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Early labor market outcomes of university graduates: Does time to degree matter?

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ABSTRACT

Using university administrative and survey data drawn from the AlmaLaurea Consortium, we analyze the effect of time to degree on the early labor market performance of Italian graduates. The empirical strategy allows identifying separately the impact of elapsed time to degree on the transition from university to work and on earnings from other determinants specific to the academic path completed. Findings suggest that delayed graduation reduces the employment probability (0.8% points for each year of delay), and this effect is still persistent five years after graduation. Once employed, graduates not completing their degree within the minimum period are also penalized in their net monthly earnings, even five years after graduation. The most penalized groups are women and graduates in non-scientific fields.

1. Introduction

Education plays a crucial role in individuals, families, and societies: it not only enables people to perform better in the labor market but also helps to improve health, encourages active citizenship, and reduces crime [1].

Despite these positive average returns to tertiary education, more recent literature, together with public opinion and policy makers, started to raise the question of whether tertiary education attainment is always "worth it" and is "still a good investment", regardless of the field of study (major) chosen, the university attended (sheepskin effects), the time actually devoted to study, etc. Especially the time to degree, namely the number of years spent to complete the university program, has become subject of increased concern within OECD countries due to the rise in the age profile of university graduates. In fact, the average age at completion was of 26 in 2015, well above the age consistent with university enrolment right after high school and graduation within the mandatory duration [2].[1] As a confirmation of this, the Complete College America report [3] revealed that less than half of full-time students in public institutions completed their degree within four years in the US.

This tendency is common in tertiary systems where students can freely determine the length of their studies, as for example the US, France, Germany, Denmark, Sweden, and Italy [4]. Nevertheless, in the Nordic European countries, the increase in the age at graduation is mainly driven by postponing university enrolment (gap years), while in other countries, such as Italy, it is primarily due to delayed graduation, since admission at university for high school leavers essentially occurs just after the diploma.

Whatever the motives, taking longer to graduate may have several drawbacks. First, it increases the direct (tuition fees) and indirect (foregone earnings) costs of getting a university degree, as well as taxpayers' subsidy in systems where tertiary education is mainly publicly funded [5]. Second, it reduces university graduates' time in the labor market over their life course, which can totally or partly undermine the benefits of the investment in education [6,7]. A great concern of graduating not at the expected age is also the prospect of failing to achieve the earnings of individuals who graduate on time (see Ref. 8–11). Moreover, in the presence of severe delays, there is the concrete risk that the knowledge acquired at university is already obsolete or forgotten at the time of job market entry. Prospective employers, in the condition of asymmetric information that is typical of any job candidate selection process, may eventually consider delayed graduation as a negative signal, i.e., a signal of poor organization, low productivity, laziness, etc. [12].

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[1] The average age at which students achieve a university degree is a combination of age at matriculation, degree program length, and the effective number of years spent to graduate.

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Italy is a good case study as the tertiary education system was characterized, notably before the implementation of the university reform introduced in 2001, by a widespread tendency to stay enrolled more than the legal duration (for more details see Section 4.2).

In light of all the points listed above, this paper investigates the early labor market effects of a specific trait of the Italian university graduates, namely elapsed time to degree, by using the method of instrumental variables. We assess whether taking longer to graduate has a negative impact on university graduates' employment and earnings perspectives—as suggested by the economic theory—and to what extent. In particular, due to small number of contributions in this area, this study aims to fill the gap by providing robust evidence of the effects of delayed graduation on labor market outcomes (i.e., three and five years from degree conferral) of two cohorts of Italian graduates. In the choice of the instrument, we take advantage of a well-established finding of the literature that studies the determinants of time to degree. According to this, the labor market situation and, more in general, the economy influence the duration of the university studies, besides individual, family and institutional characteristics.[2] For each student, delayed graduation is then instrumented by exploiting the variation of the employment rates between the 1st and the 3rd year of university enrolment, and calculated at gender and macro-area level. Since taking longer to graduate is a rather common behavior in Italy, it is likely that employers are not so much deterred by this trait. We therefore believe that our findings underestimate the labor market consequences of lengthening graduation in countries where this tendency is less frequent and probably more stigmatized.

The novelty of our paper is that we have access to a rich dataset, including information on academic career, personal characteristics, parental background, and labor market conditions for all the individuals surveyed. For the first time, we are able to provide evidence of the early labor outcomes of Italian graduates by exploiting the effects of timing of graduation along with all the determinants explored in the literature, but often analyzed separately. The wealth of information available allows us to determine delays in obtaining a degree with precision, since we have the dates of matriculation and graduation and the legal length of major, which was not possible in Aina et al. [13]. Hence, our data enables to detect the effects of a non-traditional academic path versus a more traditional one, distinguishing between age at matriculation, legal length (i.e., study duration by field of study), and years beyond the minimum period required, accounting for all sources of heterogeneity among graduates. In this way, we can separately identify the impact of elapsed time to degree from other characteristics of the academic path completed (for instance field of study, gap years, final grade, being a working student, etc.) (i) on the transition from university to work as well as (ii) on earnings. This approach, in short, makes it possible to test whether potential penalties associated with postponing graduation can be offset by other graduate attributes. In addition to existing evidence, we aim to test whether delayed graduation is, *ceteris paribus*, a key variable in explaining the different performance of graduates in the labor market by controlling several determinants that may influence this specific trait of graduates. Finally, potential heterogeneous effects are accounted by separately analyzing males and females, as well as graduates in STEM[3] and non-STEM majors.

Our estimates suggest that delayed graduation slows down the transition from university to the labor market, particularly for women and for graduates with a degree in non-scientific or non-technological majors (non-STEM). Having work experiences or spending a period of study abroad during university help to prevent poor employability opportunities, while very small benefits are associated with obtaining top marks. Once employed, graduates are still penalized in their monthly earnings if they achieve the degree with delay, and this lower return persists five years after graduation. The most penalized subgroups again appear to be women and graduates in non-scientific or non-technological fields.

The remainder of the paper is organized as follows. Section 2 outlines a literature review on the research topic. A brief description of the Italian tertiary education system is presented in Section 3. Sections 4 and 5 describe the data used and the empirical strategy applied. Section 6 discusses the results and the sensitivity analysis. Finally, Section 7 offers some conclusions.

2. Literature review

Greater human capital endowment eases the transition from education to employment by increasing the job opportunities and lowering the risk of unemployment [14–16]. In addition, people that are more educated have, on average, larger earnings.

To identify the heterogeneous returns to education, several features have been exploited. For instance, many contributions analyzed the link between labor market outcomes and family background, confirming that children's outcomes are highly correlated with their parents' characteristics, and especially with their level of education [17,18].

Other studies have investigated college quality and ability, the latter measured by an IQ or aptitude test and final grade [19–22]; and the "sheepskin effect", i.e., the existence of wage premiums related to credentials rather than the years of schooling [23–26]. Additional explanations for pay gap between workers are gender [27–30], ethnicity [31,32], and college majors, finding large earnings premiums especially for STEM and business fields [33–41].

Despite the growing proportion of students not completing tertiary education within the legal duration or at the expected age, evidence of delayed graduation mostly focuses on the determinants of elapsed time to degree [42–44] , but very few contributions investigate its labor market consequences. Analyzing the economic payoff from graduating at an older (than typical) age in the US, Monks [8] finds a negative correlation between age at graduation and entry-level wage. This penalty is persistent over the entire working career of graduates 32 years old and above, since they are not able to catch up to their counterparts (i.e., on time/expected age graduates). To be more precise, he finds that the university premium decreases by about 4% for each additional year of age at degree completion. Fixed effects estimates by Taniguchi [10]; instead, show that the penalty for late graduation occurred from 25 years old onwards. In particular, he finds that for late graduation, the penalty is much smaller for females than males since the former, in spite of timing, experiences lower college returns growth. Two other contributions analyze the effects of delayed graduation due to gap years between high school and university, which is a common trend especially in Sweden, where about 25% of individuals enroll at university from two up to four years after obtaining their high school diploma, while about 40% enroll more than five years later. This behavior, by postponing labor market entry, has an impact on graduates' earnings. Holmlund et al. [11] find a significant and negative effect for graduation at ages 30 and 40, which is persistent over the graduates' working careers. Similarly, for the UK, Egerton [9] shows that graduates older than 25 require 15 years to fully overcome the penalization associated with not graduating at the typical age. Hällsten [45,46] investigated the economic returns of upgrading to a university degree (versus staying in the labor market) in Sweden for individuals enrolling after age 25. Hällsten [45] reports that late graduation is mostly valuable for people concentrated at the lower part of the earnings distribution before enrolment. Hällsten [46]; in addition, finds that late university enrolment improves the probability of finding a job (about 12%), but has only a negligible effect on earnings, with women being more advantaged. Finally, Aina et al. [[13]] examine the association between age at tertiary graduation and labor outcomes during the first phase of graduates' working careers in Italy. Estimates suggest that older age at graduation slightly reduces the

[2] For a review on the determinants of the time to degree, see Ref. [5].

[3] This acronym stands for Science, Technology, Engineering and Mathematics.

probability of being employed in the private sector but does not penalize weekly wages, annual earnings, or employment/unemployment spells either in the first working year, or in the following ones. Results by gender, instead, show that women experience a penalty, especially when the cumulative earnings of the first 10 years of graduates' working careers are accounted for.

To sum up, the existing literature on returns to university education explored several dimensions that may explain differences among graduates once employed. Nevertheless, only a handful of studies have examined the effects of late graduation (i.e., due to gap years or spending more years at university than the legal length of a degree) on the transition from university to work as well as on earnings. Given the shortage of studies on this issue, we contribute to closing the gap by providing evidence of the causal effects of delayed graduation on the labor market by controlling for several graduate attributes.

3. Institutional background: the Italian tertiary education system

In Italy, all students with a high school diploma (i.e., an upper secondary qualification, which is usually completed at age 19) can enroll in a university degree. High school can be academic (*licei classici* and *licei scientifici*) or vocational (*istituti tecnici* and *istituti professionali*), and both types of diplomas give access to tertiary education programs.

The Italian university system traditionally includes only academic degrees with little vocational or professional purposes and with an official duration, which used to vary between 4 and 6 years, according to the subject. This university system was changed in 2001 by a reform (so-called *Bologna Process*) that split the long degrees into two levels, an initial three-year degree called *Laurea Breve* (honors degree) followed by a two-year degree course called *Laurea Magistralis* (master's degree). Our empirical exercise includes only students who began their degree in the pre-reform period, therefore not affected by the changes occurred in 2001.

Most Italian universities are public, and with the exception of a few types of faculty, such as medical schools, there are no university admission examinations. There is no official limit to the number of years a student can be enrolled in a degree program before completing it. This is because progression from one year to another is generally not conditional on past performance, and if students fail an exam or are unhappy with the mark obtained, they can re-sit the exam several times. Consequently, students usually take much longer than the minimum official period to complete their degree. Within the tertiary education regime analyzed, four-year degrees were usually completed in an average of 7.5 years, with only one in eight students completing their course within 4 years [47].

Financial aid for university students is limited,[4] but public university fees are rather low because they are mainly state funded. In addition, students living in economically disadvantaged families may apply for exemption of the tuition fees. Nevertheless, there is a clear socio-economic gradient in university enrolment. Children with low-income or poorly educated parents usually choose a secondary qualification, which is vocational, and are unlikely to enroll in a university [48–50]. This gap in university enrolment is in part explained by the lack of vocational university degree programs and is one of the main factors explaining the strong intergenerational correlation in educational attainment in Italy [51–53].

[4] In 2000, only 12% of students received a public university grant [67].

4. Data

In our empirical exercise, we use AlmaLaurea[5] data. AlmaLaurea is a consortium of Italian Universities whose aim is to provide employers with information on graduates. Since 1994, it has run surveys for each cohort of graduates from the universities belonging to the consortium. Graduates are interviewed at the completion of their degree (*Profilo dei Laureati survey*) and are followed and interviewed again after 1, 3, and 5 years (*Condizione Occupazionale dei Laureati survey*). These last three interviews are computer-assisted telephone interviews administered by trained interviewers.

Information from the four interviews are matched with students' details contained in the administrative data registers of each university. Consequently, for each cohort of graduates, AlmaLaurea collects information on age, sex, area of residence, family background (e.g., parents' occupation and education), timing of graduation, educational choices, final grades (high school and university), scholarship grants, Erasmus activities, labor market status during and after university, occupational characteristics, and income bracket after graduation.

The initial survey at the completion of the degree covers almost the whole population of new graduates from the universities belonging to the AlmaLaurea consortium. The response rates in these initial surveys are usually well above 90%. Looking at the interviews at 5 years after graduation, the respondents still represent more than 80% of the population of graduates who completed the initial interviews (see Ref. [54]).

4.1. Sample

Our main sample is reduced to a panel of graduates that obtained their degree in 2002 and 2003, interviewed three and five years after graduation.[6] We use an outflow sample in which individuals completed their degree course in a specific year (i.e. 2002 and 2003), albeit they may have enrolled at university in different academic years. We include all universities and departments belonging to the Consortium in 2002 or 2003, with the exception of two private institutions and of all medical degrees, for sake of comparability among graduates.[7] We end up with a sample of graduates from 24 universities representative of the Italian university system. We then drop from our sample all students who were older than 35 at the completion of their degree and those who were already working during university and kept their job after graduation, together with those who enrolled at university after the age of 22. This selection is driven by the heterogeneity of these individuals with respect to "standard" full-time students. Finally, we exclude graduates who were not working and were not seeking a job. Largely, these graduates were still involved in some education (master, Ph.D.), were completing an internship program (necessary to become lawyer or a business consultant, for instance), or were studying for a qualifying examination.

Our final sample of graduates includes over 21,000 individuals interviewed 3 and 5 years from obtaining their degree. With reference to the graduates' earnings, the sample narrows to over 17,000 and 19,000[8]

[5] AlmaLaurea surveys only university students who completed their degree course, albeit with delay, but it does not contain any information on students who dropped out.

[6] We do not analyze employment outcomes one year after graduation for two reasons. First, because the returns to education are not very reliable if measured too early, especially in Italy where the transition from education to the labor market is rather slow. Second, because for our identification strategy we need to put some temporal distance between the university years and the employment outcomes, as explained in Section 5.

[7] In Italy, during the period analyzed, the only degrees with selective admission tests were those offered by Medical Departments, so those students are expected to be particularly selected.

[8] The number of observations increases because more graduates are employed five years from degree.

Table 1
Summary statistics of analyzed outcomes (%).

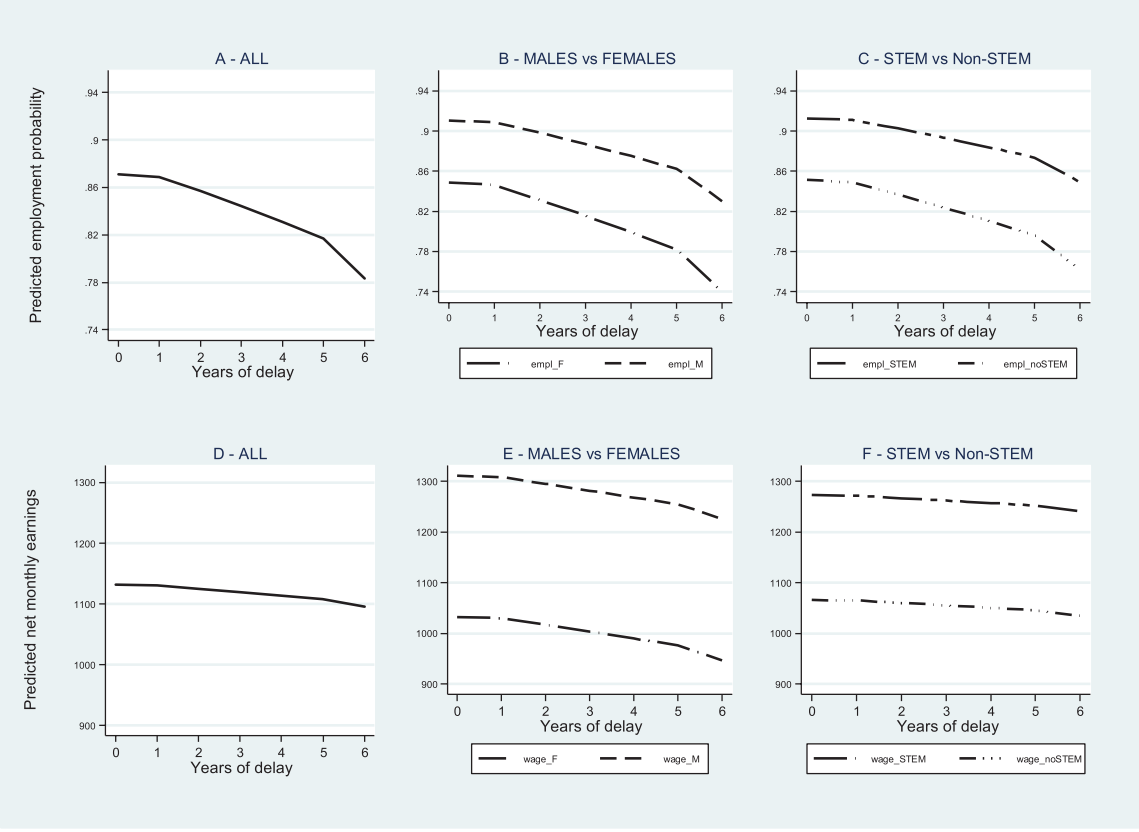
	3 years after graduation			5 years after graduation		
	All	Males	Females	All	Males	Females
Employed	0.839	0.880	0.812	0.919	0.948	0.9
Earning (intervals)						
€0-250	1.98	1.44	2.37	1.38	0.78	1.79
€251-500	6.23	3.74	8.05	3.57	1.91	4.74
€501-750	9.4	5.58	12.18	6.25	3.49	8.19
€751-1000	19.61	12.96	24.44	12.93	7.81	16.53
€1001-1250	28.96	26.13	31.02	25.16	17.37	30.65
€1251-1500	21.29	28.45	16.09	24.95	26.1	24.15
€1501-1750	5.97	9.95	3.08	10.75	16.05	7.01
€1751-2000	3.05	5.28	1.43	7.15	11.8	3.88
€2001-2250	1.22	2.11	0.57	2.71	4.96	1.12
€2251-2500	0.8	1.46	0.32	1.96	3.64	0.77
€2501-2750	0.33	0.65	0.1	0.75	1.39	0.29
€2751-3000	0.39	0.68	0.18	0.79	1.42	0.35
Over 3000	0.77	1.58	0.18	1.66	3.28	0.52

The second is the graduates' net monthly earnings. AlmaLaurea collects information on earnings by asking respondents to indicate their net monthly earnings in over 13 brackets, where the transition from one bracket to another is defined by adding 250 euros.[9]

Fig. 1 shows the predicted probability of being employed (A, B, C) and of the graduates' earnings (D, E, F) three years after graduation as a function of the years of delay beyond the legal duration (i.e., 0 up to 1, 2, 3, 4, 5, and more than 5 years of delay), estimated over the overall sample and by subsamples. It appears that both dependent variables are negatively related to the time to degree.

For each graduate, the explanatory variables used in our analysis include observable characteristics measured before enrolment at university and up to the graduation date, so we do not take account of potentially endogenous events occurring from graduation to the moment of the interview.

Some variables are independent from the university experience. They include student gender, age at matriculation, type of high school attended,[10] high school final mark, and parents' education level. Other



Note: Predicted employment probability conditional on years of delay (A and D) years of delay and gender (B and D), and years of delay and major (C and F).

Fig. 1. Predicted employment probability and net monthly earnings by years of delay
Note: Predicted employment probability conditional on years of delay (A and D) years of delay and gender (B and D), and years of delay and major (C and F).

individuals, respectively.

4.2. Variable definitions

To analyze graduates' labor market outcomes, we consider two variables summarized in Table 1. The first is a dummy taking a value of 1 for graduates who are working and 0 for those who are unemployed. The unconditional employment probability ranges from 0.81 for women three years after graduation to 0.95 for men five years after graduation.

variables concern the university experience, such as the university

[9] The lowest interval corresponds to a net monthly earnings up to 250 euros, while the highest interval corresponds to more than 3000 euros.

[10] High school type is a dummy variable taking value 1 for academic high schools and 0 for other high schools.

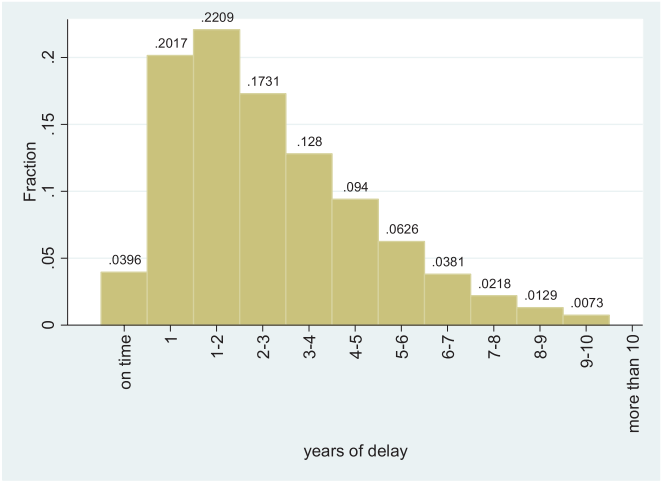


Fig. 2. Years of delay distribution.

attended and its geographical area,[11] the field of study of the degree obtained, the final university grade,[12] a dummy equal to 1 if the student had work experience during university (and 0 for full-time students), and a dummy equal to 1 if the student had any experience abroad (i.e., Erasmus) (0 otherwise). Moreover, as a proxy for the motivation of the student (and for her propensity to procrastinate), we exploit information about the day on which the student registered at university for the first time. Since registration at university generally opens in August and the semester starts in September/early October, we consider as "late registrations" those made after November 1st of each year. Finally, as a proxy of the financial conditions of a student's family, we include a dummy equal to one if the student received a scholarship.[13]

Finally, we include as our key variable of interest the delay in obtaining the university degree, measured as the number of additional years spent to get a degree beyond the minimum period. Considering the sample of graduates interviewed three years after graduation (Fig. 2), only 4% obtained their degree within the legal duration of the degree course (i.e., "on time"), 20% with up to one year of delay, and 22% with a delay ranging from one to two years. More than 50% of the graduates received their degree with a delay of more than two years. Fig. 2 provides clear evidence of the widespread propensity of Italian university students to delay graduation.

Table 2 summarizes the explanatory variables, overall and by sex. We report the mean and standard deviation for each explanatory variable using our main sample of 21,763 graduates interviewed three years after graduation.

5. Empirical strategy

In order to assess the link between time to degree and graduates' employment outcomes, we run two set of estimates. First, we use a simple empirical setup to estimate the probability of being employed 3 and 5 years after graduation, running a probit regression model of the following equation Eqn 1:

Table 2
Summary statistics of explanatory variables.

Variable	All	Males	Females
Females	0.597		
Age at matriculation	19.344	19.367	19.328
	(0.491)	(0.621)	(0.589)
Late matriculation	0.112	0.106	0.116
Academic high school diploma	0.664	0.831	0.552
High school final grade	48.662	47.997	49.111
	(7.091)	(7.211)	(6.974)
Parents' education			
University degree	0.149	0.161	0.141
High school diploma	0.163	0.160	0.165
Compulsory schooling or less	0.688	0.679	0.694
Field of Study			
Non-STEM	0.710	0.568	0.807
Business and Economics	0.174	0.211	0.149
Modern literature and philosophy	0.218	0.078	0.312
Law	0.134	0.125	0.141
Psychology	0.050	0.019	0.071
Political science	0.084	0.079	0.088
Architecture	0.050	0.056	0.046
STEM	0.290	0.432	0.193
Agriculture	0.031	0.038	0.027
Pharmacy	0.051	0.044	0.054
Engineering	0.137	0.279	0.042
Science	0.071	0.071	0.070
Top final grade (≥105)	0.477	0.379	0.543
Scholarship	0.309	0.277	0.330
Having worked during university	0.626	0.630	0.623
Erasmus experience	0.181	0.160	0.195
Geographic area of study			
North-west	0.188	0.219	0.167
North-east	0.440	0.448	0.435
Center	0.120	0.112	0.125
South and islands	0.252	0.221	0.273
Years of delay	2.407	2.657	2.238
	(2.129)	(2.185)	(2.074)
No. observations	21,763	8770	12,993

Note: mean and standard deviation in parenthesis.For a full description of the explanatory variables see Table A1.

$$Employed_i = \alpha + \beta x_i + \delta * Delay_i + \varepsilon_i, \quad (1)$$

Where $Employed_i$ is an indicator that takes the value of 1 if the individual i is employed and 0 otherwise; x is the set of regressors defined in Section 4. Second, we estimate an interval regression model of the net monthly earnings declared by the graduates. Interval regression is used to model outcomes that have interval censoring, i.e., when an interval rather than the precise value of the dependent variable (in our case the monthly earnings) is observed:

$$ear_{min} \leq earnings_i \leq ear_{max} \quad (2)$$

Where ear_{min} and ear_{max} are the lower and upper bounds of the interval. The main advantage of the interval regression method (with respect to ordinal models) is that it is possible to interpret parameters as in OLS estimations.

Possible heterogeneous returns to obtaining a university degree, emphasized by the recent empirical literature (see, for instance Ref. [55, 56]), are taken into account by running estimates separately for four different subsample: males, females, graduates in STEM, and graduates in non-STEM degrees. To control for unobserved heterogeneity across individuals, we use standard proxies of their ability. Although we do not have a direct measure of graduates' ability, we can rely on a wide range of information on graduates' educational achievements both before and after university enrolment. We include a dummy for high school type and for the corresponding final grade. An additional well-known indirect measure of individuals' abilities is their parents' educational

[11] We distinguish four macro-areas: the north-west, north-east, center, south and islands.

[12] In order to take into account possibly different grading standards across different areas of Italy, we alternatively controlled for the high school and university final grades standardized at the macro-area level. Since the results are very similar, we have decided to present estimates with the grades non-standardized.

[13] In Italy, scholarships are typically granted both on a merit and family income basis.

background, which is accounted. All individuals in the sample completed tertiary education, and thus they are homogeneous in terms of the achieved educational level.[14] However, they differ in terms of the field of study in which they graduated. We control for both these aspects. Geographical area dummies (for the north-west, north-east, center, and south and islands of Italy) are included in order to control for local labor market fixed effects. Finally, we add the dummy of the university where the students graduated, to control for the potential heterogeneous quality of university institutions across the country.

The focus of our analysis is on the effect of a *delay* in completing a degree on the probability of finding a job and on earnings. The variable is measured in years, months, and days starting from the last graduation session in which students could obtain the degree "on time".[15] One concern is the potential endogeneity of the delay: if student ability is not adequately controlled for, and in case ability and the time needed to graduate are correlated, the resulting estimates are biased and inconsistent. With this in mind, we have explored several potential instruments that are expected to affect the timing of graduation without having a direct effect on the analyzed outcomes (employment probability and monthly earnings).[16] Among these instruments, one emerged as particularly promising: the difference in the employment rates between the 1st and 3rd enrolment year at university of each student, measured at the gender and macro-area level.[17] According to the literature on the determinants of the time to degree, labor market conditions are among the most convincing candidates to explain student performance in terms of the timing of graduation (in addition to student ability and university resources) in tertiary systems where students are allowed to freely determine the duration of their study, as in Italy. It has been shown that poor labor prospects are a disincentive to graduate within the minimum period [42,57]. Typically, in a context of low tuition fees, university can be seen as a "parking lot" [58], where "staying put" is advantageous compared with potentially unsuccessful job searches. According to this evidence, we assume that this simple mechanism can motivate our instrument's choice. An increase in employment rates during the early years of university career could encourage students, *ceteris paribus*, to graduate as fast as possible to take advantage of the good labor market prospects.[18] Conversely, if the labor market conditions worsen, students might decide to stay longer at university to avoid entering the labor market at a bad time, with potential negative consequences for their future career. Considering that the dataset used in the analysis is an outflow sample collecting information on graduates in two years (2002 and 2003), and that we drop those who graduated after 35 year old, the observed individual entry cohorts at university vary precisely from 1986 to 1999, which provides enough variability to our instruments.[19]

If there are theoretical and empirical arguments for using labor market conditions as (exogenous) determinants of the time to degree,[20] we have to rule out any direct effect of the instrument on the dependent variables or any effect running through omitted variables (i.e., exclusion restriction). We argue that a direct effect of the variation in the employment rate in the first three years of university enrolment (the proposed instrument) on graduate employment probability and earnings three and five years after graduation (the dependent variable) can be excluded for the following reasons. First, one variable is measured in terms of *variation* (the instrument) and the others in *levels* (the dependent variables). Concerning employment probability, namely the variable for which the validity of the exclusion restriction is more debatable, it is plain that the employment rate at time t is a determinant of the employment rate in the following years. However, it is disputable whether a relationship exists between the *variation* in a given span of time and the *level* some years later. As a proof of the absence of a direct effect, we ran a fixed effects estimate of the graduates' regional employment probability in 2005 and 2006 (i.e., 3 years after our sample's graduation) on the variation of the overall regional employment rate between 1999 and 2001 and between 2000 and 2003, so as to consider the minimum time-span existing between our instrument and our dependent variable. The result shows that the variation in the employment rate has no statistically significant effect on the employment rate a few years later.[21] Moreover, it is plausible to expect that an extension of the time-span between the dependent variable and the regressors, as in the case of older students in the sample, would reinforce the validity of the exclusion restriction.

A second rationale for excluding a direct effect of the instrument on the dependent variable is that the former is calculated over the *overall* employment rate (entire population), while the latter is the *individual graduate* probability (population with a university degree).[22] A third rationale is that the two variables are measured at a significant lapse of time (minimum of four years).[23]

However, the change in employment rate during the early academic years could affect not only the time needed to graduate, but also other student behaviors that might affect their employment outcomes. For instance, students might revise their decision about the university attended, the field of study, and/or the list of exams (i.e. curriculum). Furthermore, they could decide to work part-time (or to leave a job), to spend some time abroad (e.g. for the Erasmus program) or to put more effort in the study in order to raise the final grade.[24] As regards the last

[14] They are not perfectly homogeneous in terms of years of schooling, however, as there are some degrees (for instance, engineering) with a duration of five years.

[15] Students can graduate starting from the summer session of their last year of enrollment. However, up to the following spring session (which generally ends in the month of April) they are still considered as "on time" (*in corso*) graduates.

[16] The fact that our covariate of interest (delay) is constant, as it is measured at the moment of graduation, does not allow us to exploit the panel nature of our dataset to run a fixed effects model.

[17] We distinguish four macro-areas: north-west, north-east, center, and south and islands.

[18] All students in our sample were enrolled in degree courses of 4, 5, or 6 years. The assumption is that all of them might be influenced by the labor market prospects inferred by looking at the employment/unemployment rates in the three first years of university enrollment.

[19] The instrument has 112 different values, which is the result of 14 different years of first enrollment at university (from 1986 to 1999), 4 macro-areas (north-west, north-east, center, and south and islands), and two sexes (female, male).

[20] Other papers demonstrate that labor market conditions also affect the dropout propensity of university students in Italy (see, for instance, Ref. [59,68]).

[21] We used regional-level graduate employment rates in 2005 and 2006 ($20 \times 2 = 40$ observations) and the variation in the regional employment rates of 15–64 year olds between 1999 and 2001 and between 2000 and 2002. Data and estimates are available upon request. All data are from Istat (Italian Institute of Statistics).

[22] We run a sensitive test using the graduate-specific employment rate variation as instrument. First stage coefficients of the instrument show a lower impact (although always statistically significant at 1% level) on the time to degree. Apart from that, results are very similar to those reported here. We prefer to instrument our endogenous variable with the overall employment rate both for a theoretical reason (people are most likely informed and sensitive to it than to the less-known graduates-specific rate) and for a methodological reason (the exclusion condition assumption is even more debatable with the graduate-specific employment rate).

[23] The temporal distance between the moment when the instrument and the dependent variables are measured ranges from a minimum of 4 years (for those who enrolled at university in 1999, graduated on time in a four-year degree course in 2003, and were surveyed for the first time in 2005) to a maximum of 16 years (for those who enrolled at university in 1986, graduated in 2003 with a huge delay, and were surveyed for the first time in 2005).

[24] In Italy, the final grade at university ranges from 66 (the minimum) to 110 cum laude (100 at Polytechnics). The final grade used to be relevant especially for those who aimed to apply for a job in the public sector.

Table 3
Employment probability three years after graduation.

	(1)	(2)	(3)	(4)	(5)	(6)
	All probit	All IV probit	Men probit	Men IV probit	Women probit	Women IV probit
Delay (years)	−0.008***	−0.005*	−0.002	0.006	−0.012***	−0.010***
	(0.001)	(0.003)	(0.002)	(0.004)	(0.002)	(0.004)
Women	−0.030***	−0.029***				
	(0.005)	(0.005)				
Chemistry & pharmacy	0.010	0.012	0.004	0.007	0.018	0.019
	(0.013)	(0.013)	(0.017)	(0.017)	(0.018)	(0.018)
Agriculture	−0.054***	−0.052***	−0.046***	−0.043***	−0.053**	−0.052**
	(0.014)	(0.014)	(0.016)	(0.016)	(0.022)	(0.022)
Architecture	0.079***	0.075***	0.053**	0.043*	0.100***	0.098***
	(0.018)	(0.018)	(0.023)	(0.024)	(0.027)	(0.027)
Engineering	0.108***	0.106***	0.076***	0.071***	0.133***	0.132***
	(0.012)	(0.012)	(0.011)	(0.012)	(0.028)	(0.028)
Sociology and political science	−0.031***	−0.030***	−0.045***	−0.044***	−0.012	−0.012
	(0.010)	(0.010)	(0.012)	(0.012)	(0.015)	(0.015)
Psychology	−0.065***	−0.062***	−0.029	−0.022	−0.076***	−0.074***
	(0.013)	(0.013)	(0.025)	(0.026)	(0.017)	(0.017)
Science	−0.065***	−0.066***	−0.055***	−0.058***	−0.068***	−0.068***
	(0.010)	(0.010)	(0.012)	(0.012)	(0.015)	(0.015)
Humanities	−0.041***	−0.041***	−0.078***	−0.080***	−0.027**	−0.027**
	(0.008)	(0.008)	(0.012)	(0.012)	(0.012)	(0.012)
Law	−0.123***	−0.124***	−0.092***	−0.095***	−0.139***	−0.139***
	(0.008)	(0.008)	(0.010)	(0.010)	(0.012)	(0.012)
Job during university	0.045***	0.043***	0.035***	0.030***	0.049***	0.048***
	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)
Experiences abroad	0.021***	0.022***	0.010	0.014	0.028***	0.028***
	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)
Scholarship	−0.013**	−0.010*	−0.014*	−0.009	−0.013*	−0.011
	(0.005)	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)
Final grade ≥ 105/110	−0.000	0.002	−0.003	0.002	0.005	0.006
	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)	(0.008)
Empl. rate variation (instrument – 1st stage)		−1.005***		−0.839***		−1.126***
		(0.013)		(0.022)		(0.016)
Weak identification test (Cragg–Donald Wald F statistic)		*5403.04*		*1408.84*		*4325.1*
P-value		*0*		*0*		*0*
Wald test of exogeneity (corr = 0) χ^2 (1)		*1.74*		*3.96*		*0.34*
Prob > χ^2		*0.187*		*0.047*		*0.562*
Observations	21,763	21,763	8770	8770	12,993	12,993

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
Other controls included: high school track (academic vs. other), high school grade, parents' education, age at first enrollment at university, dummy for late registration at university, university attended, and geographical macro-area. Reference category for the field of study: business and economics.

three possible choices (working during university, spending time abroad, raising the final grade), we control for all these features in all our estimates. Therefore, the impact of the employment rate on the time to degree and of the latter variable on the employment outcomes are both estimated by comparing individuals with similar working and abroad experiences,[25] and with the same final grade. As regards the other possible changes (university, field of study), we also run all estimates on a sub-sample obtained by excluding those who had any university experience before enrolling in the degree program obtained.[26] This robustness exercise is thereby carried out on students who enrolled for the first time in the Italian university system in the degree program surveyed in AlmaLaurea dataset.[27] Finally, we can exclude that a change in the list of exams can affect the graduates' employment outcomes, especially considering that the structure of the degree programs in Italy used to be (and still is) rather rigid and students do not have much room to differentiate their curricula.

Another channel through which a change in the labor market conditions in the early university years could affect the student experience is the possible effect on the employment condition of the student parents and, consequently, on the households' financial conditions. During an economic downturn, parents could lose their job, and students could be forced to withdraw from university both for the worsening of the household financial condition, and for the necessity to find a job to contribute to family resources. On the other side, however, students who are at risk of dropping out could decide to remain enrolled at university because the outside options worsen.[28] Unfortunately, our dataset does not collect information on students' dropout behavior, as it is an outflow sample composed only by those who achieved the university degree. Therefore, we cannot determine which mechanism best describes the university students' dropout decision. However, some findings of the empirical literature on this issue may provide insights on the prevailing mechanism. According to Di Pietro [59] and more recently to Adamopoulou and Tanzi [60]; university students' dropout probability in Italy, which is amongst the highest in developed countries, does not increase

[25] We use the term "similar" because we do not have information about the time actually devoted to the job and/or the period spent abroad. Therefore, we argue that we are comparing individuals who had similar experiences at university.

[26] In the employment probability estimates, the sample shrinks from 21,763 to 19,770 observations. In the earnings equation from 17,552 to 15,973 observations.

[27] These students are called "*matricole pure*" (pure freshmen), in order to distinguish them from those who previously enrolled in other Italian university degree courses.

[28] During the economic recessions, the foregone expected earnings, which is key to decide whether to remain enrolled at university, are likely to be lower.

in periods of recession. It seems that students prefer to remain enrolled at university, mainly in poorer southern regions, where university is perceived, not having outside options, as a kind of "parking lot". The rather low amount of the Italian university tuition fees, especially in the years when the students in our sample were enrolled at university, can contribute at explaining this behavior. All in all, the fact that we cannot control for the selection process that separates those who withdraw from university (that we do not observe) from those who achieve the degree (that we observe) makes the negative effect of elapsed time to degree even more worrying. This is because students who completed the university degree, *ceteris paribus*, are expected to be among the best in terms of ability at school, motivation, engagement in study, household's financial conditions, etc.

The instrument is always statistically significant at the 1% level in the first-stage equation and has the expected negative sign in all estimates. The Cragg–Donald Wald test always rejects the hypothesis of weak identification, with values well above the Stock–Yogo [61] critical values. As for the employment condition estimates, in almost all cases (with the sole exception of the subsample of males in the employment probability 3 years after graduation estimate), the Wald test does not reject the null hypothesis of exogeneity of the delay. We then present both estimates (probit and IV probit) with the awareness that probit estimates are more efficient if the delay is exogenous, while IV estimates are consistent when endogeneity cannot be excluded. Results are very similar regardless of the type of estimate. As for the net monthly earnings estimates, the results of the Wald test of exogeneity are rather mixed depending on the sample analyzed (all, females, males, STEM, non-STEM) and on the time of the interview (3 or 5 years). Also in this case, we present the results of the interval regression estimates assuming the exogeneity of the delay and then instrumenting it with the variable described above.[29] We speculate that our key variable "delay" is almost always exogenous in the employment condition estimates but much less in the earnings estimates because the latter estimates are much more affected by an issue of omitted variables (e.g., ability, motivation) correlated with the time needed to obtain a degree.

As explained above, the academic careers of students enrolled in the same field are differentiated not only in terms of their times to degree but also in terms of their leaving grade, work experience, or experiences abroad (for instance, as a part of the Erasmus program) during their period at university. All these features may have consequences on the time needed to graduate. Students who aim to graduate with a high final grade, which can be required to get a job in the public sector, may decide to take longer to graduate.[30] Likewise, those who work while at university may take longer to graduate, as they cannot devote all their time to studying. On the other hand, especially if work activities are somehow related to the field of study, working can provide students with some practical experience that can be positively evaluated by future employers [62,63]. Since these features of each student's academic career are probably highly correlated with the time needed to graduate, we control for their impact on labor market outcomes when analyzing our key variables.

6. Results

We estimate the effect of time to degree, together with other relevant traits of the university experience, on graduate employment outcomes, namely employment probability and net monthly earnings. Given that a large amount of the heterogeneity among university degree returns is due to graduates' gender and chosen major, we also report estimates separately for women and men and, as a robustness exercise, for graduates in STEM and non-STEM fields.

6.1. Employment probability

Using the unbalanced sample of graduates,[31] Table 3 shows the average marginal effect of probit and IV probit estimates of the probability of being employed three years after graduation. In all IV estimates we report, together with the above described tests, the coefficient (and standard error) of the instrument in the first stage equation, which is always statistically significant at 1%.The first stage estimates of the employment probability equation are reported Table A6 in Appendix.

Delayed graduation implies that for each additional year spent to get a degree, the chances of finding a job decrease about 0.8% points; this penalty disappears for men, while it persists for women. The estimated negative effect is apparently only mild. Tertiary education represents one of the most powerful insurances against unemployment; therefore, our finding suggests that postponing university completion shrinks the positive effect of having obtained a university degree. Moreover, considering that the average delay is of 2.4 years in the overall sample and 2.2 years for women, the estimated average drop in employment probability is of 1.9 (overall sample) and 2.6 (women subsample) percentage points, which is not negligible for university graduates.[32] These results suggest that postponing university completion is not cost-neutral as this behavior reduces the benefits associated with tertiary education investment. However, not all university graduates are equally (negatively) affected by the delay, as men are not affected at all. How to explain this gender difference? There are several possible explanations. For instance, women who graduate at an older age could be perceived as more "at risk" of motherhood, and potential employers could prefer to hire younger women or same-age men. Alternatively, there might be some kind of expectation that women should be more organized, more compliant with deadlines, etc., so women's delays are judged more harshly than men's are. Whatever the reason is, women with less brilliant academic curricula appear to be more penalized than their male peers. Further investigations are needed to assess whether female's penalty for delayed graduation is because of the high probability of becoming pregnant or because they are perceived as less competent, *ceteris paribus*, than men. For example, to test the first hypothesis, information on having or not kids for females that graduates with delay are required; whereas, for the second hypothesis, the availability of reconciliation policies could contribute to explaining the negative selection of female graduates with delay (i.e. lower abilities rather than exposure to motherhood).

In addition, we control for observable characteristics at graduation to test whether such determinants can affect the likelihood of finding a job.[33] As expected, heterogeneous results are found for different college majors. Shielded from poor labor market performances, individuals who gained work experience or spent a period of study abroad during their time at university are less exposed to the risk of unemployment. These advantages are more pronounced for females. Quite interestingly,

[29] For the instrumental variable interval regression, we use the ivintreg function package developed in GRETL by Bettin and Lucchetti (see Ref. [69]).

[30] Delayed graduation does not at all penalize those who participate competitions for public service jobs. On the contrary, a minimum final grade is often required.

[31] We also ran the same set of estimates on the balanced sample and the results were very similar, so we decided to report findings for the unbalanced sample to avoid attrition between the interviews run three and five years after graduation.

[32] We tested the assumption of a linear relation between the delay and the employment probability by adding the delay squared in the estimates, which was not significant.

[33] Some information about students' characteristics and outcomes observed before or during university (high school track, high school grade, parents' education, age at first enrollment at university, dummy for late registration at university) are included in the estimates. We decided not to report them in tables and comments due to space reasons. However, this set of variables enriches the information on student ability, which is crucial to isolate the effect of the time to degree. All estimates are available upon request.

Table 4
Net monthly earnings three years after graduation.

	(1)	(2)	(3)	(4)	(5)	(6)
	All int. reg.	All IV int. reg.	Men int. reg.	Men IV int. reg.	Women int. reg.	Women IV int. reg.
Delay (years)	−9.1***	−15.2***	−7.8***	−14.5*	−9.9***	−15.1***
	(1.757)	(3.025)	(2.992)	(7.526)	(2.094)	(3.523)
Women	−177.9***	−179.1***				
	(7.324)	(7.968)				
Chemistry & pharmacy	33.6**	30.05**	54.6*	48**	23.7	21.6
	(15.975)	(14.015)	(29.484)	(23.296)	(18.076)	(21.46)
Agriculture	−214.9***	−219.2***	−220.8***	−224.2***	−209.6***	−214.1***
	(19.858)	(25.54)	(32.579)	(35.80)	(24.425)	(26.528)
Architecture	−162.8***	−155.8 ***	−152.5***	−146***	−173.7***	−167***
	(19.695)	(21.438)	(33.745)	(43.071)	(24.450)	(31.11)
Engineering	95.4***	97.9***	103.5***	105.1***	82.1***	84.8***
	(12.341)	(18.28)	(17.953)	(21.498)	(20.685)	(20.988)
Sociology and political science	−110.6***	−111***	−135***	−134.8***	−91.5***	−91.7***
	(13.566)	(14.728)	(24.149)	(23.878)	(15.728)	(17.319)
Psychology	−349***	−356.6***	−290.7***	−299.15***	−353.8***	−360.4***
	(17.187)	(16.108)	(43.030)	(17.813)	(17.889)	(24.184)
Science	−123***	−121.7***	−90.1***	−87.8***	−143.1***	−142.4***
	(14.397)	(14.361)	(24.797)	(18.874)	(17.033)	(18.041)
Humanities	−249.4***	−251***	−319.1***	−319.8***	−227.4***	−229.1***
	(11.535)	(7.870)	(25.690)	(20.171)	(12.656)	(11.529)
Law	−224.3***	−222.2***	−232.6***	−231.8***	−217.6***	−214.5***
	(12.778)	(15.263)	(22.293)	(30.142)	(15.034)	(12.867)
Job during university	47.1***	51.3***	62.7***	67.8***	33.5***	36.7***
	(6.934)	(6.982)	(12.183)	(11.569)	(8.058)	(7.149)
Experiences abroad	88.6***	87.3***	123.9***	121.2***	66.1***	65.5***
	(8.353)	(9.261)	(15.536)	(18.645)	(9.336)	(9.006)
Scholarship	−8.2	−12	−17.5	−21.1	−3.7	−7.1
	(7.204)	(7.925)	(13.155)	(17.636)	(8.140)	(9.275)
Final grade ≥ 105/110	13*	10.2	10.4	7.5	18**	15.7*
	(7.517)	(7.187)	(13.476)	(11.416)	(8.607)	(8.702)
Constant	1190.5***	1222.7 ***	1105.3***	1137.7***	1086.4***	1114.5***
	(119.670)	(112.504)	(207.305)	(194.896)	(140.139)	(169.483)
Empl. rate variation (instrument – 1st stage)		−1.018***		−0.845***		−1.158***
		(0.015)		(0.024)		(0.018)
/lnsigma	6.018***		6.156***		5.883***	
	(0.005)		(0.008)		(0.007)	
Weak Instrument Test		*294*		*147*		*437.4*
P-value		*0*		*0*		*0*
Wald test of exogeneity (corr = 0) χ^2 (1)		*3.403*		*0.682*		*3.014*
Prob > χ^2		*0.065*		*0.409*		*0.082*
Observations	17,552	17,552	7386	7386	10,166	10,166

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
Other controls included: high school track (academic vs. other), high school grade, parents' education, age at first enrollment at university, dummy for late registration at university, university attended, and geographical macro-area. Reference category for the field of study: business and economics.

obtaining a very high final grade (greater than 105/110), considered a major achievement in Italy as it was a necessary condition to sit competitions to become a civil servant, has no effect on the probability of being employed.

Correcting for the potential endogeneity and omitted variables issue, the IV estimates imply similar results for both the entire sample and the subsamples, namely females and males. The little differences in the consistent IV estimates suggest that there is a negligible bias from omitted ability variables in the probit results of the effect of delay on employment probability.

Similar results are also found using a subsample of students composed by only those that enrolled for the first time in the Italian university system in the same degree program surveyed in AlmaLaurea dataset. This reassures us that variation in the employment rate has an impact on the graduates' employment outcomes essentially through their time to degree (see Table A3 in Appendix).

Looking at the same outcome (employment probability) five years after graduation, it emerges that the negative effect of delaying graduation is persistent (although decreasing), signaling that the effect of this trait of the university experience does not vanish over time, especially for females (Table A2 in Appendix). The other observed characteristics also have persistent but smaller effects over time in most cases. Results do not change with the IV strategy.

6.2. Net monthly earnings

Tables 4 and 5 report the monthly returns to university investment, as represented in Eqn 2, three and five years after graduation, overall and by gender.[34] The working sample, in this case, is restricted only to those who were employed at the moment of the interview. In all IV estimates we report, together with the relevant tests, the coefficient (and the standard error) of the instrument in the first stage equation, which is always statistically significant at 1%.The first stage estimates of the earnings equations are reported in Appendix, Table A7.

The mincerian equation of a graduate who is working three years after completing their academic studies shows that delayed graduation entails a monthly earnings penalty of about 9 euros, which becomes 8 euros for men and 10 for women (Table 4). As above, considering that

[34] In this case, we show both estimates at three and five years after graduation as earnings heterogeneity (i.e., earnings penalties/premiums) increases over time.

Table 5
Net monthly earnings five years after graduation.

	(1)	(2)	(3)	(4)	(5)	(6)
	All int. reg.	All IV int. reg.	Men int. reg.	Men IV int. reg.	Women int. reg.	Women IV int. reg.
Delay (years)	−17.9***	−29.3***	−16.3***	−32.8***	−19.3***	−26.9***
	(1.875)	(3.469)	(3.267)	(8.567)	(2.202)	(3.318)
Women	−252.2***	−254.6***				
	(7.825)	(7.169)				
Chemistry & pharmacy	19.9	14.57	26.9	20.8	21.3	16.2
	(17.495)	(27.687)	(32.697)	(40.015)	(19.628)	(25.523)
Agriculture	−168.9***	−175***	−198.1***	−203.8***	−135.***	142.45***
	(21.206)	(38.349)	(35.300)	(49.100)	(25.846)	(36.24)
Architecture	−138.6***	−125.2***	−157.5***	−135.2***	−121***	−112.8***
	(22.089)	(36.045)	(38.332)	(42.474)	(27.196)	(35.306)
Engineering	143.6***	149***	147.8***	156.6***	126.5***	129.5***
	(13.595)	(19.478)	(19.908)	(24.401)	(22.982)	(23.711)
Sociology and political science	−135.6***	−137.05	−167.3***	−166.8***	−111.1***	−112.6***
	(14.981)	(18.962)	(27.307)	(26.626)	(17.113)	(17.673)
Psychology	−377.9***	−390.1***	−374.2***	−388.7***	−368.5***	−379***
	(18.662)	(20.632)	(49.941)	(42.153)	(19.108)	(17.888)
Science	−113.6***	−112.3***	−119.6***	−112.7***	−103.9***	−105.1***
	(15.262)	(20.987)	(26.506)	(26.300)	(17.996)	(21.712)
Humanities	−270.45***	−271.4***	−362.6***	−358***	−240***	−242.2***
	(12.458)	(23.033)	(28.055)	(26.300)	(13.502)	(22.153)
Law	−175.9***	−172.4***	−173***	−166.3***	−171.3***	−169.*1***
	(12.716)	(14.068)	(22.784)	(24.381)	(14.698)	(14.640)
Job during university	59.4***	66.8***	86.5***	98***	38.9***	43.7***
	(7.424)	(8.016)	(13.335)	(13.465)	(8.524)	(8.419)
Experiences abroad	115.85***	113***	150.1***	142.3***	96.9***	95.9***
	(9.221)	(10.948)	(17.626)	(23.552)	(10.168)	(8.224)
Scholarship	−23.2***	−30.4***	−33.7**	−43.5***	−19.2**	−24.1***
	(7.778)	(7.839)	(14.443)	(14.737)	(8.719)	(7.150)
Final grade ≥ 105/110	31.1***	24.7***	27.3*	16.9	36.8***	33***
	(8.075)	(5.892)	(14.764)	(11.08)	(9.148)	(8.137)
Constant	1616.9***	1681.73***	1866***	1962.9***	1180.6***	1228.1***
	(129.681)	(122.148)	(229.970)	(237.609)	(149.902)	(148.152)
Empl. rate variation (instrument – 1st stage)		−1.033***		−0.872***		−1.160***
		(0.014)		(0.023)		(0.017)
/lnsigma	6.140***		6.288***		6.002***	
	(0.005)		(0.008)		(0.007)	
Weak Instrument Test		*326.874*		*200.921*		*425.81*
P-value		*0*		*0*		*0*
Wald test of exogeneity (corr = 0) χ^2 (1)		*8.875*		*3.7408*		*7.385*
Prob > χ^2		*0.0028*		*0.053*		*0.006*
Observations	19,124	19,124	7905	7905	11,219	11,219

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
Other controls included: high school track (academic vs. other), high school grade, parents' education, age at first enrollment at university, dummy for late registration at university, university attended, and geographical macro-area. Reference category for the field of study: business and economics.

the average delay for employed men and women is 2.6 and 2.1 years, respectively, the average penalty is of 21 euros per month for both, or 250 euros per year. Females, *ceteris paribus*, earn less than men do, namely about 180 euros less per month, so the incidence of the penalization for the delay is higher for them. Heterogeneous returns are also found according to the field of study. Since we cannot control for selection into a major, which is arguably affected by students' unobserved ability, our estimates simply provide the average monthly penalty/premium of different majors for graduates with the same observable characteristics. By running estimates according to gender, a similar pattern is found, with earnings premiums observed for graduates with previous job experience and study experiences abroad. By running IV interval regression estimates, the effects of control variables are consistent with the simple interval regression estimates, but the negative effect of delayed graduation is larger (about 15 euros), especially for males.

Further estimates show that the earnings premium/penalty persists five years after graduation, suggesting that people are sorting into the labor market based on characteristics at the time of graduation, which in turn affects their future returns (Table 5). In particular, not completing university within the minimum period reduces monthly earnings by 18 euros, 16 euros, and 19 euros for all, male, and female graduates, respectively. Similar to the IV estimates three years after graduation, results five years after graduation are consistent with the simple interval regressions for our control variables, while some differences emerge for the delayed graduation coefficient, with a penalty that increases for the entire sample and for the subsamples. The instrumental variable provides consistent estimates for the group of delayed graduates, whose behavior can be manipulated by our instrument. These results suggest that the omitted variables in the earnings equation are correlated with delay, thus the corresponding instrumental variable estimates reveal a statistically significant and more sizeable effect of postponing graduation on earnings.

In addition, estimates run on the subsample of students who did not change university and/or field of study provide similar results, proving that the effect of a change in the employment rate mainly occurs through the effect on the student time to degree (see Table A4 in Appendix).

Table 6
Employment probability of STEM and Non-STEM graduates three years after graduation.

	(1)	(2)	(3)	(4)
	STEM int. Reg.	STEM IV int. reg.	Non-STEM int. Reg.	Non-STEM IV int. reg.
Delay (years)	−0.000	0.007	−0.010***	−0.010***
	(0.002)	(0.005)	(0.002)	(0.003)
Women	−0.045***	−0.042***	−0.042***	−0.042***
	(0.008)	(0.008)	(0.007)	(0.007)
Job during university	0.020***	0.016**	0.058***	0.058***
	(0.008)	(0.008)	(0.006)	(0.007)
Experiences abroad	0.006	0.009	0.033***	0.033***
	(0.012)	(0.012)	(0.008)	(0.008)
Scholarship	−0.011	−0.007	−0.014**	−0.014**
	(0.008)	(0.009)	(0.007)	(0.007)
Final grade ≥ 105/110	−0.050***	−0.044***	0.035***	0.035***
	(0.008)	(0.009)	(0.007)	(0.007)
Empl. rate variation (instrument – 1st stage)		−0.812***		−1.124***
		(0.026)		(0.015)
Weak identification test (Cragg–Donald Wald F statistic)		*1044.5*		*4680.3*
P-value		*0*		*0*
Wald test of exogeneity (corr = 0) χ^2 (1)		*2.15*		*0*
Prob > χ^2		*0.143*		*0.96*
Observations	6253	6253	15,464	15,464

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
Other controls included: high school track (academic vs. other), high school grade, parents' education, age at first enrollment at university, dummy for late registration at university, university attended, and geographical macro-area.

6.3. Sensitivity analysis

Considering the growing literature suggesting that there are greater job opportunities for graduates in STEM[35] compared to socio-humanistic disciplines, we devote further attention to these two categories of individuals to provide evidence on the potentially different consequences of postponing graduation. By running separate estimates for STEM and non-STEM graduates, Table 6 shows that three years after graduation, only those belonging to the non-STEM group are less likely to find a job (0.1 pp) if they did not complete university studies within the minimum period. Delayed graduation is partially compensated by having gained previous job experience, Erasmus experiences, and by achieving a high final grade. With reference to the subsample of STEM graduates, it emerges that this group does not face any penalization for elapsed time to degree, and only previous experiences in the labor market increase this transition probability. This result suggests that the choice of these college majors prevents graduates from experiencing unemployment, while all the other characteristics become negligible in the selection process. For both subgroups, estimates are confirmed when endogeneity issues are accounted for.

Findings for the STEM and non-STEM groups five years after graduation are in line with those observed after three years (Table A5). It is confirmed that graduates in STEM are affected very little by other relevant traits of the university experience (time to degree, final grade, work or study abroad experiences). Still persistent is the gap in finding a job for women, with females in the STEM group facing a lower probability by 4.2 pp., suggesting that implicit stereotypes about women and

[35] In Italy, on average, only 20% of students enroll in STEM degree courses (30% and 13% for men and women, respectively) (OECD, various years).

Table 7
Net monthly earnings of STEM and Non-STEM graduates three and five years after graduation.

Panel A - Three years after graduation				
	(1)	(2)	(3)	(4)
	STEM int. Reg.	STEM IV int. reg.	Non-STEM int. Reg.	Non-STEM IV int. reg.
Delay (years)	−2.20	−10.30	−10.20***	−17.0***
	(3.287)	(6.705)	(2.103)	(3.876)
Women	−240.4***	−244.4***	−215.8***	−218.1***
	(12.799)	(13.363)	(8.779)	(9.689)
Job during university	43.70***	49.00***	37.60***	42.30***
	(12.213)	(10.169)	(8.727)	(9.830)
Experiences abroad	109.2***	107.0***	81.2***	80.3***
	(18.258)	(22.64)	(9.600)	(9.956)
Scholarship	−0.60	−4.40	−19.30**	−23.70**
	(13.345)	(19.367)	(8.872)	(10.2)
Final grade ≥ 105/110	−40.50***	−47.143***	−17.40**	−20.20
	(13.406)	(11.272)	(8.704)	(12.893)
Constant	1569.4***	1621.1***	1119.2***	1147.3***
	(246.815)	(215.96)	(141.166)	(121.67)
Empl. rate variation (instrument – 1st stage)		−0.812***		−1.159***
		(0.028)		(0.017)
/lnsigma	6.045***		6.043***	
	(0.010)		(0.007)	
Weak Instrument Test		*326.2*		*298.6*
P-value		*0*		*0*
Wald test of exogeneity (corr = 0) χ^2 (1)		*1.25*		*2.71*
Prob > χ^2		*0.263*		*0.099*
Observations	5434	5434	12,118	12,118
Panel B - Five years after graduation				
Delay (years)	−12.834***	−27.246***	−15.904***	−26.502***
	(3.628)	(6.190)	(2.208)	(4.081)
Women	−313.789***	319.299***	−298.765***	−301.429***
	(14.038)	(16.345)	(9.270)	(8.229)
Job during university	69.042***	77.772***	42.060***	48.904***
	(13.472)	(14.902)	(9.142)	(8.957)
Experiences abroad	137.149***	130.170***	108.400***	106.298***
	(20.598)	(37.230)	(10.476)	(12.615)
Scholarship	−37.876***	−46.497***	−26.252***	−32.568***
	(14.587)	(14.848)	(9.468)	(9.756)
Final grade ≥ 105/110	−44.534***	−54.497***	−2.284	−8.089
	(14.668)	(16.145)	(9.222)	(19.203)
Constant	1779.031***	1882.12***	1691.910***	1743.00***
	(265.449)	(351.54)	(152.281)	(144.506)
Empl. rate variation (instrument – 1st stage)		−0.827***		−1.166***
		(0.027)		(0.016)
/lnsigma	6.170***		6.158***	
	(0.010)		(0.006)	
Weak Instrument Test		*493.778*		*304.822*
P-value		*0*		*0*
Wald test of exogeneity		*5.1846*		*5.3055*

(continued on next page)

Table 7 (*continued*)

Panel A - Three years after graduation				
	(1)	(2)	(3)	(4)
	STEM int. Reg.	STEM IV int. reg.	Non-STEM int. Reg.	Non-STEM IV int. reg.
(corr = 0) χ^2 (1)				
Prob > χ^2		*0.0228*		*0.0213*
Observations	5696	5696	13,428	13,428

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
Other controls included: high school track (academic vs. other), high school grade, parents' education, age at first enrollment at university, dummy for late registration at university, university attended, and geographical macro-area.

mathematics persist and revealing a strong bias of employers related to their expectations of candidate performance by sex [64].

Panel A in Table 7 contains the results of the earnings equation run according to the two subgroups of college majors three years after graduation. With reference to delayed graduation, a penalty is observed only for non-STEM graduates (about 10 euros), whereas elapsed time to degree does not influence the earnings of STEM graduates. Once in the labor market, women, regardless the field of study, are penalized, and even more in STEM jobs [65]. Controlling for nonrandom selection into delay that may induce spurious correlations between delay and unmeasured individual characteristics, we find that delayed graduation entails a larger penalty for both groups.

The pattern recorded five years after graduation (Table 7 - panel B) is very similar to the one proposed in the top panel, although in absolute terms, the size of the coefficients is increased. In particular, the penalty for women is augmented, especially in the STEM group. Solving for endogeneity issues, IV estimates reveal that delayed graduation, for both STEM and non-STEM graduates, has a larger negative effect on monthly earnings, suggesting that delayed graduation weakly affects the transition into the labor market, whereas it has a significant and sizeable negative effect on monetary returns.

7. Concluding remarks

The Italian university system is homogeneous, given that all universities provide the same types of degrees. Despite the autonomy granted to each university, the curricula of the different degree programs must comply with national rules in terms of the number and types of exams to be passed. Moreover, at least from a normative point of view, degrees in the same field have the same value for access to the labor market, independent of the university that issued the degree.

University students can, however, differentiate their *curricula studiorum* in several ways in order to improve their employment chances. They can get a high final grade to signal to potential employers their theoretical grounding. They can accumulate work experience while studying to signal their practical abilities. Finally, they can graduate on time to prove their organizational ability. Nevertheless, students may overestimate (underestimate) the positive (negative) effects that such signals have in the labor market.

This study estimates the impact of the time to degree on graduates' early career outcomes, controlling for other features that can differentiate graduates' *curricula*. We find that postponing graduation has a negative and persistent effect on the future employment outcomes. However, the effect is not homogeneous over different types of graduates. Our findings show that women and graduates in non-STEM fields (i.e., the humanities, law, psychology, sociology, political science, business and economics, etc.) are notably negatively affected by a delay in obtaining a university degree. Such results suggests that staying enrolled at university well beyond the prescribed duration of the degree course is especially detrimental for those who are already perceived as "weaker" in the graduate labor market. More generally, women seem to be more penalized by negative features of their university experience (for instance, lack of motivation or family's poor economic conditions), while they benefit more from positive traits (for instance, high final grade) than men and STEM graduates. If the empirical strategy applied is convincing in tackling the causal relationship between time to degree and employment outcomes, the lesson we have learned is that especially women and non-STEM students should be mindful of the time taken to obtain a degree rather than focusing, for instance, on achieving a high final grade, considering the negligible positive returns this implies.

Overall, our findings suggest the need of policies that aim at closing the gap between graduates who completed their degree program within the minimum period required, and those who, instead, spent more than the expected duration. In particular, students have to be informed about the negative economic consequences of postponing graduation in order to modify this behavior. In this regard, individuals may benefit from all-inclusive orientation activities before enrolment as well as during the university career, since they can forecast the labor market outcomes in case of delay. Moreover, to avoid elapsed time to degree it is necessary to intervene in the rules and organization of the degree programs. The great flexibility that features the Italian university courses, namely when to sit an exam, the possibility of postponing difficult exams till the last years, and to re-sit any exam as many times as wished to improve the grade, instead of helping students, seems to be detrimental in terms of completion rates as well as graduation on time. For that reason, stricter rules would probably help students to follow more standard path. First, exams scheduled in a specific academic year should be passed in the same year to be admitted to the subsequent one, thus students cannot freely decide when to sit an exam. Second, the number of times in which students can re-take an exam should be limited, as in the most countries. However, a mere tightening of the university rules can hardly solve the problem of the excessive time to degree in an underfunded system (see for instance [66] fig. C2.2 page 261) by itself. More resources should be devoted to increase the number of public university grants and accommodation to give the opportunity to deserving students from disadvantaged backgrounds to prevent delayed graduation because of the need, for instance, of working while studying.

CRediT authorship contribution statement

Carmen Aina: Writing - review & editing, Data curation, Conceptualization. **Giorgia Casalone:** Writing - review & editing, Data curation, Conceptualization.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.seps.2020.100822.

Appendix

Table A1
Variable name and description

Variable	Description
Employed	a dummy taking a value of 1 for graduates who are working and 0 for those who are unemployed
Net monthly earnings	graduates' net monthly earnings in over 13 brackets
Gender	a dummy taking a value of 1 for female graduates and 0 for those who are males
Age at matriculation	age at which a student enrolled at university
Late registration	a dummy taking a value of 1 for graduates who enrolled after November 1st of each year and 0 otherwise
Academic high school diploma	a dummy taking a value of 1 for graduates who obtained an academic high school diploma and 0 for those with other types of high school diploma
High school final grade	high school mark that ranges between 36 (minimum grade) to 60 (maximum grade)
Parents' education	
University degree	a dummy taking a value of 1 for graduates whose parents had a university degree and 0 otherwise
High school diploma	a dummy taking a value of 1 for graduates whose parents had a high school diploma and 0 otherwise
Field of Study	
Non-STEM	a dummy taking a value of 1 for graduates in business and economics, modern literature and philosophy, law, psychology, political science, architecture and 0 otherwise
Business and Economics	a dummy taking a value of 1 for graduates in business and economics and 0 otherwise
Modern literature and philosophy	a dummy taking a value of 1 for graduates in modern literature and philosophy and 0 otherwise
Law	a dummy taking a value of 1 for graduates in law and 0 otherwise
Psychology	a dummy taking a value of 1 for graduates in psychology and 0 otherwise
Political science	a dummy taking a value of 1 for graduates in political science and 0 otherwise
Architecture	a dummy taking a value of 1 for graduates in architecture and 0 otherwise
STEM	a dummy taking a value of 1 for graduates in agriculture, pharmacy, engineering, science and 0 otherwise
Agriculture	a dummy taking a value of 1 for graduates in agriculture and 0 otherwise
Pharmacy	a dummy taking a value of 1 for graduates in pharmacy and 0 otherwise
Engineering	a dummy taking a value of 1 for graduates in engineering and 0 otherwise
Science	a dummy taking a value of 1 for graduates in science and 0 otherwise
Top final grade ($\geq$105)	a dummy taking a value of 1 for graduates with university final grade equals to or greater than 105 (maximum grade 110) and 0 otherwise
Scholarship	a dummy taking a value of 1 for graduates who benefited of a scholarship and 0 otherwise
Having worked during university	a dummy taking a value of 1 for graduates who had working experience during university and 0 otherwise
Erasmus experience	a dummy taking a value of 1 for graduates who had any experience abroad during university (Erasmus) and 0 otherwise
Geographic area of study	
North-east	a dummy taking a value of 1 for graduates who studied in the north-east of Italy and 0 otherwise
Center	a dummy taking a value of 1 for graduates who studied in the center of Italy and 0 otherwise
South and islands	a dummy taking a value of 1 for graduates who studied in the south and islands of Italy and 0 otherwise
Delay	the number of additional years spent to get a degree beyond the minimum period

Table A2
Employment probability five years after graduation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	All probit	All IV probit	Men probit	Men IV probit	Women probit	Women IV probit
Delay (years)	−0.005***	−0.007***	−0.002**	−0.002	−0.007***	−0.009***
	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)	(0.003)
Women	−0.024***	−0.025***				
	(0.004)	(0.004)				
Chemistry & pharmacy	−0.014	−0.015*	−0.004	−0.004	−0.020	−0.021
	(0.009)	(0.009)	(0.011)	(0.011)	(0.013)	(0.013)
Agriculture	−0.034***	−0.034***	−0.031***	−0.030***	−0.030*	−0.032*
	(0.010)	(0.010)	(0.010)	(0.010)	(0.017)	(0.017)
Architecture	0.011	0.013	0.007	0.007	0.008	0.010
	(0.012)	(0.012)	(0.014)	(0.014)	(0.019)	(0.019)
Engineering	0.042***	0.042***	0.035***	0.034***	0.026	0.027
	(0.009)	(0.009)	(0.008)	(0.008)	(0.020)	(0.020)
Sociology and political science	−0.028***	−0.029***	−0.036***	−0.036***	−0.014	−0.015
	(0.007)	(0.007)	(0.008)	(0.008)	(0.012)	(0.012)
Psychology	−0.057***	−0.059***	−0.055***	−0.055***	−0.063***	−0.066***
	(0.009)	(0.009)	(0.014)	(0.014)	(0.013)	(0.013)
Science	−0.058***	−0.058***	−0.029***	−0.029***	−0.079***	−0.079***
	(0.007)	(0.007)	(0.008)	(0.008)	(0.010)	(0.010)
Humanities	−0.044***	−0.044***	−0.050***	−0.050***	−0.042***	−0.043***
	(0.006)	(0.006)	(0.008)	(0.008)	(0.009)	(0.009)
Law	−0.031***	−0.030***	−0.018***	−0.018***	−0.038***	−0.037***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.009)	(0.009)
Job during university	0.023***	0.024***	0.017***	0.017***	0.026***	0.027***
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Experiences abroad	0.004	0.004	−0.001	−0.001	0.006	0.006
	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)

(*continued on next page*)

Table A2 (*continued*)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	All probit	All IV probit	Men probit	Men IV probit	Women probit	Women IV probit
Scholarship	−0.006*	−0.007*	−0.004	−0.004	−0.008	−0.009
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)
Final grade ≥ 105/110	0.010**	0.009**	0.003	0.004	0.015***	0.014**
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
Empl. rate variation (instrument – 1st stage)		−1.015***		−0.851***		−1.134***
		(0.013)		(0.022)		(0.017)
Weak identification test (Cragg–Donald Wald F statistic)		*5463.6*		*1456.7*		*4318.9*
P-value		*0*		*0*		*0*
Wald test of exogeneity (corr = 0) χ^2 (1)		*0.84*		*0*		*0.75*
Prob > χ^2		*0.359*		*0.98*		*0.387*
Observations	21,598	21,598	8701	8701	12,897	12,897

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
Other controls included: high school track (academic vs. other), high school grade, parents' education, age at first enrollment at university, dummy for late registration at university, university attended, and geographical macro-area. Reference category for the field of study: business and economics.

Table A3
Employment probability three years after graduation - Restricted sample of the graduates who did not change university/field of study/degree program.

	(1)	(2)	(3)	(4)	(5)	(6)
	All probit	All IV probit	Men probit	Men IV probit	Women probit	Women IV probit
Delay (years)	−0.007***	−0.003	−0.001	0.008*	−0.012***	−0.010**
	(0.001)	(0.003)	(0.002)	(0.005)	(0.002)	(0.004)
Empl. rate variation (instrument – 1st stage)		−1.006***		−0.837***		−1.129***
		(0.014)		(0.023)		(0.017)
Weak identification test (Cragg-Donald Wald F statistic)		*5016.64*		*1318.17*		*3983.88*
P-val		*0*		*0*		*0*
Wald test of exogeneity (corr = 0) chi2(1)		*2.18*		*4.33*		*0.49*
Prob > chi2		*0.14*		*0.037*		*0.4833*
Observations	19,770	19,770	7987	7987	11,783	11,783

Standard errors in parenthesis. ***p < 0.01, **p < 0.05, *p < 0.1.
Estimates include the same controls as of Table 3. Complete estimates are available upon request.

Table A4
Net monthly earnings three after graduation - Restricted sample of the graduates who did not change university/field of study/degree program.

	(1)	(2)	(3)	(4)	(5)	(6)
	All int. reg.	All IV int. reg.	Men int. reg.	Men IV int. reg.	Women int. reg.	Women IV int. reg.
Delay (years)	−8.574***	−15.396***	−7.562**	−13.48	−9.354***	−16.02***
	(1.863)	(3.248)	(3.190)	(8.776)	(2.203)	(2.924)
Empl. rate variation (instrument – 1st stage)		−1.015***		−0.842***		−0.842***
		(0.015)		(0.025)		(0.025)
/lnsigma	6.016***		6.160***		5.871***	
	(0.006)		(0.009)		(0.008)	
Weak Instrument Test		*299*		*160*		*417.4*
P-value		*0*		*0*		*0*
Wald test of exogeneity (corr = 0) chi2(1)		*3.605*		*0.451*		*8.381*
Prob > chi2		*0.057*		*0.502*		*0.004*
Observations	15,973	15,973	6751	6751	9222	9222

Standard errors in parenthesis. ***p < 0.01, **p < 0.05, *p < 0.1.
Estimates include the same controls as of Tables 4 and 5. Complete estimates are available upon request.

Table A5
Employment of STEM and Non-STEM graduates five years after graduation

VARIABLES	(1)	(2)	(3)	(4)
	STEM int. Reg.	STEM IV int. reg.	Non-STEM int. Reg.	Non-STEM IV int. reg.
Delay (years)	−0.003*	−0.001	−0.005***	−0.007***
	(0.001)	(0.004)	(0.001)	(0.002)
Women	−0.042***	−0.042***	−0.031***	−0.031***
	(0.005)	(0.006)	(0.005)	(0.005)
Job during university	0.007	0.006	0.030***	0.031***
	(0.005)	(0.006)	(0.004)	(0.005)

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Table A5 (*continued*)

VARIABLES	(1)	(2)	(3)	(4)
	STEM int. Reg.	STEM IV int. reg.	Non-STEM int. Reg.	Non-STEM IV int. reg.
Experiences abroad	−0.003	−0.002	0.004	0.004
	(0.009)	(0.009)	(0.006)	(0.006)
Scholarship	−0.011*	−0.010	−0.006	−0.008
	(0.006)	(0.006)	(0.005)	(0.005)
Final grade ≥ 105/110	−0.015***	−0.014**	0.011**	0.009*
	(0.006)	(0.006)	(0.005)	(0.005)
Empl. rate variation (instrument – 1st stage)		−0.811***		−1.138***
		(0.026)		(0.015)
Weak identification test (Cragg–Donald Wald F statistic)		*1019.5*		*4818.6*
P-value		*0*		*0*
Wald test of exogeneity (corr = 0) χ^2 (1)		*0.745*		*1.05*
Prob > χ^2		*0.621*		*0.305*
Observations	6235	6235	15,363	15,363

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
Other controls included: high school track (academic vs. other), high school grade, parents' education, age at first enrollment at university, dummy for late registration at university, university attended, and geographical macro-area.

Table A6
Delay equation – First stage of employment probability equation - three years and five years from graduation

	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	All – 3 y	Men – 3y	Women-3y	noSTEM-3y	STEM-3y	All-5y	Men-5y	Women-5y	noSTEM-5y	STEM-5y
Employment rate variation	−1.005***	−0.839***	−1.126***	−1.124***	−0.812***	−1.015***	−0.851***	−1.134***	−1.138***	−0.811***
	(0.013)	(0.022)	(0.016)	(0.015)	(0.026)	(0.013)	(0.022)	(0.017)	(0.015)	(0.026)
Women	−0.140***			−0.183***	−0.323***	−0.135***			−0.164***	−0.353***
	(0.026)			(0.031)	(0.045)	(0.026)			(0.031)	(0.045)
Age at 1st enrollment	−0.089***	−0.061*	−0.111***	−0.125***	−0.094**	−0.065***	−0.063*	−0.068***	−0.094***	−0.067
	(0.021)	(0.035)	(0.025)	(0.024)	(0.045)	(0.021)	(0.034)	(0.026)	(0.024)	(0.043)
Late enrollment	0.536***	0.437***	0.599***	0.469***	0.756***	0.550***	0.522***	0.570***	0.473***	0.841***
	(0.062)	(0.102)	(0.077)	(0.069)	(0.139)	(0.063)	(0.105)	(0.079)	(0.071)	(0.142)
High school final grade	−0.042***	−0.049***	−0.038***	−0.037***	−0.048***	−0.042***	−0.050***	−0.036***	−0.036***	−0.049***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)
Academic high school track	−0.190***	−0.229***	−0.172***	−0.151***	−0.194***	−0.183***	−0.257***	−0.150***	−0.152***	−0.214***
	(0.027)	(0.056)	(0.030)	(0.029)	(0.064)	(0.027)	(0.056)	(0.030)	(0.029)	(0.064)
At least 1 parent with high school degree	−0.046	0.013	−0.094**	−0.057	−0.044	−0.049	0.017	−0.094***	−0.043	−0.073
	(0.031)	(0.053)	(0.037)	(0.037)	(0.057)	(0.030)	(0.053)	(0.036)	(0.037)	(0.057)
At least 1 parent with university degree	−0.270***	−0.242***	−0.285***	−0.258***	−0.245***	−0.249***	−0.221***	−0.262***	−0.255***	−0.200***
	(0.031)	(0.051)	(0.037)	(0.036)	(0.060)	(0.030)	(0.051)	(0.037)	(0.036)	(0.058)
Job during university	0.413***	0.499***	0.346***	0.362***	0.478***	0.413***	0.522***	0.334***	0.362***	0.484***
	(0.024)	(0.040)	(0.030)	(0.029)	(0.043)	(0.024)	(0.040)	(0.030)	(0.029)	(0.043)
Experiences abroad	−0.217***	−0.395***	−0.115***	−0.209***	−0.307***	−0.203***	−0.349***	−0.121***	−0.185***	−0.265***
	(0.027)	(0.045)	(0.033)	(0.031)	(0.055)	(0.027)	(0.047)	(0.033)	(0.031)	(0.058)
Scholarship	−0.461***	−0.468***	−0.431***	−0.478***	−0.472***	−0.450***	−0.473***	−0.413***	−0.465***	−0.457***
	(0.023)	(0.041)	(0.028)	(0.028)	(0.043)	(0.023)	(0.040)	(0.028)	(0.028)	(0.042)
Final grade ≥ 105/110	−0.428***	−0.483***	−0.390***	−0.378***	−0.581***	−0.456***	−0.499***	−0.427***	−0.403***	−0.592***
	(0.026)	(0.044)	(0.032)	(0.030)	(0.047)	(0.026)	(0.043)	(0.032)	(0.030)	(0.047)
Constant	6.512***	6.014***	6.747***	6.951***	6.676***	5.716***	6.390***	5.845***	6.219***	6.147***
	(0.441)	(0.724)	(0.538)	(0.511)	(0.935)	(0.440)	(0.729)	(0.553)	(0.515)	(0.892)
R-squared	*0.402*	*0.354*	*0.438*	*0.402*	*0.358*	*0.406*	*0.363*	*0.439*	*0.407*	*0.366*
Observations	21,763	8770	12,993	15,464	6299	21,598	8701	12,897	15,363	6235

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
Other controls included field of study, university attended, geographical macro-area. Reference category for high school track: non-academic oriented. Reference category for parents' education: both parents with compulsory education.
Note: the covariates of the first stage are the same of the main equation. We report those who are more interesting in terms of interpretability.

Table A7
Delay equation –First stage of earnings equation - three years and five years from graduation

	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	All – 3 y	Men – 3y	Women-3y	noSTEM-3y	STEM-3y	All-5y	Men-5y	Women-5y	noSTEM-5y	STEM-5y
Employment rate variation	−1.018***	−0.845***	−1.158***	−1.159***	−0.812***	−1.033***	−0.872***	−1.160***	−1.166***	−0.827***
	(0.015)	(0.024)	(0.018)	(0.017)	(0.028)	(0.014)	(0.023)	(0.017)	(0.016)	(0.027)

(*continued on next page*)

Table A7 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	All – 3 y	Men – 3y	Women-3y	noSTEM-3y	STEM-3y	All-5y	Men-5y	Women-5y	noSTEM-5y	STEM-5y
Women	−0.162***			−0.218***	−0.302***	−0.144***			−0.174***	−0.356***
	(0.028)			(0.034)	(0.048)	(0.027)			(0.032)	(0.047)
Age at 1st enrollment	−0.083***	−0.044	−0.117***	−0.112***	−0.101**	−0.074***	−0.062*	−0.082***	−0.104***	−0.074
	(0.023)	(0.037)	(0.027)	(0.026)	(0.049)	(0.022)	(0.036)	(0.028)	(0.026)	(0.045)
Late enrollment	0.539***	0.418***	0.616***	0.467***	0.738***	0.585***	0.493***	0.644***	0.508***	0.862***
	(0.072)	(0.118)	(0.090)	(0.082)	(0.154)	(0.069)	(0.111)	(0.087)	(0.077)	(0.152)
High school final grade	−0.040***	−0.046***	−0.035***	−0.033***	−0.047***	−0.040***	−0.049***	−0.035***	−0.034***	−0.048***
	(0.002)	(0.004)	(0.003)	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)	(0.004)
Academic high school track	−0.163***	−0.230***	−0.133***	−0.125***	−0.227***	−0.180***	−0.273***	−0.140***	−0.147***	−0.217***
	(0.029)	(0.062)	(0.033)	(0.031)	(0.070)	(0.028)	(0.059)	(0.032)	(0.030)	(0.069)
At least 1 parent with high school degree	−0.060*	−0.020	−0.104***	−0.068*	−0.081	−0.042	0.030	−0.093**	−0.035	−0.068
	(0.032)	(0.055)	(0.038)	(0.039)	(0.059)	(0.032)	(0.055)	(0.037)	(0.038)	(0.059)
At least 1 parent with university degree	−0.239***	−0.253***	−0.227***	−0.215***	−0.238***	−0.235***	−0.213***	−0.242***	−0.244***	−0.177***
	(0.033)	(0.054)	(0.041)	(0.040)	(0.063)	(0.032)	(0.053)	(0.039)	(0.037)	(0.061)
Job during university	0.426***	0.489***	0.371***	0.366***	0.498***	0.425***	0.525***	0.348***	0.367***	0.498***
	(0.026)	(0.043)	(0.032)	(0.032)	(0.045)	(0.025)	(0.041)	(0.031)	(0.030)	(0.044)
Experiences abroad	−0.206***	−0.372***	−0.107***	−0.183***	−0.319***	−0.209***	−0.350***	−0.129***	−0.183***	−0.285***
	(0.028)	(0.048)	(0.035)	(0.032)	(0.058)	(0.028)	(0.048)	(0.035)	(0.032)	(0.059)
Scholarship	−0.429***	−0.449***	−0.388***	−0.433***	−0.454***	−0.432***	−0.458***	−0.390***	−0.447***	−0.445***
	(0.025)	(0.043)	(0.030)	(0.031)	(0.045)	(0.024)	(0.042)	(0.030)	(0.029)	(0.044)
Final grade ≥ 105/110	−0.410***	−0.476***	−0.367***	−0.349***	−0.565***	−0.428***	−0.460***	−0.404***	−0.375***	−0.554***
	(0.028)	(0.046)	(0.035)	(0.033)	(0.050)	(0.027)	(0.045)	(0.034)	(0.031)	(0.049)
Constant	6.168***	5.721***	6.524***	6.443***	6.682***	0.425***	0.525***	0.348***	0.367***	0.498***
	(0.475)	(0.785)	(0.576)	(0.547)	(1.004)	(0.025)	(0.041)	(0.031)	(0.030)	(0.044)
R-squared	0.413	0.362	0.454	0.420	0.361	0.409	0.365	0.443	0.414	0.366
Observations	17,552	7386	10,166	12,118	5434	19,124	7905	11,219	13,428	5696

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

Other controls included field of study, university attended, geographical macro-area. Reference category for high school track: non-academic oriented. Reference category for parents' education: both parents with compulsory education.

Note: the covariates of the first stage are the same of the main equation. We report those who are more interesting in terms of interpretability.

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