); geographical variables (residential area, region, Erasmus mobility experience). The main descriptive statistics associated with all the variables used in the econometric analysis are given Table 4, in Appendix.

Socio-economic variables

First, we control the effect of gender, knowing that the results obtained in the literature do not all converge towards the same conclusion. For example, Faggian et al (2007) show that in the United Kingdom women have greater education and job mobility, while Kazakis and Faggian (2017) for the USA and Ciriaci (2014) for Italy show the opposite effect. Haussen and Uebelmesser (2018) find no effect of gender on integration mobility.

In these personal characteristics, we have also introduced the social and geographical origin of the parents. For social and financial reasons, students from modest social backgrounds can be expected to experience a lower rate of mobility than others. It is indeed easier (i) for students from a well-off social background to project themselves into long and non-local higher education and (ii) for their families to bear the costs of studies requiring geographical mobility. Moreover, because higher education supply is more likely to be located in large or even very large cities, the probability of education mobility should be higher for students whose parents live in rural areas. An indicator related to this information was considered.

Finally, the conjugal configuration is important for the question of geographical mobility and it can be assumed that being in a couple and having children strengthens territorial and relational anchoring and reduces the probability of migration.

Educational variables

Because, on the one hand, the supply of higher education is not the same in all regions (especially for master's degrees), it is important to take into account the highest degree obtained,

[4] These variables correspond to means by region and generation. Rates of permanent and executive jobs have been computed using data from the previous generation survey.

but also broad fields of specialization (economics-law, social sciences, sciences, literature, health).

We construct an academic delay variable (which is for us a proxy of age). For education mobility, this delay is defined by an indicator according to whether the person is at least one year late when starting higher education. Academic delay (i.e. older people) could be associated with a stronger attachment to the region of origin and therefore lower mobility rates. Again, the results in the literature are divergent. While age has a negative effect on education mobility, it has no effect on job mobility in Italy (Ciricia, 2014) or Germany (Haussen and Uebelmesser, 2018); it has a positive effect on mobility (both education, job and return) in the USA (Kazakis and Faggian, 2017) and no significant effect in South Korea (Ma, Kang and Kwon, 2017).

Geographical variables
Regional indicators have been introduced as control variables. To explain education migration patterns, we considered the region of origin (the place of residence at the beginning of middle school), and to explain job migration, it is the region of graduation that has been taken into account. The economic literature shows that the probability of being mobile is higher for people who have already achieved education mobility (Faggian et al., 2007; Ciriaci, 2014; Ma, Kang and Kwon, 2017; Haussen and Uebelmesser 2018) or international mobility (Haussen and Uebelmesser 2018), suggesting the importance of some form of mobility experience.

Finally, we construct some macroregional variables to characterize higher education and labor regional markets.

- “rate of Master” which corresponds to the share of Master graduates in the total higher education graduates in a region. It characterizes a relative specialization of a region in producing long-cycle graduates. This variable is used as an explanatory variable of education mobility.
- “rate of permanent jobs” which corresponds to the share of permanent jobs in a region.
- “rate of executive jobs” which corresponds to the share of executive jobs in a region.
- “housing rental costs” which corresponds to the average rental cost per square meter.

These last three variables are used to explain job (and return) migration.

5. Results

Econometric estimations allow us to characterize the determinants of interregional migration patterns (Table 2).

In Table 2, the generation variable shows the reinforcement of education and return migration over time for both short and long cycle graduates. The effect of generation is less clear for job mobility. In fact, if we test the model without the third "return" equation, the generation effect is significantly positive on job mobility with increasing coefficients. But with the trivariate *probit*, it is return mobility that captures the generation effect: it is therefore return mobility, as a configuration of job mobility, that increases significantly over the generations.

The "higher degree" variable does not have the same impact for short cycle graduates as for long cycle graduates. Having a bachelor's degree (Bac+3) rather than a Bac+2 increases both education and job mobility, confirming the traditional labor economics results that a higher degree increases the acceptance of migration to achieve higher human capital return. On the other hand, having a PhD rather than a Master's degree decreases the probability of migration, which is in line with Bernela's (2015, 2017, 2018) findings that age progression implies a

relational and territorial anchoring that limits mobility. Academic delay of three years or more decreases job mobility, which tends to confirm this trend.

Concerning geographical variables, we observe that being from a rural area increases the probability of education and return migration: coming from a low-density area encourages people to leave the region to pursue higher education, with a higher probability of returning after graduation. At the same time, coming from a region with a high level of Master's programs reduces the likelihood of education mobility. Finally, high rates of permanent and executive jobs reduce the probability of leaving the region to find a job. The supply side of education and employment is therefore impacting.

Having non-executive parents decreases the probability of education and job mobility and increases the probability of return mobility when education mobility is observed. This result can be compared to the one obtained by Feinberg (2021) concerning foreign PhD students: PhDs with limited family resources are more likely to return home. International mobility during studies increases the probability of job mobility and diminishes return mobility one. In other words, social capital and migration capital seem to have cumulative effects on mobility behaviour.

To investigate time effects, we have tested interaction between education mobility and generation: education mobility encourages job mobility, and this positive effect is significantly increasing over time. Mobility therefore increases structurally in individual career paths even as the quality of professional integration deteriorates: mobility is therefore not an a priori protection mechanism.

6. Conclusion

Many studies have been made on the interregional migration of University graduates and its impact on job quality in a microeconomic perspective, and on regional development in a macroeconomic perspective. This paper contributes to this literature by investigating the evolving migration patterns of students and graduates by using French survey data over several years. We show that Non-Migrants, although they remain the majority profile, decrease in proportion over the generations. The increase in mobility is partly captured by the huge increase in Return Migrants. A substantial proportion of people tend to return to their home region after completing their education, which suggests that graduates value highly regional familiarity and family ties in migration decisions (Berck *et al.*, 2016; Faggian *et al.*, 2007; Sage *et al.*, 2013).

Understanding the dynamics of migration of highly educated people is important in terms of policy implications both for universities and governments. The high level of Non-Migrant is not a very good signal for attractiveness policies: what is the point of carrying out attractiveness measures if individuals are not mobile? The growth of Return Migrants reinforces this reserve: individuals, including highly qualified individuals, are attracted first and foremost by relational determinants. Policymakers should be interested in retaining students rather than attracting graduates.

Table 1: Construction of sequential migration patterns

Education Mobility	No		Yes		
Job Mobility	No	Yes	No	Yes	
Return Mobility	No				Yes
Migration patterns	Non Migrant	Late Migrant	University Stayer	Repeat Migrant	Return Migrant
Short cycle graduates	66.7%	11.5%	8.3%	5.0%	8.5%
Long cycle graduates	40.7%	12.9%	16.4%	16.3%	13.7%

Source: Céreq data (generational surveys G1998, G2001, G2004, G2007, G2010 and G2013).
The numbers shown in this table are weighted

Table 2. Estimation of the interregional migration patterns (trivariate probit models)

		Short higher education cycle (n=53,453)									Long higher education cycle (n=28,310)								
		Education mobility			Job mobility			Return mobility			Education mobility			Job mobility			Return mobility		
intercept		-1.437	***	0.06	-0.630	***	0.13	-1.210	***	0.29	-0.569	***	0.07	0.355	***	0.19	-1.425	***	0.23
Generation	1998 (ref)																		
	2001	0.126	***	0.02	0.078	**	0.03	0.264	***	0.07	0.136	***	0.03	0.127	***	0.04	0.057		0.08
	2004	0.409	***	0.02	-0.191	***	0.03	0.722	***	0.07	0.355	***	0.02	-0.092	**	0.04	0.509	***	0.06
	2007	0.544	***	0.03	-0.042		0.04	0.651	***	0.08	0.632	***	0.04	0.252	***	0.05	0.411	***	0.07
	2010	0.651	***	0.02	-0.117	**	0.05	0.854	***	0.09	0.555	***	0.03	0.126	**	0.06	0.418	***	0.08
	2013	0.771	***	0.03	0.113	***	0.04	0.830	***	0.08	0.746	***	0.04	0.302	***	0.04	0.335	***	0.08
Gender	Male	0.013		0.01	0.040	***	0.01	0.021		0.03	-0.025		0.02	0.006		0.02	-0.019	***	0.02
Mother	No job	-0.014		0.03	-0.093	***	0.03	-0.095		0.06	-0.045		0.03	-0.031		0.02	0.073		0.05
Labor market	Non-executive	-0.108	***	0.02	-0.072	***	0.02	-0.016		0.04	-0.115	***	0.02	-0.079	**	0.03	-0.006		0.03
	Executive (ref)																		
Born in France	Yes	0.159	***	0.03	0.065	**	0.03	0.005		0.07	-0.089	***	0.04	0.035		0.04	0.065		0.06
Father's	No job	-0.066	**	0.03	-0.109	***	0.03	0.095		0.07	-0.060	*	0.03	-0.075	**	0.04	0.114	**	0.06
Labor market	Non-executive	-0.147	***	0.01	-0.034	**	0.01	0.097	**	0.04	-0.158	***	0.02	-0.076	***	0.02	-0.022		0.03
	Executive (ref)																		
Born in France	Yes	0.124	***	0.03	-0.005		0.03	-0.012		0.06	-0.117	***	0.03	-0.107	***	0.04	-0.014		0.05
Baccalaureate	Economic (ref)																		

	Foreign	0.052		0.06							0.072		0.14							
	Technical	-0.072	***	0.02							0.007		0.03							
	Literature	0.044	**	0.02							0.027		0.03							
	Sciences	0.105	***	0.02							0.167	***	0.02							
Higher degree	Bac+2 or Master (ref)																			
	Bachelor or PhD	0.136	***	0.01	0.094	***	0.01	-0.039		0.04	-0.090	***	0.02	-0.176	***	0.02	-0.364	***	0.03
Rate of master		-0.472	***	0.11							-0.963	***	0.14							
Rate of permanent job£					-1.099	***	0.29	-0.280		0.51				-1.771	***	0.40	0.764		0.53
Rate of executive job£					-1.401	***	0.26	-0.354		0.48				-2.229	***	0.36	1.651	***	0.53
Housing rental costs£					0.006		0.01	0.009		0.02				0.007		0.01	-0.017		0.02
Parents' residence	Rural area	0.106	***	0.02				0.152	***	0.03	0.073	***	0.02				0.073		0.03
Region	Yes																			
Years behind																				
Middle school	Yes	0.065	**	0.03							-0.040		0.05							
Higher education	1 ou 2 years				0.033	**	0.01	-0.063	**	0.03				-0.069	***	0.02	0.003		0.03
	3 years or more				-0.123	***	0.02	-0.025		0.04				-0.249	***	0.03	-0.085	*	0.05
University fields	Economic-law (ref)																			
	Social sciences	0.215	***	0.02	-0.017		0.02	0.281	***	0.05	-0.094	***	0.03	-0.172	***	0.03	0.011		0.05
	Sciences	0.118	***	0.02	0.041	**	0.02	0.123	***	0.04	0.113	***	0.02	0.122	***	0.02	-0.029		0.04
	Literature	0.218	***	0.03	-0.036		0.03	0.041		0.07	-0.049	**	0.04	-0.132	***	0.04	0.132	**	0.07
	Health	0.312	***	0.02	0.097	***	0.02	0.367	***	0.05	-0.087	***	0.04	-0.197	***	0.04	0.066		0.06
Employment during studies: no (ref)																				
	Occasionally				0.045	**	0.02	-0.074	*	0.04				-0.031		0.02	-0.022		0.03
	Regularly				-0.113	***	0.02	-0.097	*	0.05				-0.138	***	0.03	-0.037		0.04
In relationship	Yes				0.039	***	0.01	-0.065	**	0.03				-0.138	***	0.02	-0.051	**	0.02
International mobility during studies	Yes				0.038	*	0.02	-0.079	**	0.04				0.196	***	0.02	-0.083	***	0.03
Education mobility	Yes				1.167	***	0.09							0.675	***	0.08				
Education mobility	1998 (ref)																			
and generation	2001				0.164	***	0.05							-0.077		0.07				
	2004				0.883	***	0.05							0.559	***	0.05				
	2007				0.687	***	0.05							0.616	***	0.06				
	2010				0.722	***	0.05							0.427	***	0.05				
	2013				0.831	***	0.05							0.433	***	0.06				
Correlation	σ_{EJ}				-0.246	***	0.05							0.185	***	0.05				
coefficient	σ_{ER}				0.591	***	0.11							0.708	***	0.10				
	σ_{JR}				0.153		0.11							0.485	***	0.06				

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Appendix

Table 3. Distribution of the population by generation and diploma level

		Short-cycle		**Long-cycle**		
Generation class	Year of survey	**Bac+2**	**Bac+3**	**Bac+5**	**Bac+8**	**Total**
G1998	2001	10409 (46.2%)	6264 (27.8%)	4287 (19.0%)	1566 (7.0%)	22526 (27.6%)
G2001	2004	3480 (45.2%)	1857 (24.1%)	1069 (13.9%)	1300 (16.9%)	7706 (9.4%)
G2004	2007	6536 (44.1%)	2123 (14.3%)	4566 (30.8%)	1609 (10.8%)	14834 (18.1%)
G2007	2010	5232 (43.0%)	2963 (24.3%)	2901 (23.8%)	1075 (8.8%)	12171 (14.9%)
G2010	2013	3616 (24.9%)	5119 (35.3%)	3959 (27.3%)	1827 (12.6%)	14521 (17.8%)
G2013	2016	2761 (27.6%)	3093 (30.9%)	2773 (27.7%)	1378 (13.8%)	10005 (12.2%)
Total		32034 (39.2%)	21419 (26.2%)	19555 (23.9%)	8755 (10.7%)	81763 (100%)

Source: Céreq data (generational surveys G1998, G2001, G2004, G2007, G2010 and G2013). The numbers shown in this table are unweighted.

The likelihood function is defined with the five contributions given in the text.

$$L(\beta_E, \beta_J, \beta_{J'}, \sigma_{EJ}, \sigma_{ER}, \sigma_{RJ}) = \prod_{i=1}^{n} \Phi_2\left(-X_E\beta_E, -X_J\beta_J; \sigma_{EJ}\right)^{(1-E_i)(1-J_i)} \times \Phi_2\left(-X_E\beta_E, X_J\beta_J; -\sigma_{EJ}\right)^{(1-E_i)J_i} \times \Phi_2\left(X_E\beta_E, -X_J\beta_J; -\sigma_{EJ}\right)^{E_i(1-J_i)} \times \Phi_3\left(X_E\beta_E, X_J\beta_J, -X_R\beta_R; \sigma_{EJ}, -\sigma_{ER}, -\sigma_{RJ}\right)^{E_iJ_i(1-R_i)} \times \Phi_3\left(X_E\beta_E, X_J\beta_J, X_R\beta_R; \sigma_{EJ}, \sigma_{ER}, \sigma_{RJ}\right)^{E_iJ_iR_i}$$

n is the number of observations in the sample. E_i, J_i, R_i take the value 1 if the individual i has respectively an education migration, a job migration and a return. They take the value 0 otherwise. The maximum likelihood was obtained using the function *optim* of the R software. The authors would like to thank Batiste Bonnal who, as part of his internship, helped us to program this likelihood.

Table 4. Descriptive statistics

		Short higher graduate cycles						Long higher graduate cycles					
		All	Migration					All	Migration				
			no	stayer	late	repeat	return		no	stayer	late	repeat	return
Sample size		53453	34419	4454	6654	2836	5090	28316	11110	4871	4009	4861	3465
Generation	1998	31.2	34.6	30.6	36.9	16.5	9.3	20.7	25.2	21.5	26.7	12.3	9.6
	2001	10.0	10.6	11.5	10.7	7.1	5.2	8.4	9.8	11.7	8.5	5.0	3.8
	2004	16.2	16.5	13.4	13.2	16.0	20.2	21.8	23.1	19.2	19.4	21.1	25.1
	2007	15.3	14.0	15.3	15.4	20.2	21.8	14.0	11.2	10.7	14.2	19.3	20.3
	2010	16.3	9.3	18.3	13.8	21.7	24.3	20.4	18.3	20.7	18.8	24.3	23.5
	2013	11.0	38.6	10.9	9.8	18.5	19.2	14.7	12.4	16.2	12.5	17.9	17.7
Gender	male	38.3	38.6	34.5	39.2	39.0	37.9	52.1	50.2	52.0	55.6	54.8	51.0
Mother	employee	58.3	60.6	52.7	56.6	51.0	54.4	45.0	48	42.6	46.7	41.5	41.6
Labor market	out of labour force	7.8	8.3	8.8	7.6	5.9	4.7	8.3	9.4	9.3	8.0	6.1	6.9
	executive	33.9	31.1	38.5	35.8	43.1		46.7	42.5	48.1	45.2	52.4	51.5
Born in France	yes	91.7	90.3	93.5	93.6	95.8	94.6	92	89.7	94	92.7	94.7	91.7
father	executive	36.2	33.8	45.1	38.9	46.2	36.3	55.3	51.9	59.1	54.5	59.0	56.6
Labor market	employee	58.1	60.3	47.9	55.9	49.2	59.1	38.8	41.6	34.9	40	36.6	37.1
	out of labour force	5.7	5.9	7.0	5.2	4.2	4.6	5.9	6.5	5.9	5.5	4.4	6.3
Born in France	yes	90.6	89.2	92.7	92.4	94.7	93.5	91.0	88.2	92.9	92.4	94.1	91.2
rural area	yes	22.1	20.0	23.7	23.0	26.0	31.3	16.4	13.0	19	15.9	20.6	17.9
Employed during studies	yes, sometimes	41.4	41.3	42.8	39.7	42.4	42.9	44.4	46.7	44.4	43.1	41.6	42.8
	yes, regularly	12.0	12.9	15.0	11.1	8.2	6.8	13.3	16.8	14.7	10.9	8.7	9.4
Partner	yes	49.0	46.9	57.5	53.1	51.8	48.8	55.7	56	63.2	53.1	53.5	49.9
Academic delay (before higher education)	yes	5.2	5.5	4.8	4.5	4.1	4.4	2.0	2.4	1.8	1.9	1.5	1.6
		30.6	29.4	34.7	33.2	33.4	30.4	29.3	31.3	31.1	27.8	25.6	27.3
		11.7	11.1	19.7	9.1	11.5	12.0	8.2	9.8	10.6	4.6	5.8	6.8
University fields	economics-law	23.4	25.7	18.2	23.7	18.5	35.0	25.5	28.6	21.6	24.8	21.9	27.0
	litterature	6.4	6.1	10.3	6.9	6.5	4.1	5.4	6.4	6.4	4.4	3.2	5.0
	sante	16.7	16.0	17.7	16.7	16.4	20.6	6.2	7.5	7.5	4.8	4.0	5.0
	science	37.6	36.6	33.4	37.0	44.4	45.0	52.0	44.4	53.6	57.6	62.9	52.6
	Social science	15.9	15.5	20.3	15.6	14.2	16.0	10.9	13.1	10.9	8.4	8.1	10.5
International mobility	yes	12.6	11.1	13.6	11.8	19.3	18.6	29,7	16,7	19,4	22,8	29,2	28,3
Higher degree	licence-PhD	40.1	37.2	47.9	43.6	50.4	42.6	30.9	31.0	42.5	32.3	27.8	17.2
	bac+2-Master	59.9	62.8	52.1	56.4	49.6	57.4	69.1	69.0	57.5	67.7	72.2	82.8