DISCUSSION PAPER SERIES

No. 9565

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Magali Beffy, Denis Fougère and Arnaud Maurel

LABOUR ECONOMICS

Centre for Economic Policy Research

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ISSN 0265-8003

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Magali Beffy, INSEE and CREST
Denis Fougère, CNRS, CREST, LIEPP/Sciences Po and DEPP, IZA and CEPR
Arnaud Maurel, Duke University, NBER and IZA

Discussion Paper No. 9565
July 2013

Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820
Email: cepr@cepr.org, Website: www.cepr.org

CEPR Discussion Paper No. 9565

July 2013

ABSTRACT

The Effect of College Employment on Graduation: Evidence from France*

This paper investigates the effect of employment while in college on graduation, using data from the French Labour Force Surveys over the period 1992 to 2002. Using spatial variation in low-skill youth unemployment rates to circumvent the endogeneity of college employment decisions, we find a significant and very large detrimental effect of working while in college on graduation probability. We argue that this may be due to the lack of flexibility of the French university system, which does not offer much complementarity between schooling and in-school employment.

JEL Classification: C35, I20 and J24
Keywords: bivariate probit models, post-secondary educational attainment and students and labour supply

Magali Beffy
CREST-INSEE
15 Boulevard Gabriel Péri
92245 Malakoff Cedex
FRANCE

Email: magali.beffy@insee.fr

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Denis Fougère
CREST-INSEE
15 Boulevard Gabriel Péri
92245 Malakoff Cedex
FRANCE

Email: fougere@ensae.fr

For further Discussion Papers by this author see:
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Arnaud Maurel
Department of Economics
213 Social Sciences
Durham, NC 27708-0097
USA

Email: apm16@duke.edu

For further Discussion Papers by this author see:
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*We thank Peter Arcidiacono, Elise Coudin, Xavier D'Haultfoeuille, Marc Gurgand, Thomas Lemieux, Sabrina Pabilonia, Thomas Piketty, Jean-Baptiste Pomarède, Jean-Marc Robin, and participants in various seminars for helpful discussions and comments.

Submitted 13 July 2013

1 Introduction

The higher education situation in France has been the subject of much debate, covering the effects of the twofold separation between the so-called *Grandes Ecoles* (elite schools) and universities on the one hand, and teaching and research, on the other hand, as well as the scarce resources allocated to higher education.[1] However, one of the most worrisome characteristics of the French higher education system is the especially high non-completion rate. According to the French Ministry of Education (Ministère de l'Enseignement Supérieur et de la Recherche, 2013), 27% of the students enrolled in 2007 in the first year of the Bachelor (*licence*) curriculum obtained a Bachelor degree three years after, and 12% among them needed a supplementary year to get this diploma. In 2012, 44% of this cohort dropped out through the previous five years without getting any post-secondary diploma. An increase in the number of students who work to finance their studies is often mentioned as one of the possible causes of this low graduation rate. According to the report of the French *Conseil Economique et Social* on students' employment (2007), 15% to 20% of students work regularly while studying. This proportion of working students increased quite significantly during the 1990s, rising by 4.4 points between 1990 and 2002, but has flattened out since then.

In this paper, we investigate the effect of employment while in school on graduation from an Associate, Bachelor or Master degree, using data from the French Labour Force Surveys over the period 1992 to 2002. Specifically, we examine the impact on graduation of working during the final year of each of these degrees.[2] Providing additional evidence on the impact of in-school employment on post-secondary educational attainment is

[1]The French higher education system is composed of universities, *grandes écoles*, and specialized schools. Universities are public institutions which offer academic, technical, and professional degrees to any student who has achieved a French *baccalauréat* (the high-school final diploma). University degrees are awarded at three different levels of achievement within a framework referred to as *licence*, master, *doctorat* (L-M-D, corresponding respectively to 3, 4 and 8 years of study after the *baccalauréat*). *Grandes écoles* are prestigious public and private institutions that are highly selective. They are similar to universities but generally offer a more specialized three- course of study, such as business, public administration, or engineering.

[2]In this paper we focus on the short-term effect of college employment on graduation. To the extent that in-school employment is likely to affect the whole process of human capital formation, it would also be interesting to quantify its longer-term impact on graduation. This is an interesting avenue for further research, which would require to follow the individuals for a longer period of time.

especially worthwhile since the vast majority of the literature focuses on the effect of working while enrolled in high school. Paradoxically, although working while studying is more common in college than in high school, little is known about the impact of in-school employment on post-secondary educational attainment. We further contribute to the literature by examining the effect of employment while in school on graduation probability, rather than on grade point average (GPA). Although college or high school GPA have traditionally been the outcomes of interest in this literature, graduation is arguably even more relevant since it ultimately plays a major role on future labour market outcomes such as wages or employment.

The main difficulty in identifying the causal effect of working while studying on academic attainment stems from the potential endogeneity of labour supply. Indeed, the decision to work while in school is likely to be related to unobserved characteristics that are also related to academic attainment. For instance, students who are working may on average have either a lower or a higher unobserved ability or motivation for schooling. In such a case, OLS estimates of the effect of in-school employment would be biased. In order to cope with this issue, we use an instrumental variable strategy. Similarly to Hotz et al. (2002), Dustmann & van Soest (2007) and Montmarquette et al. (2007), we use variation in college employment decisions induced by local low-skill youth unemployment rates (at the level of the *département*, which corresponds roughly to an U.S. county), computed for individuals under 29 with a secondary schooling level. This local unemployment variable is used as a proxy for local labour market conditions which are faced by the students deciding to work while studying. Our identification strategy also exploits the interactions between the local unemployment rate and the father's socio-economic status. The underlying idea for the use of this variation is that the width of the social and professional network of the parents is likely to limit the negative impact of unfavorable economic conditions on the probability of finding a job (see, e.g., Kramarz & Skans, 2007, and Coate, 2013).

In order to estimate the effect of employment while in college on academic attainment, we estimate probit models with two simultaneous equations accounting for working while studying and graduation from an Associate, Bachelor or Master degree. We take the working time into account by making a distinction between jobs in which more or less than 16 hours are worked per week.[3] Using our estimates, we compute

[3]The cutoff is set at 16 hours per week consistently with the existing literature, which suggests that

the average effect of in-school employment on graduation probability, which is further decomposed by major and level of studies. Overall, our results suggest a statistically significant and economically very large detrimental effect of working while studying on graduation probability. Compared to prior evidence available from North American and British data, our estimates point to a particularly strong negative impact of in-school employment on academic achievement. We argue that this finding may be due to the lack of flexibility of the French university system, which does not offer much complementarities between schooling and in-school employment. Our results also highlight the need to take the endogeneity of labour supply into account since simple probit estimates strongly underestimate the detrimental effect of college employment.

The remainder of the paper is organized as follows. Section 2 reviews the empirical literature about the effect of working while in school on academic attainment. Section 3 describes the data and the identification strategy. Section 4 presents the econometric models that are estimated. Section 5 discusses the estimation results and presents some robustness checks, and Section 6 finally concludes.

2 Previous literature

Many studies have been devoted to the situation where work and school are combined, and in particular to the effects of working while studying on academic performance. While most of the literature concludes to the existence of a detrimental effect of working while studying on educational attainment, it is fair to say that there is still no consensus whether holding a job while studying has an economically large, or only a small or even a negligible adverse effect on academic attainment.

A first generation of papers has focused on the relationship between working while studying and educational attainment and primarily examined correlations as well as OLS estimates (see, e.g., Meyer & Wise, 1982; D'Amico, 1984 and Marsh, 1991). However, as the decision to work while studying can be endogenous, simple OLS estimates of the effect of in-school employment on academic attainment are likely to be biased.

working more than a certain number of hours, usually between 10 and 20 hours per week, is especially detrimental to educational attainment. Descriptive evidence from our data suggests that the related break indeed occurs at around 16 hours per week.

The recent literature on the effect of in-school employment on academic attainment revolves around correcting for this selection issue. The majority of these articles use an instrumental variable strategy (see, e.g.,Stinebrickner & Stinebrickner, 2003; Tyler, 2003; Dustmann & van Soest; Montmarquette et al., 2007 and Kalenkoski & Pabilonia, 2010). Several of these papers (see, e.g., Dustmann & van Soest, 2007; Montmarquette et al., 2007 and Kalenkoski & Pabilonia, 2010) assume that local labor market conditions, and in particular local unemployment rates, only affect schooling performances indirectly through in-school employment. We follow a similar strategy in this paper.[4] Another strand of the literature uses fixed-effect and difference-in-differences methods to estimate the effect of working while studying without instrumental variables (see, e.g., Oettinger, 1999; Rothstein, 2007 and Buscha et al., 2012). Finally, Eckstein & Wolpin (1999) estimates a dynamic structural model of high school attendance and work decisions, which is used to estimate the effect of working while studying on schooling achievement.

It is worth noting that most of this literature has focused on the impact of in-school employment in high school on schooling performance. Among the articles mentioned above, Stinebrickner & Stinebrickner (2003) and Kalenkoski & Pabilonia (2010) are the only ones examining the effect of working while in school at the higher education level (both using U.S. data). While both of them conclude to a negative and significant effect of working while studying on grade point averages, the results obtained by Stinebrickner & Stinebrickner (2003) points to a much larger detrimental effect of college employment (0.16 GPA decrease for an increase of 1 hour worked per week, against 0.18 GPA decrease for an increase of 15 hours worked per week).

3 Data and identification strategy

The data we use are extracted from the annual Labour Force Surveys (LFS) conducted each year by the French National Institute of Statistics and Economic Studies (INSEE) from 1992 to 2002. The French LFS is a rotating nationally-representative panel in

[4]Aside from the papers considering the effect of working while studying on academic attainment, several articles focus on its longer-term effects on labour market outcomes (see, e.g., Ruhm, 1997; Light, 1999 and Hotz et al., 2002). Notably, Hotz et al. (2002) also make use of variations in local labor market conditions to identify the effect of in-school employment.

which households are surveyed for three consecutive years. Our sample is built as follows: for any year t ranging between 1992 and 2001, we select students belonging to households interviewed for the first time, who were enrolled (at the time of the survey, i.e. in March) in university studies for initial education, and in the final year of an Associate, a Bachelor or a Master degree. Only students who also answered the survey in year $t + 1$ were kept. We also restrict our sample to those who were younger than 29 in year t and who were born in mainland France. Furthermore, we exclude students following a course combining work and studies: this category comprises apprentices under contract as well as medical interns. We are finally left with a sample of 1,603 students.[5] [6]

The employment variable we choose corresponds to the individual situation with respect to the labour force at the date of the survey, as defined by the International Labour Organization. We allow the probability to work while studying to depend on the level of studies currently followed and on the field of studies, two dummy variables taking the value 1 (0 otherwise) when the student's age is either one year or at least two years above the usual age in the schooling level under consideration (this usual age being 20 years old or younger for an Associate degree, 21 years old or younger for a Bachelor degree, and 22 years old or younger for a Master degree), dummies for gender, matrimonial status, a dummy for residence in the Paris region, the number of individuals and the presence of children aged 18 or younger in the household.[7] Finally, we also control for year fixed-effects. This allows us to control for potential changes in composition over time, which may act as confounders when estimating the effect of in-school employment on graduation.

We make use of instrumental variables that are supposed to affect the graduation probability only through their effects on in-school employment. Similarly to Hotz

[5]Note that this sample does not provide findings concerning students who changed their residence between years t and $t+1$ since the LFS samples housing units and not individuals. Similarly, our results cannot be generalized to students who are not following a university curriculum.

[6]Detailed descriptive statistics are omitted from the paper for brevity. They are available from the authors upon request.

[7]In fact, the dummy for residence in the Paris region, the number of individuals and the presence of children aged 18 or younger in the household, do not have a statistically significant effect on the graduation probability, but they do have one on the propensity to work while in school. These variables are excluded from the graduation equation, but are introduced into the employment equation. As such, they contribute to the overidentification of our models and help increase the efficiency of our estimators.

et al. (2002), Dustmann & van Soest (2007) and Montmarquette et al. (2007), our identification strategy primarily uses variation in college employment induced by the unemployment rate in the *département* for low-skill individuals aged 15 to 29.[8] This local low-skill youth unemployment rate variable is assumed to affect graduation only indirectly through college employment. We discuss below and in Section 5 the validity of this exclusion restriction.

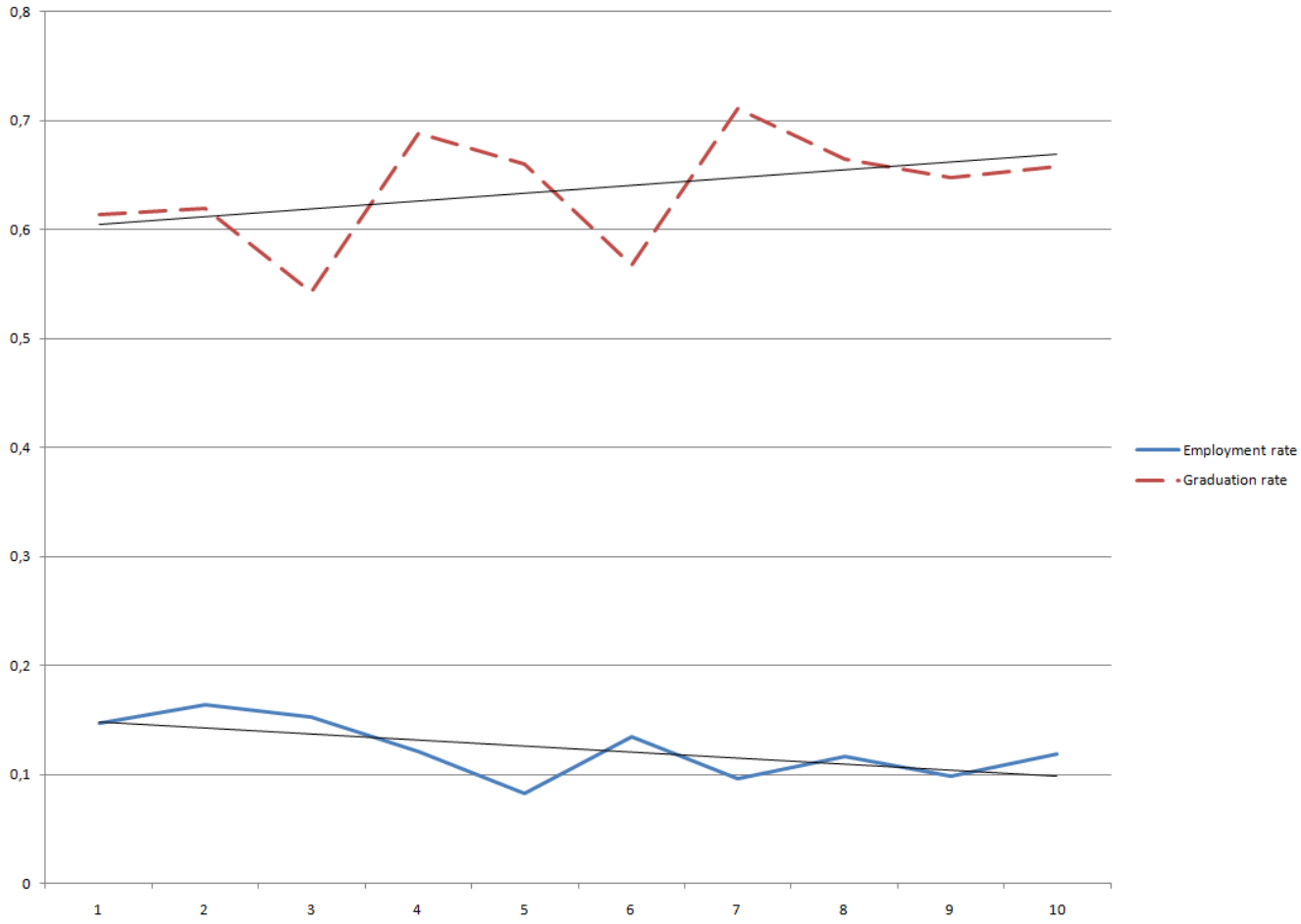
Our identification strategy also exploits the interactions between local low-skill youth unemployment rate and the father's social status.[9] Along with the father's social status itself, we assume that this interaction may only affect graduation indirectly through the effect on in-school employment. Although some empirical evidence suggests that the parental socio-economic status has an impact on primary and secondary schooling attainment, there is no clear reason why the father's socio-economic status should still have a direct effect on academic performance at the higher education level. We discuss further in Section 5 the validity of these exclusion restrictions, with robustness checks making use of the fact that we are in an overidentified setting. Overall, our main results are not sensitive to these additional exclusion restrictions, which help increase the precision of the estimation.

The unemployment rate of low-skill youth in the *département* is an indicator of the problems faced by students deciding to work while studying. Indeed, working students are often employed in low-skill jobs, notably in retail trade and the hotel-catering sector. Hence, when the local unemployment rate of low-skill youth is high, these jobs in services will be less frequent, which will in turn lower the probability to work while studying. Figure 1 below reports the relationships between the deciles of the local low-skill youth unemployment rate and the college employment rates observed in the sample, and between these deciles and the graduation rates.

[8] Low-skill youth corresponds to individuals with a high-school educational level. For all individuals in the sample, this local unemployment variable was computed from the 1990 and 1999 French Censuses as the average of the local unemployment rates in years 1990 and 1999. We use the spatial variation in local unemployment rate to identify the effect of college employment on graduation.

[9] This variable is binary. The first value corresponds to the highest socio-economic status, which includes managers of companies with 10 employees or more, professionals, administrative and business managers of companies, as well as engineers and technical managers of companies. The second category includes all other socio-economic status, in particular intermediate occupations, blue-collar and white-collar workers.

Figure 1: College employment and graduation rates at each decile of the distribution of the local low-skill youth unemployment rate



From a descriptive point of view, this figure suggests that there exists indeed a slightly negative relationship between the local unemployment rate for low-skill workers under 29 and the students' employment rate, which is consistent with the discussion above.[10] As shown in the sequel, this negative relationship, which is characterized here by a correlation coefficient which is statistically significant at the 10% level only, is actually strengthened when controlling for other characteristics affecting the probability to hold a job. Conversely, there is no clear reason why the local unemployment rate

[10]The deciles of the local unemployment rate for low-skill workers under 29, averaged over the period 1990-1999, are equal to 16.2%, 17.3%, 18%, 19.9%, 20.7%, 21.5%, 23.6%, 25.4%, 28.7% and 32.7%.

of low-skill job seekers should have any direct effect on graduation probability.[11] In particular, it is important to recall that our sample is restricted to those who are enrolled in the final year of their degree at the time of the survey (in March). Therefore, even though local labor market conditions may affect the decision to dropout from college, and ultimately graduation, it seems quite unlikely that this would happen so late in the academic year. Nevertheless, a potential concern about the validity of this instrument could be that students living in *départements* where the local unemployment rate is higher tend to have a higher motivation for academic achievement. This would be consistent with college degrees being more valuable when unemployment rates are high (see, e.g., Hoynes et al., 2012, for the case of the Great Recession). In such a case, our identification strategy could lead to overestimate the detrimental effect of holding a job on academic achievement. We address this concern in Section 5 by including a proxy for students' motivation for schooling in the set of regressors. Our results are robust to this augmented specification. Figure 1 illustrates the indirect positive relationship between the local low-skill unemployment rate and the graduation rate: when the local low-skill unemployment rate increases, the probability of working when studying decreases and, since the graduation probability increases when the student is not working, the graduation rate is expected to increase with the local low-skill unemployment rate.

Furthermore, the father's socio-economic status is likely to be correlated with the parental income, which is not observed in the data. Students whose father has a higher social status are more likely to work less often to finance their studies, because of the higher level of financial support they can benefit from. Several studies have also shown that the socio-economic status of parents, an indirect measure of their income but also of the width of their network of social relationships, facilitates the access of youth to jobs, in particular when unemployment is high (see, in particular, Kramarz & Skans, 2007). This is why we introduce an interaction between the socio-economic status of the student's father and the local unemployment rate of low-skill youth, as the detrimental effect of the unemployment rate could be lower for students whose father has a higher

[11]This hypothesis, and the exclusion restriction it results in are standard in the literature and used, among others, by Dustmann & van Soest (2007) and Montmarquette et al. (2007). The latter also use changes in the level of the real minimum wage to identify the effect of combining working and studying on schooling achievement. Probably due to its relatively small fluctuations in France during the period of interest, the level of the real hourly minimum wage is found here to have no significant effect on the probability of working while studying.

socio-economic status.

The sample is composed of 1,603 individuals, 202 of whom work while studying. The graduation rate stands at 63.4% in the whole sample, while it is equal to 66% for students who do not work and 45.5% only for working students. Among the 202 students who hold a job, 86 students work less than 16 hours per week and 116 work 16 hours or more. The average graduation rate stands at 55.8% for students who work less than 16 hours per week, and 37.9% for those who work 16 hours or more, respectively.[12]

Table 1: Descriptive statistics (percentages)

	Proportion	Graduation
Working students (16 hours or more)	7.2	37.9
Working students (less than 16 hours)	5.4	55.8
Non working students	87.4	66
Total	100	63.4

4 The econometric models

In order to estimate the effect of working while studying on graduation, we first use a bivariate probit model with structural shift (Heckman, 1978) and subsequently a model that takes into account the number of hours worked per week.

4.1 A bivariate probit model

We first estimate a probit model with two equations. The first equation accounts for working while studying, while the second one accounts for graduation.

The student works while studying (in which case $Y_1 = 1$, $Y_1 = 0$ otherwise) if the latent variable Y_1^*, defined by the equation $Y_1^* = X_1\beta_1 + \varepsilon_1$, is positive. This

[12]The number of hours worked corresponds to the usual number of hours of work per week. For students who state they do not have a fixed working time, we use the number of hours worked in the week prior to the interview.

latent variable can be interpreted as the individual willingness to combine working and studying. It depends on a set of individual characteristics X_1 and on a random term ε_1, which is supposed to follow a standard normal distribution $\mathcal{N}(0,1)$.

Graduation is supposed to be determined by a latent variable Y_2^* that is positive if the student graduates at the end of the academic year (in this case, $Y_2 = 1$), negative otherwise (in which case $Y_2 = 0$). This individual propensity to graduate, that can be interpreted as the difference between the individual score and the score corresponding to the average of grades ensuring the student graduates, is defined by a linear equation $Y_2^* = Y_1\beta_{20} + X_2\beta_{21} + \varepsilon_2$. This propensity is therefore supposed to depend first on the dummy variable for in-school employment (Y_1), which is a potentially endogenous variable, but also on a vector X_2 of individual characteristics, such as the college major, gender, etc. The random term ε_2 is similarly supposed to follow a normal standard distribution $\mathcal{N}(0,1)$, and may be correlated with the residual ε_1 of the graduation equation.

Specifically, we denote by σ_{12} the correlation coefficient between the residuals. $(\varepsilon_1, \varepsilon_2)$ follows a normal bivariate distribution $\mathcal{N}(0,\Sigma)$ whose covariance matrix Σ is equal to:[13]

$$\Sigma = \begin{pmatrix} 1 & \sigma_{12} \\ \sigma_{12} & 1 \end{pmatrix} \tag{4.1}$$

Note that if σ_{12} is equal to zero, then the dummy variable for in-school employment Y_1 is exogenous in the graduation equation, and the maximum likelihood estimation of this single equation yields consistent estimates of parameters $\beta_2 = (\beta_{20}, \beta_{21})'$. Otherwise, Y_1 is endogenous and the separate estimation of the graduation equation yields biased estimates of β_2. The two equations then have to be simultaneously estimated.

4.2 A model accounting for the number of working hours

The second model extends the analysis by considering the number of hours worked each week. The first equation of the model now determines a variable Y_1 that takes three values, depending on whether the student does not work ($Y_1 = 0$), works less than 16 hours per week ($Y_1 = 1$), or works 16 hours or more per week ($Y_1 = 2$). The second

[13] Probit models are identified up to a scaling factor, hence the normalization of the variance of residuals.

equation still accounts for graduation. However, the working time Y_1 is now included in the list of explanatory variables of graduation with two dummy variables, according to whether working time is positive, but below or above 16 hours per week. The residuals of the two equations are still potentially correlated, in order to account for the potential endogeneity of in-school labour supply.

College employment is now modeled with an ordered probit specification of the following form:

$$\forall k \in \{0,1,2\}, \quad Y_1 = k \Leftrightarrow s_k < Y_1^* = X_1\beta_1 + \varepsilon_1 \leq s_{k+1}$$

where Y_1^* refers to the individual willingness to work and Y_1 is a discrete variable taking three values that describe the amount of the student's working time. We denote hereafter Y_1^1 and Y_1^2 the dummy variables for working respectively less or more than 16 hours per week. When the willingness to work is low, i.e. when it is formally lower than the threshold s_1 ($s_0 = -\infty < Y_1^* \leq s_1$), the student does not work, and in this case $Y_1 = 0$. When this willingness reaches an intermediate level, i.e. when its value ranges between the thresholds s_1 and s_2 ($s_1 < Y_1^* \leq s_2$), the student works less than 16 hours per week, and in this case $Y_1 = 1$. Finally, when the individual willingness to work is higher than the threshold s_2 ($s_2 < Y_1^* < s_3 = +\infty$), the student works 16 hours or more per week, and in this case $Y_1 = 2$. The thresholds s_1 and s_2 are unknown and have to be estimated. In order to identify the model, we normalize the intercept to zero and the variance of the residual ε_1 to one.[14]

Graduation is denoted as above by the binary variable Y_2, whose realization (1 if the student graduates by the end of the year, 0 otherwise) is generated by the value of the latent propensity $Y_2^* = Y_1^1\beta_{20}^1 + Y_1^2\beta_{20}^2 + X_2\beta_{21} + \varepsilon_2$, where ε_1 and ε_2 follow a standard bivariate distribution $\mathcal{N}(0,\Sigma)$.

4.3 The average effect of college employment on graduation probability

Parameter estimates of the bivariate probit model enable us to quantify the average effect of working while in school on graduation, while those of the model with a variable

[14] An alternative specification, that would be more demanding in terms of identification conditions, would consist in adding an equation accounting for in-school employment (extensive margin), with the third equation accounting for graduation and the second one for the number of hours worked (intensive margin).

working time allow us to make this effect varying with the number of hours worked per week. Let us denote by Y_2^k the potential graduation status when $Y_1 = k$. For students with characteristics X who hold a job, the average effect of working while studying on graduation is equal to:

$$\Delta_{TT}^{1}(X) = E(Y_2^1 \mid Y_1 = 1, X) - E(Y_2^0 \mid Y_1 = 1, X) \tag{4.2}$$

This effect corresponds to the (conditional) treatment effect on the treated, the treatment being here working while studying. In the model with a varying working time, the effect on graduation of working less than 16 hours per week, conditional on observable characteristics X and on working less than 16 hours per week, is:

$$\Delta_{TT}^{2}(X) = E(Y_2^1 \mid Y_1 = 1, X) - E(Y_2^0 \mid Y_1 = 1, X) \tag{4.3}$$

Finally, the average effect on graduation of working 16 hours or more per week is:

$$\Delta_{TT}^{3}(X) = E(Y_2^2 \mid Y_1 = 2, X) - E(Y_2^0 \mid Y_1 = 2, X) \tag{4.4}$$

In order to estimate those average effects for students who work, unconditional on their characteristics X, we compute the empirical means of the conditional effects, denoted $\widehat{\Delta}_{TT}^{j}(X_i)$ for $j = 1, 2, 3$ and $i = 1, ..., n$. We further detail our analysis by estimating the average effect of working on graduation across various subgroups of students, according to the major or level of studies.[15]

5 Results

5.1 Parameter estimates

We first report the parameter estimates of the single-equation probit model for graduation. This univariate model does not address the issue of the endogeneity of college employment. Tables 2 and 3 below present the effect of working while studying and the effects of working more or less than 16 hours per week, respectively. On average, working while in college significantly decreases the graduation probability (Table 2).

[15] Similarly, we estimate the effect of working on graduation probability for students who do not work, that is the treatment effect on the untreated.

Taking into account the number of hours worked actually suggests that this detrimental effect is only significant for intensive employment, with 16 hours or more worked per week (Table 3). Nevertheless, as already mentioned, not taking into account the potential endogeneity of in-school employment is likely to bias these initial estimates. Hereafter, we will therefore focus on the simultaneous estimate of college employment and graduation equations.

Table 2: The effect of college employment on graduation probability (single-equation probit model)

Covariates	Estimates	St.errors
Intercept	0.718^{***}	0.090
College employment	-0.353^{***}	0.110
Educational level		
Associate degree	-0.760^{***}	0.213
Bachelor degree	*Ref.*	*Ref.*
Master degree	-0.183^{**}	0.071
Major		
Sciences	-0.063	0.087
Law, humanities and social sciences	*Ref.*	*Ref.*
Management and trade	-0.355^{***}	0.085
Other majors	-0.177	0.159
Age above the usual age in the grade		
Usual age	*Ref.*	*Ref.*
One year above	-0.219^{***}	0.085
Two years above or more	-0.380^{***}	0.080
Male	0.035	0.070
Married	-0.219	0.220

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%). Year dummies are also included in the estimation.

Table 3: The effect of hours worked on graduation probability (single-equation probit model)

Covariates	Estimates	St.errors
Intercept	0.714^{***}	0.090
College employment		
Non-working	*Ref.*	*Ref.*
Less than 16 hours per week	-0.158	0.146
16 hours or more per week	-0.538^{***}	0.143
Educational level		
Associate degree	-0.765^{***}	0.214
Bachelor degree	*Ref.*	*Ref.*
Master degree	-0.181^{**}	0.071
Major		
Sciences	-0.067	0.087
Law, humanities and social sciences	*Ref.*	*Ref.*
Management and trade	-0.358^{***}	0.086
Other majors	-0.121	0.162
Age above the usual age in the grade		
Usual age	*Ref.*	*Ref.*
One year above	-0.217^{**}	0.085
Two years above or more	-0.372^{***}	0.080
Male	0.034	0.07
Married	-0.216	0.22

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%). Year dummies are also included in the estimation.

Estimation results for the simultaneous two-equation model are reported in Tables 4 (employment equation) and 5 (graduation equation) below. The parameters of the two equations of the model with a varying working time are reported in Tables 6 (employment equation) and 7 (graduation equation).

Once allowing for a non-zero correlation between the residuals of the employment and graduation equations, it appears that working has a large negative and statistically significant (at the 1% level) effect on graduation probability (Table 5). This effect is in fact much stronger for students who work 16 hours or more per week than for those who work less than 16 hours per week (Table 7). The correlation coefficient between the residuals of the two equations is positive, statistically significant at the 1% level and quite large in the two models.

These results imply that working while studying is indeed endogenous. Thus, simple probit estimates reported in Tables 2 and 3 are biased. Furthermore, our results point to the existence of a positive selection effect associated with college employment. This may be due to the fact that, on average, students working while studying are actually more motivated than the others, both from an academic and a professional point of view. Noteworthy, in our case, those naive single-equation specifications severely underestimate the detrimental effect of working on graduation probability.[16]

Besides, our results suggest that the probability of working while studying is significantly lower for students whose father has a higher socio-economic status.[17] The magnitude of the corresponding coefficient (-1.953) is notably high. It is in fact the highest estimated coefficient (in absolute value) in the employment equation, which means that the social status of the student's parents is one of the main determinants of holding a job while studying. As expected, the probability of working while studying is also lower (at the 5% level) when the local unemployment rate of low-skill youth is higher. In this case, however, students with a higher socio-economic background have

[16] Using U.S. data, Tyler (2003), at the high-school level, and Stinebrickner & Stinebrickner (2003) and Kalenkoski & Pabilonia (2010), at the college level, also find positive selection effects associated with in-school employment.

[17] We also estimated an alternative specification of the employment equation, including a more detailed father's socio-economic status variable making a distinction between intermediate occupations, blue-collar and white-collar workers. The only significant coefficient was that of the higher socio-economic status defined above, thus suggesting that restricting to a binary socio-economic status variable is relevant in our context.

a significantly higher probability of finding a job. Moreover, the probability of working while studying is higher for students who are preparing a Master degree, as well as for those who have accumulated more than two years of school delay (see Table 4).[18] It is also much higher for students who are in majors other than Science, Social Sciences, Law and Arts, and Management,[19] as well as, to a lesser extent, for those who are married. However, it is lower for students who live in households with three persons or more. Finally, the employment probability is affected neither by the student's gender, nor by the number of children under 18 in the household. *Ceteris paribus*, students living in Paris have the same employment probability than those living outside Paris. These overall findings are similar when accounting for the number of hours worked (see Table 6).

Finally, graduation rates are significantly lower in the second year of an Associate degree, as well as in Management and Trade, and for students who have accumulated some delay in education (cf. Tables 5 and 7). A noteworthy point is that the negative effect of studying in the second year of an Associate degree, in comparison with a Bachelor degree, is quantitatively fairly strong. This finding is consistent with the high dropout rate prevailing in France in the very first years of university studies.

[18]However, students who are one year above the usual age in the grade are not more likely to work than those who have the usual age in the grade.

[19]These majors, in which courses are more oriented towards the labour market, concern 5.93% of our sample and consist in multi-technology majors (namely Civil Engineering, Mechanics and Electricity). See Beffy et al. (2012), who examine the determinants of the major choice in the French post-secondary system.

Table 4: The bivariate probit model: determinants of college employment

Covariates	Estimates	St.errors
Intercept	-0.787^{***}	0.283
Father's socio-economic status		
Higher	-1.953^{***}	0.590
Lower or intermediate	*Ref.*	*Ref.*
Local unskilled unemployment rate for the individuals aged 15 to 29	-0.025^{**}	0.011
Father's higher social status $\times$ unemployment rate	0.071^{***}	0.027
Educational level		
Associate degree	0.051	0.335
Bachelor degree	*Ref.*	*Ref.*
Master degree	0.34^{***}	0.097
Major		
Sciences	-0.161	0.136
Law, humanities and social sciences	*Ref.*	*Ref.*
Management and trade	0.145	0.118
Other majors	1.664^{***}	0.162
Age above the usual age in the grade		
Usual age	*Ref.*	*Ref.*
One year above	0.110	0.127
Two years above or more	0.551^{***}	0.108
Male	0.073	0.098
Children under 18 in the household	-0.048	0.153
Married	0.446^{*}	0.256
Three and more persons in the household	-0.437^{***}	0.103
Paris region	0.124	0.124

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%). Year dummies are also included in the estimation.

Table 5: The bivariate probit model: the effect of college employment on graduation probability

Covariates	Estimates	St.errors
Intercept	0.746^{***}	0.088
College employment	-1.384^{***}	0.274
Educational level		
Associate degree	-0.738^{***}	0.211
Bachelor degree	*Ref.*	*Ref.*
Master degree	-0.116	0.072
Major		
Sciences	-0.078	0.085
Law, humanities and social sciences	*Ref.*	*Ref.*
Management and trade	-0.312^{***}	0.085
Other majors	0.432^{*}	0.221
Age above the usual age in the grade		
Usual age	*Ref.*	*Ref.*
One year above	-0.193^{**}	0.084
Two years above or more	-0.243^{***}	0.087
Male	0.035	0.068
Married	-0.091	0.216
σ_{12}	0.582^{***}	0.148

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%). Year dummies are also included in the estimation.

Table 6: The two-equation model with varying working-time: determinants of the number of hours worked

Covariates	Estimates	St. errors
s_2	0.786^{***}	0.273
s_3	1.216^{***}	0.275
Father's social status		
Higher	-1.849^{***}	0.570
Lower or intermediate	*Ref.*	*Ref.*
Local unskilled unemployment rate for the individuals aged 15 to 29	-0.026^{**}	0.011
Father's higher social status × unemployment rate	0.067^{***}	0.026
Associate degree	0.032	0.331
Bachelor degree	*Ref.*	*Ref.*
Master degree	0.343^{***}	0.093
Sciences	−0.191	0.135
Law, humanities and social sciences	*Ref.*	*Ref.*
Management and trade	0.127	0.116
Other majors	1.574^{***}	0.147
Age above the usual age in the grade		
Usual age	*Ref.*	*Ref.*
One year above	0.120	0.124
Two years above or more	0.572^{***}	0.105
Male	0.081	0.095
Children under 18 in the household	−0.009	0.149
Married	0.361	0.238
Three and more persons in the household	-0.462^{***}	0.100
Paris region	0.101	0.120

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%). Year dummies are also included in the estimation.

Table 7: The two-equation model with varying working-time: the effect of hours worked on graduation probability

Covariates	Estimates	St.errors
Intercept	0.739^{***}	0.090
College employment		
Non-working	*Ref.*	*Ref.*
Less than 16 hours per week	-0.833^{***}	0.254
16 hours or more per week	-1.478^{***}	0.318
Educational level		
Associate degree	-0.758^{***}	0.212
Bachelor degree	*Ref.*	*Ref.*
Master degree	-0.128^{*}	0.072
Major		
Sciences	-0.083	0.086
Law, humanities and social sciences	*Ref.*	*Ref.*
Management and trade	-0.328^{***}	0.085
Other majors	0.396^{*}	0.230
Age above the usual age in the grade		
Usual age	*Ref.*	*Ref.*
One year above	-0.196^{**}	0.084
Two years above or more	-0.259^{***}	0.088
Male	0.033	0.068
Married	-0.115	0.218
σ_{12}	0.454^{***}	0.150

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%). Year dummies are also included in the estimation.

5.2 The effect of college employment on graduation probability

Estimation results for the bivariate probit model can be used to compute, for each of the students who work, their probability of graduating if they would not work. The actual graduation probability in the case of working and the counterfactual probability that would prevail if they would not work are then compared. The differences between these two probabilities are reported in Table 8, first for the whole sample, then separately for each major and for each level of education.[20]

Using the estimates of the the first bivariate probit model, we find that working while studying has a significant and very large detrimental effect on graduation probability, whatever the major and the level of studies are.[21] If they would not work, working students would have a graduation probability higher by slightly less than 43 points (Table 8). Given the endogeneity of in-school employment (and the non-linearity of the model), the effect of working while studying is not necessarily the same when it is estimated for working and non-working students. Thus, we also estimate the effect of working while studying for students who do not hold a job (Table 9). We find similar results: on average, holding a job would lower their graduation probability by about 47 points. Interestingly, these estimates are especially strong relative to prior empirical evidence on the effect of working while studying on academic achievement. This may stem from the fact that, as compared in particular with the U.S. post-secondary educational system, most of French university courses are more theoretical and less vocationally oriented, and are therefore less subject to complementarities between schooling and in-school employment. Moreover, evening classes and continuous assessment all over the academic year, which are more suitable for working students, are very unfrequent in French universities (see Aghion & Cohen, 2004).

Using the estimation results of the second model with a varying working time, we also compute, for students working more or less than 16 hours per week, the counterfactual graduation probabilities in the case where they would not work. Table 10 shows that the estimated effect of working is very sensitive to the number of hours worked, a

[20]Note that the average effect of working while studying depends on individual characteristics *via* the non-linearity of the models. Thus, the heterogeneity of average effects according to majors reflects both a composition effect and a major effect.

[21]The standard deviations are computed by bootstrap, with 500 replications.

result in line with the existing empirical evidence. On the one hand, working 16 hours or more per week has a very significantly negative effect (on average close to 48 points) on the probability of graduating. On the other hand, the effect of working less than 16 hours per week is much smaller, and only significant at the 10% level for those holding a job (about 28 points). This suggests that a substantial volume of hours worked per week steeply reduces the time devoted to studies as well as, potentially, students' attendance, and as a result has a negative effect on graduation probability. By contrast, holding a job that requires a low number of hours worked (in this case less than 16 hours per week) seems to limit these negative substitution effects. Table 11 reports similar results for the subsample of students who do not work.

Table 8: Average effect of college employment on graduation probability (subsample of working students), bivariate probit model

Effect on graduation probability (percentage points)	*Estimate*	*St. error*
Working students	-42.6^{***}	14.9
Major		
Sciences	-35.8^{**}	17.0
Law, humanities and social sciences	-38.6^{**}	16.4
Management and trade	-46.3^{***}	13.8
Other majors	-46.7^{***}	13.8
Educational level		
Associate degree	-45.9^{***}	12.9
Bachelor degree	-41.0^{***}	15.0
Master degree	-44.5^{***}	14.9

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%).

Table 9: Average effect of college employment on graduation probability (subsample of non-working students), bivariate probit model

Effect on graduation probability (percentage points)	*Estimate*	*St. error*
Non-working students	-47.1^{***}	9.22
Major		
Sciences	-47.8^{***}	9.71
Law, humanities and social sciences	-48.3^{***}	9.72
Management and trade	-43.2^{***}	7.84
Other majors	-46.0^{***}	10.4
Educational level		
Associate degree	-34.0^{***}	8.04
Bachelor degree	-48.1^{***}	9.65
Master degree	-45.8^{***}	8.76

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%).

Table 10: Average effect of hours worked on graduation probability (subsample of working students), model with a varying working time

Effect on graduation probability (percentage points)	*Estimate*	*St. error*
Less than 16 hours per week		
Average effect	-27.6^{*}	16.3
Major		
Sciences	-26.3	17.0
Law, humanities and social sciences	-26.0	16.6
Management and trade	-29.1^{*}	15.9
Other majors	-30.0^{*}	16.6
Educational level		
Associate degree	-27.3^{*}	15.0
Bachelor degree	-26.7	16.4
Master degree	-28.8^{*}	16.4
16 hours or more per week		
Average effect	-47.5^{***}	9.86
Major		
Sciences	-38.7^{***}	13.9
Law, humanities and social sciences	-44.6^{***}	11.7
Management and trade	-49.1^{***}	8.99
Other majors	-50.1^{***}	9.03
Educational level		
Associate degree	-45.1^{***}	12.1
Bachelor degree	-46.9^{***}	9.98
Master degree	-48.3^{***}	9.97

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%).

Table 11: Average effect of hours worked on graduation probability (subsample of non-working students), model with a varying working time

Effect on graduation probability (percentage points)	*Estimate*	*St. error*
Less than 16 hours per week		
Average effect	-28.3^{**}	14.4
Major		
Sciences	-28.3^{*}	14.6
Law, humanities and social sciences	-28.7^{*}	14.8
Management and trade	-27.1^{**}	13.3
Other majors	-27.8^{*}	14.5
Educational level		
Associate degree	-22.4^{**}	11.2
Bachelor degree	-28.6^{*}	14.7
Master degree	-28.0^{**}	14.1
16 hours or more per week		
Average effect	-48.2^{***}	6.35
Major		
Sciences	-48.6^{***}	6.59
Law, humanities and social sciences	-49.6^{***}	6.32
Management and trade	-44.1^{***}	7.05
Other majors	-48.3^{***}	7.18
Educational level		
Associate degree	-34.6^{***}	8.63
Bachelor degree	-49.2^{***}	6.30
Master degree	-47.0^{***}	6.79

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%).

5.3 Robustness checks

In order to assess the validity as an instrument of the local unemployment rate for low-skill workers under 29, we run additional estimations accounting for schooling motivation. More precisely, we include in the set of regressors a variable which corresponds to the average, in each *département*, of the level of post-secondary education (in terms of years after high-school, ranging between 1 and 5) that the students want to reach when entering post-secondary education. This variable, that we refer to in the following as the *average local educational aspiration*, was computed from the *Panel 1989* dataset (DEPP, French Ministry of Education).[22] The parameter estimates are reported in Tables 12 and 13 in the Appendix. Overall, our main results are robust to this alternative specification. In particular, in the employment equation, the parameters relative to the local unemployment rate and its interaction with the father's socio-economic status are quite stable. Similarly, parameter estimates for the graduation equation, including the one associated with the in-school employment effect, are robust to this alternative specification. Note also that the parameters relative to the aspiration variable are significant, respectively at the 10% and at the 1% level for the employment and the graduation equation, thus suggesting that motivation for schooling does matter. Interestingly, the parameter associated with the aspiration variable shows up positive for the employment equation, a result in line with the positive selection effect which was previously discussed.

Similarly, one could also argue that the father's socio-economic status has an effect on academic achievement beyond its effect on in-school employment, and this would be an argument against excluding it from the graduation equation. Nonetheless, the data appear to reject this hypothesis. Specifically, when we run the estimations without excluding the father's socio-economic status from the graduation equation, the hypothesis that there is no effect due to the father's socio-economic background on graduation cannot be rejected at the 10% level, with the corresponding coefficient being estimated to be economically very small (point estimate equal to 0.001 only). Consistently with this negligible effect, our results are robust to the inclusion of the father's socio-economic

[22] This longitudinal dataset surveys individuals entering the 6^{th} grade in 1989, and who are enrolled in a French junior high-school at that date.

status in the graduation equation.[23]

6 Conclusion

This paper contributes to the scarce literature dealing with the effect of working while studying on post-secondary educational attainment. We quantify the effect of employment while in school on graduation from an Associate, Bachelor or Master degree, using data from a French nationally-representative survey over the period 1992 to 2002. Unlike previous papers in this literature, we focus on the effect of in-school employment on graduation probability rather than GPA, this outcome being arguably more relevant in terms of future labour market outcomes. The findings reported in this article suggest that working while studying significantly reduces the graduation probability. Our estimates show that this detrimental effect is actually economically very large, with the average graduation probability of working students being about 43 points higher if they would not work. We also find that the effect depends on the number of hours worked. Working 16 hours or more per week has a negative, and quantitatively very strong effect (on average of about 48 points) on the probability of graduating. Conversely, the effect of working is much smaller when the student works less than 16 hours per week. From a policy standpoint, taxation reforms giving students an incentive to increase the number of hours worked, which have recently been discussed in France, might therefore have a perverse effect by indirectly leading to a rise in the rate of failure at university exams. The problem is all the more acute as our results suggest that the detrimental effect of in-school employment on educational attainment is especially strong in the French university system, in which evening classes and continuous assessment of students are quite uncommon.

[23]Detailed results for this specification are available upon request.

7 Appendix: additional estimates

Table 12: A bivariate probit model accounting for educational aspiration: the determinants of college employment

Covariates	Estimates	St.errors
Intercept	-0.185^{***}	0.635
Father's socio-economic status		
Higher	-1.934^{***}	0.590
Lower or intermediate	*Ref.*	*Ref.*
Local unskilled unemployment rate for the individuals aged 15 to 29	-0.024^{**}	0.011
Father's higher social status $\times$ unemployment rate	0.071^{***}	0.027
Educational level		
Associate degree	0.06	0.334
Bachelor degree	*Ref.*	*Ref.*
Master degree	0.345^{***}	0.097
Major		
Sciences	-0.167	0.136
Law, humanities and social sciences	*Ref.*	*Ref.*
Management and trade	0.140	0.118
Other majors	1.664^{***}	0.162
Age above the usual age in the grade		
Usual age	*Ref.*	*Ref.*
One year above	0.102	0.128
Two years above or more	0.557^{***}	0.108
Male	0.083	0.099
Children under 18 in the household	-0.054	0.153
Married	0.449^{*}	0.257
Three persons and more in the household	-0.462^{***}	0.104
Paris region	0.324^{**}	0.163
Average local educational aspiration	0.460^{*}	0.245

Source : French Labour Force Surveys, from 1992 to 2002 (INSEE, Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%). Year-specific dummies are also included in the estimation.

Table 13: A bivariate probit model accounting for educational aspiration: the effect of college employment on graduation probability

Covariates	Estimates	St.errors
Intercept	-0.008	0.284
College employment	-1.377^{***}	0.275
Educational level		
Associate degree	-0.700^{***}	0.212
Bachelor degree	*Ref.*	*Ref.*
Master degree	-0.107	0.072
Major		
Sciences	-0.086	0.085
Law, humanities and social sciences	*Ref.*	*Ref.*
Management and trade	-0.317^{***}	0.085
Other majors	0.429^{*}	0.222
Age above the usual age in the grade		
Usual age	*Ref.*	*Ref.*
One year above	-0.200^{**}	0.084
Two years above or more	-0.237^{***}	0.087
Male	0.035	0.069
Married	-0.090	0.216
Average local educational aspiration	0.349^{***}	0.125
σ_{12}	0.577^{***}	0.148

Source : Labour Force Surveys, from 1992 to 2002 (INSEE. Paris). Sample size: $N = 1,603$. Statistical significance levels: *** (1%), ** (5%) and * (10%). Year-specific dummies are also included in the estimation.

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