

# Age at graduation and early career prospects

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## Abstract

We analyse the association between the age at tertiary graduation and the outcomes of the first phase of the working career in Italy. We use a rich longitudinal dataset built merging IT-SILC survey data, containing information on workers' characteristics and education, with individual administrative records on working careers since the entry into the labour market. We observe labour market outcomes both at the entry and along the 10-year period after the graduation. Our findings do not reveal large differences in earnings and worked weeks across individuals who attained the degree at different ages, thus showing a negligible direct penalisation associated to graduation not at typical age in Italy. In particular, no statistically significant associations emerge between age at graduation and the total earnings obtained during the 10 years from graduation for males, while females graduated at an older age (over 29) experiment earning penalty.

**Keywords:** university-to-work transition, graduation age, earnings profiles, Italy.

**JEL:** I12, J24, J31.

## 1. Introduction

It is well established that people who invest in education, especially in tertiary education, have more job opportunities, thereby a reduced probability of being unemployed, greater labour market returns over their entire working life and better life conditions than those who attained fewer years of education (see, e.g., OECD, 2017). Trends in tertiary education attainment confirm these benefits since the average share of graduates in the 25-34 age cohort in the OECD countries increased from 26% to 43% in the period 2000-2016, but at the same time statistics show that the age profile of university graduates raised. In particular, in 2015 the average age at graduation in OECD countries was 26, showing a non-homogenous distribution. The variation is noteworthy, ranging from 23 in Belgium and the UK, to 28 in Chile, Sweden and Switzerland. Clearly, the average age at which students first graduate is a combination of average age at entry and programme length. For instance, in 2015 students usually enrol at the age of 20, 22, 24 and 25 in Belgium, Chile, Sweden and Switzerland, respectively, thus explaining different students' trajectories before entering university.

The propensity to delay graduation has drawn the attention of researchers, who attempt to provide evidence of the economic returns of a graduation not at the “expected” age (i.e. the age consistent with the legal duration of education programs). Contrary to the policy of lifelong learning encouraged by the European Commission and promoted in numerous countries, postponement of university graduation has several drawbacks. Unless late enrollees can improve their job opportunities and their wage profiles, especially if their current labour market status is weak – either because they are not working or because they are doing a job for which the university degree is not necessary –, they reduce the span in employment over their life course.<sup>1</sup> The latter fact can negatively affect individuals’ earnings profiles, hence (entirely or partly) vanishing the benefits associated to human capital accumulation. All in all, the main concern of completing a university degree late in life is of failing to attain the earnings of individuals who take the more traditional route of school and work.

Although postponing labour market entry because of older age at both university enrolment and graduation is a recent phenomenon in the OECD countries, it has always been a distinctive trait of the Italian tertiary education system (Aina et al. 2011; Garibaldi et al. 2012). Both private and public universities have no official limit to the number of years a student can be enrolled in a degree programme, since progression is not conditional on past performance; students can re-sit exams several times during an academic year if they fail, but also if they are unhappy with the mark obtained. Consequently, before implementing the university reform in 2001, which replaced the single-tier tertiary education programmes whose duration was of 4 or 5 years (6 years for students in Medicine) with a two-tier system articulated in first-level (3 years) and second-level (2 years) degrees, students enrolled in four-year degree courses obtained their degree in 7.5 years, on average, with only one in eight students completing it within the legal duration (ISTAT, 2000). Even after this reform, only 46% of students obtain a 3-year degree within the minimum period (AlmaLaurea, 2016).

Despite the recent lowering age at graduation at first-level degree, the number of students enrolled beyond the legal duration increased over time, which indicates a waste of public and private resources along with a postponement of labour market entry. Thus, the narrow portion of graduates above 30 years in Italy (about 16%) cannot be interpreted as an efficient behaviour of Italian students compared to those of the Nordic countries, because, as mentioned, the entry age in tertiary education programme is different across countries. Indeed, this percentage is confounding, as it does not discriminate between various ages at entry and motivations of delayed graduation, namely lack of abilities, mismatch in the choice of the field of study or being a worker student. For example, considering that in Italy the transition to university mainly occurs after high school completion or one year later at

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<sup>1</sup> In case of work experiences during university studies, an individual shortens the period spent into employment as a tertiary graduate.

most,<sup>2</sup> a completion not at the expected age suggests that students spend more years than those legally required for attaining the tertiary degree. This behaviour can have consequences on the labour market performance of graduates, in terms of probability of finding a job and starting wage and, in case of persistent wage penalty compared to those who completed a standard path, those who attain the degree at older ages may be not able to catch up over their entire work career. Overall, it may happen that the wage penalty associated with postponing graduation offsets the wage premium related to university degree, therefore preventing those who, for several reasons, delayed first enrolment in university to opt for further education investment.

In this article, considering the lack of evidence on this topic, we aim at investigating the consequences of age at graduation on the starting wage level, the labour market experience and earnings profiles from the first year up to the tenth year from university graduation of a representative sample of Italian graduates. In other terms, we analyse individuals' labour market outcomes over the first ten years of work career focusing on a specific trait of their academic experience, which is the timing at graduation.

By using a rich longitudinal dataset (ADministrative Statistics on Income and Living Conditions; AD-SILC) – built merging IT-SILC survey data (i.e. the Italian component of the EU-SILC), which collects information on workers' characteristics and education, with yearly detailed administrative records on individual working careers – we consider the sample of those who attained a tertiary degree in the period 1995-2001<sup>3</sup> and investigate whether different ages at graduation are associated with different wages and experience profiles over the early phase of the career. We account for the effect of a graduation not at the expected age on the earnings profile and especially, by using longitudinal data, we assess if – in case of starting wage gap – “older” graduates are able to catch up such penalty. However, in our dataset we are unable to control for unobserved abilities of individuals and for their field of studies, where the various subjects might have a different legal duration for achieving the degree and might be differently rewarded in the labour market. To overcome this limit, especially the missing information about the field of study, in our estimates we exploit detailed information on workers' sector of activity under the assumption that the heterogeneity in tertiary graduates' field of study within each specific sector is rather negligible. Furthermore, our dataset has the advantage of following the different cohorts of graduates for the first ten years after graduation, with very detailed longitudinal records (e.g., tracking annual worked weeks, earnings, employment arrangement). It also

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<sup>2</sup> About 80% of students generally enrol at university immediately after completing high school degree, namely at age 19 or less, while about 15% at age 20 and only 4% at age 21 (MIUR, several years). This implies that in Italy the most part of delayed graduations depends on students' procrastination once enrolled at university, rather than on late enrolment at university.

<sup>3</sup> We then include in our sample individuals who attained the degree before the phasing in of the 2001 Italian university reform.

allows us to distinguish those who attained the tertiary degree while working – either continuously or occasionally – from those who only entered the labour market after the graduation.

Therefore, we add to the previous studies on the economic returns to tertiary education investment by focusing on a possible gap associated with a university completion not at the expected age and assessing whether a late graduation can have persistent effects on the work career of an individual over a 10-year period. Note that we do not aim at identifying a causal relationship between age at graduation and subsequent labour market outcomes. However, our multivariate analyses enable us to describe in detail the evolution of the first phase of the working career of individuals who attained a tertiary degree at different ages.

The remainder of the paper is organised as follows. Section 2 summarises the literature related to our research. Sections 3 and 4 describe the data and the empirical strategy, respectively. Section 5 shows our main findings and Section 6 concludes.

## **2. Related Literature**

As stated in the literature, human capital influences directly both the profile and the dynamics of the working career of each individual as well as his/her income profile. At large, more educated people face lower probability of being unemployed and at the same time have more chances of facing better labour market conditions from the start. Thus, a person decides to invest in education because of better expected monetary and non-monetary returns (Becker, 1962; 1964). Not surprisingly, higher earnings prospects are the most obvious benefit and the consensus estimate is that the return to education is quite substantial. More recent analyses, mainly using US data and applying an IV strategy, suggest that an additional year of schooling typically raises an individual's earnings power by 6-7%, depending on gender (Trostel et al., 2002), whereas Card and Krueger (1992) estimate that four years of college education in the US raise earnings by about 65% (a yearly return of about 13% compounded).

In order to explain emerging earnings differences amongst workers, several aspects have been exploited. For instance, a large body of studies have analysed the link between the labour market outcomes and family background, as it is well recognised that children's education, which is the main driver of their labour market outcome, is highly correlated with parents' characteristics, especially with their level of education (Card, 1999). However, recent evidence noticed that in some countries earnings gaps within tertiary graduates are associated with their parents' socio-economic background (Raitano and Vona, 2015; 2018). Furthermore, since Tinto (1973), a positive association between college proximity and enrolment to college has been shown; especially individuals with financial

constraints and/or with lower returns' expectations in the labour market benefit from universities availability in the area of residence (Lauer, 2002).

Additional sources of heterogeneity in terms of returns to education are school quality and ability, the latter measured by IQ or aptitude test and final grade (Welch, 1973). Earnings differentials by income quintiles (Buchinsky, 2001), by gender (Blau and Kahn, 2000; 2006; Dolton and Makepeace, 1986), by parents' education and occupation (Brunello et al., 2001; Raitano and Vona, 2018) and ethnicity (Blau and Beller, 1992; Altonji and Blank, 1999) have also been investigated. Other researches, instead, look at the differences in earnings across fields of study (Berger, 1988; Daymon and Andrisani, 1984; Paglin and Rufolo, 1990; Blundell et al., 2000; Loury, 1997; Buonanno and Pozzoli, 2009). Finally, there are several contributions on the "sheepskin effect", i.e., the existence of wage premiums related to credentials rather than to the effective years of schooling attained. Other contributions explain the differences in returns to university investment, pointing out that the different individual's income obtained in the labour market is explained by the type of diploma/degree achieved rather than by the number of years spent in formal education (Belman and Heywood, 1991). However, while the issue of returns to education largely explored all the links mentioned above, much less is known about whether and how individuals' earnings are related to study completion not at the expected age. For instance, by using NLSY data from 1979 to 1993, Monks (1997) finds that the timing at graduation is important in determining wages. In particular, later graduates receive a smaller increase in earnings than earlier graduates do; this negative correlation between age at graduation and entry-level wage is persistent over time once an individual gets a degree from 32 years and above. Brodaty et al. (2008) show that, during the early work career, each additional year spent to attain a degree entails a reduction in earnings of about 9%. Aina and Casalone (2011), analysing a representative sample of Italian graduates in 2002 and 2003, interviewed five years from graduation, and controlling for fields of study, find a persisting wage penalty for Italian graduates who do not complete their undergraduate degree course within the minimum period. Since wage penalization results are associated only to long delay (more than 2 years), authors conclude that Italian employers probably do not consider short delays as an indicator of low productivity, as only a tiny fraction of students completed a degree within the legal duration at that time. Using a repeated cross-section of Italian employees, Aina and Pastore (2012) find that delayed graduation increases the chances of finding a job for which a university diploma is not required (i.e. vertical overeducation). Postponing graduation entails, in turn, a direct wage penalty, which is equal to about 7% of the median wage for each year of delay.

Holmlund et al. (2008) analyse the effect of gap years between high school and university enrolment on subsequent wages, using administrative Swedish data. This phenomenon is particularly common

in Sweden since about 25% of individuals enrol at university between two to four years after high school diploma, while about 40% more than five years later. This inevitably has a serious impact on earnings subsequent to the completion of the studies because it induces a delayed entry into the labour market. They find that taking gap years has a significant and negative effect on earnings at ages 30 and 40, which is not vanishing over the work career. Similarly, a British study finds that it takes 15 years for students graduating after 25 to fully catch up (Egerton, 2001). Analysing the economic returns to upgrading to a tertiary degree versus staying in the labour market for individuals enrolling in tertiary education after age 25, Hällsten (2009) reports an average positive return for those who choose to get late degrees. The effect is constant over age groups and is particularly concentrated to the lower parts of the earnings distribution before enrolment. Hällsten (2012), still for Sweden, finds that late enrolment in university can improve the probability of finding a job (about 12%), but it has only a negligible effect on earnings, and the effects are more pronounced for women than for men. Taniguchi (2005) estimates the college wage premium by college timing in the US. Results from fixed-effects models report that those who obtain their degree at age 25 or above receive a significantly lower premium than those who graduate at a younger age. In addition, penalty for late graduation is much smaller for women than for men, because the former, regardless when they finish university, experience a lower growth of returns to college education.

In summary, studies have particularly addressed attention to the timing of university completion and of entry into the labour market to analyse how labour market outcomes are affected by these trajectories. Although stylised facts denote a common propensity across OECD countries to postpone first-entry at university and/or graduation, the empirical evidence on the effects of this behaviour is still mixed. We add to the literature on delayed entry into the labour market by estimating the effect of age at tertiary graduation – that in Italy, due to the tendency of enrolling at university directly after high school diploma, may be considered as a very good proxy of having spent a longer than expected time to attain the degree – on the earnings profile of Italian workers over the 10-year period after graduation, by using very accurate longitudinal administrative data on employment trajectories merged with survey data that allow us to retrieve information about education achievement.

### **3. Data, sample selection criteria and variables**

We use the AD-SILC longitudinal dataset, built by merging – using individual fiscal codes as matching key – annual cross-sectional waves from 2004 to 2012 of IT-SILC (i.e. the Italian component of the European Union Statistics on Income and Living Conditions – EU-SILC) and the administrative longitudinal records collected by the Italian National Social Security Institute (INPS). The dataset includes all individuals interviewed in the various waves of IT-SILC. In detail, cross-

sectional variables collected in IT-SILC – which contains also information about education (coded through the ISCED-97 classification) and year when the highest education level was attained – have been enriched by longitudinal social security records since the entry into the labour market.

Social security records provide for any type of Italian workers their complete career profiles. In particular, thanks to the specific public pension funds where the various types of worker pay contributions, it is possible to distinguish the following categories: public and private employees, dependent self-employed (also named para-subordinate workers)<sup>4</sup> and all self-employed categories. Data contain information on gross earnings (including overtime and personal income taxes and social insurance contributions paid by the workers), working weeks, and the type of contract (i.e., self-employment, dependent self-employment or employment in the public or in the private sector), on a yearly basis and for each job contracts in place over the year. Therefore, INPS data allows us to perfectly reconstruct year by year the effective labour market experience (in weeks), total annual earnings and weekly wages (computed by dividing the total earnings obtained by the longest employment contract in each year for the corresponding number of worked weeks). Regarding employees in the private sector, INPS data also record the sector of activity, coded with the detailed (up to 6-digits) NACE Rev. 2 classification (EUROSTAT, 2008). Regarding freelance professionals, INPS archives also they record the professional association which the worker is enrolled to, thus distinguishing, e.g., lawyers, doctors, engineers, accountants, architects who work as freelance professionals. As concerns for public employees, para-subordinate workers and the few self-employed not working as professionals (e.g., craftsmen and dealers)<sup>5</sup> we can rely on information provided by the EU-SILC component of our dataset where 1 digit NACE sector of activity of activity is recorded. Furthermore, once INPS data are matched with IT-SILC, wherein information on the highest level of education and the year when this highest degree was attained are available, we can also compute individuals' labour market experience occurred in the period before graduation, namely during university and high school. Thus, the AD-SILC dataset couples very detailed information on working histories obtained from social security archives with other personal characteristics that are unavailable in administrative archives but are recorded in IT-SILC, such as the highest level of education obtained and the year of attainment of the highest degree.

In our empirical exercise, we focus only on tertiary graduates since our goal is to investigate their future labour market prospects according to the age at graduation. Particularly, we aim at analysing

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<sup>4</sup> The term dependent self-employed (usually termed “para-subordinate” workers in Italy) is used to group individuals who work as a self-employed in legal terms – they work at their own risk and are not formally subordinated to an employer – but are often “economically dependent” on an employer since, in most of cases, their activity is reliant upon single (or few) clients.

<sup>5</sup> Freelance professionals represent 80.5% of tertiary graduates working as a self-employed in our dataset,

whether entry into employment not at the expected age can have a detrimental effect on earnings profile. As concerns tertiary graduates, the year of completion of university studies – recorded in IT-SILC – is a good proxy of the year when they became active (not recorded in our dataset that only tracks individuals in administrative archives when they started to work); thus, we can study working career patterns in the period following the attainment of tertiary degree.<sup>6</sup> Conversely, as concerns upper and lower secondary educated, the year when they attained the highest education is a poor proxy of the effective year when they became active, since high drop-out from high schools and from University characterises Italy and information about possible periods spent studying without attaining a higher degree is absent in our dataset, thus preventing us to observe working career of lower educated individuals since the year when they actually became active.<sup>7</sup> Hence, we do not include individuals with a lower education as a benchmark to assess labour market outcomes of tertiary graduates after the end of the educational path, since we are not able to observe, for both lower and upper secondary educated, the effective year when they finished to study and became active.

We focus on the cohorts of individuals who attained a tertiary degree in the interval time 1996-2001 and we follow them for the 10-year period from graduation (i.e., graduates in 1996 are followed along the period 1997-2006, graduates in 1997 along the period 1998-2007, and so on). Our sample is then composed by individuals who certainly attained the tertiary degree in a single-tier university education framework (whose duration was 4-6 years according to the subject). In fact, the tertiary education reform that introduced the two-tier scheme has been implemented from the academic year 2001/02 and, thus, graduation under the new regime took place not before 2004 for students enrolled in a first-degree and in 2006 for second-level degree.

A weakness of our dataset is that the field of study of tertiary graduates is not recorded, thus preventing us from distinguishing those who attended a 4-year degree programme (the most programmes) from those who chose a 5-year degree programme (e.g., Engineering and Architecture) or a 6-year degree programme (Medicine). Furthermore, neither information about the reason of a possible delay in attaining a degree nor proxies about students' abilities (e.g. the grades) are available. However, our attempt to lessen the potential bias related to missing information on field of study and in turn the degree programme length relies on exploiting the sector of activity, which allows controlling for the heterogeneous labour market returns of different tertiary degree programmes. , Moreover, the advantage of the dataset used, to the best of our knowledge, is that it allows researchers

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<sup>6</sup> In IT-SILC the year of completion of studies for post tertiary graduates (a very limited share of Italian workers) refers to the year when the post tertiary degree was attained. Note also that we exclude from the analysis the few tertiary graduates that were still studying at the time of interview in IT-SILC.

<sup>7</sup> According to OECD statistics for 2002 reported by Cingano and Cipollone (2002), the drop-out rate from university amounted to 57.8% in Italy, while it was 36.3% in France, 28.5% in Germany, 23.7% in Spain and 17.0% in the UK.



to follow individuals who attained a tertiary degree at different ages over a large part of their working career, providing very detailed information on their employment status and earnings. Indeed, it has to be remarked that the very rich administrative longitudinal records collected by the Italian Social Security Institute have no information about workers' education, whereas survey samples have a limited time span in Italy (e.g., at most 4 years in the EU-SILC). The matching between the Italian EU-SILC waves and the administrative records enable us to overcome these crucial limits of the two different data sources.

We exclude from the sample individuals without the Italian citizenship because the retrospective AD-SILC panel under-represents immigrants in past years; besides, we do not know the country where immigrants attained the degree. Being interested in analysing working career after the tertiary graduation, we also exclude “non-standard graduates” (24% of the starting sample), identified in two ways: those who can be considered as workers before graduation (i.e., who worked for more than 52 weeks until the year they attained the tertiary degree) and the few individuals who graduated after age 35.<sup>8</sup> To reduce the influence of possible outliers due to measurement errors (however rare in administrative data), we drop from the sample the top and bottom 1% of weekly wages and annual earnings distribution.<sup>9</sup> Wages and earnings are defined at constant prices 2015 (nominal values have been converted in real values using the consumer price index).

Our final sample includes 14,749 observations, corresponding to 1,774 individuals – whereof 1,018 females and 756 males – who attained a tertiary degree between 1996 and 2001, followed for 10 years after the graduation (see Table 1).<sup>10</sup> Consistently with the increasing trend in the number of tertiary graduates in Italy, the share of individuals who obtained a university diploma at the end of the observation period is higher than the number of those who graduated at the beginning of the period analysed.

[Table 1 approximately here]

Graduates included in our estimates are those who attained the degree in the age bracket 22-35. The mean graduation age is 26.4 (26.7 and 26.1 for males and females, respectively), the median age is 26 for both sexes while the standard deviation is 2.5 for both males and females (see Table 1 where

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<sup>8</sup> Our results are, however, robust to different sample rules about “non-standard tertiary graduates”.

<sup>9</sup> Our results are, however, robust to different choices about the trimming of extreme values.

<sup>10</sup> The panel is unbalanced since some individuals are absent in administrative archives during the 10-year period. However, the absence is not due to attrition (all workers are tracked by these archives) but is due to a whole year spent without working. The absence might depend on several reasons (long-term unemployment, informal work, voluntary inactivity, migration abroad) that are not distinguished on our dataset. Note, however, that periods spent in sickness, maternity or receiving the *Cassa Integrazione* allowance for temporary suspension of the job without having been fired are, instead, recorded and considered as working periods in our dataset.

the distribution of the age at graduation variable is shown). Both the median and the mean graduation ages are rather constant across cohorts.

#### **4. Empirical strategy**

As mentioned in the Introduction, we do not aim at identifying a causal relationship between age at graduation and subsequent labour market outcomes. Our goal is, instead, to exploit our rich longitudinal dataset to study the association between the age at tertiary graduation and multiple labour market outcomes along the 10-year period after the graduation.

To analyse the link between age at graduation and individuals' labour market outcomes, we carry out three separate sets of estimates. All estimates are run through OLS, apart from the analysis of the contractual arrangement at the entry in the labour market that is studied by using a multinomial logit model.

First, we focus on the entry year into the labour market after the graduation (that may differ from the year after the graduation in case of delayed entry)<sup>11</sup> and we estimate the association between age at graduation and three outcomes: the contractual arrangement at the entry, weekly wages and annual earnings.<sup>12</sup> As mentioned, we distinguish among four types of employment arrangements, i.e., individuals might work as: employee in the private sector (the reference category), employee in the public sector, dependent self-employed, self-employed. Since employment arrangements differ in the hiring processes (e.g., public competitions in the public sector, curricula and job interviews in the private sector and for dependent self-employed), we aim at testing whether graduation not at the expected age plays different roles in determining the type of job achieved by tertiary graduates.

Then we follow individuals over the 10-year period and estimate the association between the age at graduation and three outcomes – annual worked weeks, weekly wages and annual earnings – in each year of the 10-year period after the graduation through OLS.<sup>13</sup> Distinguishing the entry year and each year of the 10-year period allows us to provide evidence about temporary or permanent effects of delayed graduation.<sup>14</sup>

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<sup>11</sup> The entry year is identified as the first year with positive earnings after the graduation.

<sup>12</sup> We do not include searching time from the graduation until the first working arrangement as a labour market outcome since searching time is mis-measured in our dataset. In particular, we observe the year of graduation but not the exact date of university degree attainment.

<sup>13</sup> If an individual is not recorded in a year in the administrative archives – i.e. she has no worked weeks and no earnings – she is not included in our estimates in that year, since, as mentioned, no information about the reason of the absence is available in the dataset.

<sup>14</sup> Estimates of weekly wages and annual earnings in the year after graduation can differ from estimates related to the first job after graduation because in the latter case also job relationship started after the end of the first year after graduation is considered. While in the estimates at “1 year from graduation” only individuals earning a positive wage in that year are included in the analysis.

Finally, to provide an overall picture of the working career dynamics over the decade after graduation, we run OLS estimates on the association between the age at graduation and the cumulative number of working weeks and of annual earnings at the end of the 10-year period.<sup>15</sup>

In addition, considering that labour economics points out the existence of significant differences between males and females in terms of labour market outcomes, we provide regressions by gender. Estimates on weekly wages and annual earnings give different information: weekly wage is a measure of the monetary returns to graduation, while annual earning takes into account also individual's employment spells and possible periods of unemployment during a year. Considering that age at graduation may affect the probability to remain employed during the year, the two estimates might yield different results. We directly test this hypothesis by running estimates on the number of annual working weeks.

The main independent variable of interest is the age at graduation, that is codified through a three-category variable in our estimates, i.e. 22-25 (the reference category in the estimates), 26-28, 29-35. We use dummies on age at graduation instead than simply the continuous age at graduation, since in preliminary estimates (available upon request) we find that the relationship between labour market outcomes and age at graduation – even if the statistical significance is very weak or absent – is not linear and is characterized by concavity, being positive and negative linear and square terms, respectively (note also that including only the linear term does not reveal a significant relationship between age at graduation and subsequent outcomes in the labour market). However, we prefer to show results obtained through dummies instead than through a polynomial on age at graduation, since dummies allow us to immediately assess the results of those graduated in the various age classes.

In any regression, we also control for gender, region and cohort of graduation fixed effects, the aforementioned four types of employment arrangements,<sup>16</sup> weeks of labour market experience until the graduation year and its square term. Once the association between age at graduation and weekly wages and annual earnings is analysed, we run additional specification in which we control for labour market experience and its square term (measured in weeks) from university graduation.

As mentioned, a major limit of our dataset is the lack of information about the field of study of university graduates. To deal with this limit, we add to our covariates the worker's sector of activity, defined matching various information concerning the various workers' categories. Indeed, we build the sector of activity of all types of workers considering the professional association of freelance

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<sup>15</sup> Note that, when considering total worked weeks and earnings over the 10-year period, also possible years spent without working are included in the computation of the indicator (i.e., cumulated weeks and earnings are not averaged by the number of years with positive earnings).

<sup>16</sup> Dummies on employment arrangements are clearly not included as controls when the dependent variable is the employment arrangement. Being the type of arrangement a time-varying variable, these dummies are not included also when we estimate the association between age at graduation and total worked weeks and earnings over the 10-year period.

professionals –thus precisely identifying their field of study – and the NACE sector of activity of the remaining workers (recorded at 2-digits NACE for private employees, at 1-digit for the other types of workers).<sup>17</sup> We are thus confident that – apart from professionals whose field of study is precisely captured – within each sector of activity the heterogeneity in field of studies between tertiary graduates quite vanish, whereas the estimates become more accurate.

No datasets jointly record in Italy the field of study of tertiary graduates and worker's detailed sector of activity. A periodical ISTAT survey observes employment conditions of individuals who attained tertiary degree 3 years before and distinguishes 19 sectors of activity.<sup>18</sup> Considering these large sectors, a not negligible decrease in the within sector heterogeneity in field of studies emerges. For instance, 77% of those working in the health sector attained a degree in Medicine (whose legal duration is 6 years in Italy), 82% of those working in the financial sector attained a 4-year degree in Law, Economics or Social Sciences and around 70-80% of tertiary graduates employed in manufacturing obtained a 5-year STEM degree. We are, thus, confident that controlling in more details the sectors in our estimates (in particular, as concerns professionals and private employees), we are able to strongly reduce the heterogeneity in field of studies and degree programme duration between university graduates working in the same sectors. All in all, this additional control variable contributes to reducing the omitted variable bias due to the absence of information about the field of study in our dataset.

Summarising, the analyses carried out in this empirical exercise enable us to study:

- i) whether age at graduation is associated to the type of arrangement attained by graduates at the entry into the labour market after graduation;
- ii) the association between graduation not at the expected age and the starting wage;
- iii) the evolution of possible wage/earning gaps along the career path among tertiary graduates distinguished according to timing of graduation;
- iv) the association between postponing university graduation and unemployment risks along the career, using as dependent variable the number of working weeks over a year and across the entire 10-year period.

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<sup>17</sup> To avoid using too many dummies because of the size of our dataset, we include as controls 2-digit sector fixed effects (81 dummies) for private employees. However, results do not change if we include 3-digit sector fixed effects (208 dummies) or 1-digit sector fixed effects (13 dummies) as for public employees, para-subordinate workers and the other self-employed categories.

<sup>18</sup> Details about the ISTAT survey are available at <https://www.istat.it/it/archivio/6993>.

## 5. Results

### 5.1 Labour market outcomes at the beginning of the career as a tertiary graduate worker

The first set of analysis focuses on graduates' outcomes at the beginning of their career, identified as the first working year from graduation (that, in case of delayed entry in the labour market, might be different from the calendar year after the graduation).

Age at graduation is positively correlated with two contractual arrangements: public employment and self-employment (see Table 2). However, when estimates are run separately on the sample of males and females, coefficients show that only females who graduate at an older age have a higher probability both to be employed in the public sector and to become self-employed than private employees (the reference category of the estimates in Table 2). For males, coefficients associated to the dummies of graduation at an older age are statistically significant only in the estimates of the probability to be self-employed. The potential explanations of the positive association between age at graduation and self-employment (i.e. freelance professional) are mainly two. On the one hand, taking longer to get a degree can be a deliberate choice for those who know that they have the possibility to benefit of the "intergenerational transmission" of a liberal profession (Aina and Nicoletti, 2017). On the other hand, it could be a second best due to a greater difficulty for an older graduate to be hired by an employer. Older females are more likely to be employed in the public sector probably because they prefer to take more time at university in order to raise their final grades, which is crucial to get a job in the public sector, since the entrance is based on a public competition. Indeed, since age limits in public competitions for graduates have rather high values, it is preferable to graduate late with good grades than early with low grades.

[Table 2 approximately here]

With reference to early economic returns, there is no effect of late age at graduation on the weekly wage earned in the first year from graduation (see Table 3). On the contrary, the coefficients associated to graduation at age 29-35 are statistically significant for females in the annual earnings estimates: older females' annual earnings in the first year of work after graduation are more than 20% lower than their younger counterparts (22-25 year old) (see Table 4).<sup>19</sup> This penalization cannot be due to a mere composition effect (i.e. to the higher probability for older females to be employed in the public sector or to be self-employed) as estimates also control for the contractual arrangement. The comparison of these two results (i.e. no effects on weekly wages, a significant effect on annual earnings for females) suggests that postponing graduation might affect economic returns through the

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<sup>19</sup> We also run all our estimates on the sub-sample of private employees but results (available upon request) are consistent with those of the full sample, thus confirming that graduation age does not have heterogeneous effect according to the type of contractual arrangement.

duration of employment and unemployment spells, even if results are not clear-cut. Considering that the first worked year after graduation (or in general after completion of whatever university degree programme) may be poorly informative of the overall career, it is necessary to extend the analysis to the following years.

[Table 3 approximately here]

[Table 4 approximately here]

### *5.2 Labour market outcomes along the first 10-year of the working career*

The negative effect of late graduation on the duration of the employment spells is confirmed in the estimates of the annual working weeks for females only partially (see Tables 5a and 5b), as negative coefficients are statistically significant only in the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> years after the entry into the labour market. For males the effect is opposite, as older graduates are those who work more weeks, although the effect is not stable over time.

[Tables 5a and 5b approximately here]

Consistently with previous findings on the first working years and on the number of working weeks by year, estimates evidence some negative effects of very mature age at graduation on weekly wages only for females, although always only for some years (see Tables 6a and 6b). Males' weekly wage seems instead completely insensitive to the age at graduation. Very similar results emerge when considering the annual earnings in each of the 10 years after graduation, confirming a weak negative effect associated to very late graduation only for females (see Tables 7a and 7b).

[Tables 6a and 6b approximately here]

[Tables 7a and 7b approximately here]

The fact that the penalty is only weakly related to age at graduation is a counterintuitive result since it is different from previous contributions (Aina and Pastore, 2012; Taniguchi, 2005). However, the penalization for females who graduate at a very old age is consistent with Aina and Casalone (2011).

### *5.3 Total worked weeks and earnings in the 10-year period*

To complete the analysis of the labour market prospects of graduates across different ages, we finally run estimates on the cumulative weeks and earnings in the first ten years of work from graduation,

controlling for the prevalent contractual arrangement and sector of activity over the 10-year period (Table 8). Dependent variables also include possible employment and wage gaps during the period under analysis. Quite interestingly, in this case results are very clear: females who graduate at a mature age (29-35 year old) are heavily penalized as their 10-years cumulated earning is 29% lower than their younger counterpart.<sup>20</sup> Again, no effect is found for males who do not have any kind of penalization (neither in terms of unemployment spells – rather they work more if graduated after age 28 – nor in terms of earnings) even if they postpone a lot the timing of graduation.

[Table 8 approximately here]

Our findings seem to reveal no penalization associated to late graduation in Italy, at least for males. A possible explanation to this result, which is not fully consistent with previous empirical evidence for the Italian context, can be that, given that Italian students traditionally tend to procrastinate graduation, employers do not consider late graduation as a reliable signal of low productivity.

For females, instead, there is a heavy penalization in the long run, but only if they graduate at a rather old age (over 29 years). Considering that estimates are run controlling for the sector of activity and for previous experience, our findings seem to reveal that also university graduates are penalized in terms of earnings when they reach the age when women typically become mothers in Italy, i.e. after their 30s. This penalization can be due to a decision of the woman itself, who prefer to spend more time with children and accepts to earn less in this stage of her life, or to the employers' discrimination who prefer to hire a man in his 30s than a woman, *ceteris paribus*. Our data, however, do not allow to disentangle which of these two mechanisms (self-selection or true discrimination) is prevailing.

## 6. Conclusions

In this article, exploiting an innovative longitudinal dataset built merging IT-SILC survey data with the administrative longitudinal records provided by the Italian Social Security Institute (INPS), we evaluated in the 10-year period after the graduation the working histories of a sample of Italians who attained the tertiary degree at different ages. We focused on several individual outcomes during the first 10-year of the career: i.e., first contractual arrangement, entry wages and – along the decade – working weeks, weekly wages and annual earnings.

We find that late graduation, i.e. graduation at an older than “expected” age (i.e. the age consistent with the legal duration of education programs), reduces the number of weeks in which graduates are

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<sup>20</sup> Total earnings over the 10-year period are computed summing individual earnings at constant prices. Results do not change if we compute cumulated earnings by applying various discount rates (e.g. the real GDP growth rate) to earnings in the various years.

employed during the year, and therefore their annual earnings. This effect emerges only for males, while females who graduate later have a lower probability to be self-employed, but do not experience any wage/earning penalisation. These findings are only partially consistent with previous literature on this issue, which mostly finds significant penalizations for late entry into the labour market. Our results can partly depend on the unobservable characteristics of the working sample, as we do not have information on graduates' field of study and, more in general, on their abilities. However, once we include a proxy to reduce this omitted variables bias, i.e. sector of activity, the results are basically confirmed and highlighted that the greater penalisation is faced by males. In particular, regardless the outcomes (such as weekly or annual earnings) and the age brackets considered, it seems that the labour demand side negatively rewards the job career of men who enter into the labour market as mature graduates, rather than women. This could be because women who graduate at an older age might have a higher positive earning differential – due to the choice of more rewarding fields of study – with respect to their counterparts who graduate early in poorly rewarding fields.

The empirical exercise proposed has the advantage of using a unique dataset, namely the AD-SILC. First, it precisely reconstructs the working history of each graduate (before and after graduation) based on administrative data and not on self-reported information. Second, it allows to follow graduates for many years (10 in our analysis), while most of the studies do not have this long-run perspective, which is chiefly important in the analyses of employment outcomes.

As a conclusion, and from a more general perspective, even if the estimated “direct” effects are mild, indirect negative effects of late graduation should be considered. Firstly, those who graduate late have greater direct (tuition fees, living costs if they study far from home) and indirect costs (foregone earnings) to achieve the degree than those who graduate on time. Secondly, since they enter later in the labour market, they can benefit of the possible wage premium associated to tertiary education for a shorter period. This double penalisation, which cannot emerge from the proposed estimates that take into account only the period from graduation, can highly reduce the profitability of the individual investment in tertiary education. Therefore, considering the whole set of costs associated to late graduation (and the absence of monetary benefits), policies aimed to close the gap between the actual age at graduation and the “expected” age would increase the overall returns to investments in tertiary education.



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## Tables

Table 1: Sample characteristics (individual observations; percentage values for age and year at graduation)

<i>Sample distribution of age at graduation</i>			
P10	24	23	24
P25	25	24	25
P50	26	26	26
P75	28	27	28
P90	30	29	30
Mean	26.4	26.1	26.4
Standard deviation	2.40	2.48	2.46
<i>Age at graduation</i>	Males	Females	Total
22-25	32.3	44.6	39.2
26-28	47.9	41.5	44.2
29-35	19.8	13.9	16.6
<i>Year of graduation</i>			
1996	17.4	13.5	15.2
1997	16.1	16.7	16.4
1998	14.1	14.8	14.5
1999	14.9	16.3	15.7
2000	20.3	18.5	19.3
2001	17.2	20.2	18.9
Total	42.6	57.4	100.0
N. of sampled graduates	756	1,018	1,774
<i>Total number of observations</i>	<i>6,427</i>	<i>8,322</i>	<i>14,749</i>

<sup>1</sup>Mean values.

Source: own elaborations on AD-SILC data.

Table 2: Multinomial logit estimates of the first employment arrangement after graduation (private employee as reference category)

	Full sample	Males	Females
<i>public employee</i>			
grad. age 26-28	-0.164 [0.174]	-0.321 [0.300]	-0.110 [0.216]
grad. age 29-35	0.834*** [0.208]	0.436 [0.350]	1.090*** [0.266]
<i>dependent self-employed</i>			
grad. age 26-28	-0.028 [0.133]	-0.241 [0.222]	0.061 [0.168]
grad. age 29-35	0.282 [0.190]	-0.018 [0.296]	0.504** [0.253]
<i>self-employed</i>			
grad. age 26-28	0.568*** [0.167]	0.502** [0.249]	0.601*** [0.227]
grad. age 29-35	1.141*** [0.212]	0.994*** [0.299]	1.251*** [0.305]
Obs.	1766	753	1013

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, gender, weeks of labour market experience until the graduation year and its square term. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Source: own elaborations on AD-SILC data.

Table 3: OLS estimates of weekly wage in the first working year after graduation

	Full sample	Males	Females
grad. age 26-28	0.004 [0.032]	0.010 [0.049]	0.002 [0.044]
grad. age 29-35	-0.020 [0.044]	-0.016 [0.063]	-0.034 [0.062]
Obs.	1661	714	947

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, gender, contractual arrangement (private employee, public employee, para-subordinate, self-employed), sector of activity, weeks of labour market experience until the graduation year and its square term. For “private employees” also sector of activity (coded at 2-digits NACE) is added among control variables. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.

Table 4: OLS estimates of annual earnings in the first working year after graduation

	Full sample	Males	Females
grad. age 26-28	0.014 [0.061]	0.154 [0.096]	-0.060 [0.081]
grad. age 29-35	-0.064 [0.083]	0.189 [0.124]	-0.233** [0.115]
Obs.	1736	743	993

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, gender, contractual arrangement (private employee, public employee, para-subordinate, self-employed), sector of activity, weeks of labour market experience until the graduation year and its square term. For “private employees” also sector of activity (coded at 2-digits NACE) is added among control variables. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.

Table 5a: OLS estimates of annual working weeks by year from graduation

Year from graduation	Full sample				Obs.
	grad. age 26-28		grad. age 29-35		
1	2.097*	[1.234]	1.690	[1.696]	887
2	1.640	[1.010]	0.928	[1.399]	1165
3	-0.373	[0.861]	-1.821	[1.199]	1339
4	-0.379	[0.744]	-3.628***	[1.015]	1455
5	-0.329	[0.686]	-2.174**	[0.921]	1519
6	-0.329	[0.643]	-0.519	[0.864]	1570
7	-0.441	[0.600]	0.433	[0.809]	1598
8	0.662	[0.554]	1.287*	[0.760]	1614
9	0.559	[0.556]	0.690	[0.765]	1629
10	0.269	[0.473]	0.214	[0.652]	1625

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, gender, contractual arrangement (private employee, public employee, para-subordinate, self-employed), sector of activity, weeks of labour market experience until the graduation year and its square term. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.

Table 5b: OLS estimates of annual working weeks by distance from the year of graduation, by gender.

	Males			Females		
	grad. age 26-28	grad. age 29-35	Obs.	grad. age 26-28	grad. age 29-35	Obs.
1	5.189**	[2.087]	388	0.231	[1.632]	499
2	3.641**	[1.495]	516	0.276	[1.390]	649
3	0.819	[1.297]	595	-1.214	[1.192]	744
4	-0.026	[1.053]	642	-0.389	[1.050]	813
5	0.176	[0.912]	665	-0.707	[0.991]	854
6	0.583	[0.819]	687	-0.769	[0.952]	883
7	0.060	[0.812]	694	-0.622	[0.867]	904
8	1.941***	[0.728]	695	-0.135	[0.811]	919
9	1.485*	[0.767]	699	0.197	[0.785]	930
10	1.320**	[0.612]	699	-0.333	[0.685]	926

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, contractual arrangement (private employee, public employee, para-subordinate, self-employed), sector of activity, weeks of labour market experience until the graduation year and its square term. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.

Table 6a: OLS estimates of weekly wages by distance from the year of graduation.

	grad. age 26-28		grad. age 29-35		Obs.
1	0.003	[0.038]	-0.041	[0.054]	831
2	0.031	[0.035]	0.054	[0.049]	1112
3	0.014	[0.034]	-0.013	[0.049]	1278
4	0.009	[0.032]	-0.044	[0.044]	1395
5	0.014	[0.035]	-0.028	[0.047]	1466
6	0.019	[0.033]	-0.017	[0.045]	1525
7	0.006	[0.033]	0.000	[0.045]	1558
8	-0.029	[0.033]	-0.093**	[0.046]	1574
9	-0.013	[0.031]	-0.043	[0.043]	1596
10	-0.010	[0.030]	-0.073*	[0.042]	1594

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, gender, contractual arrangement (private employee, public employee, para-subordinate, self-employed), sector of activity, weeks of labour market experience until the graduation year and its square term. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.

Table 6b: OLS estimates of weekly wages by distance from the year of graduation, by gender.

	Males					Females				
	grad. age 26-28		grad. age 29-35		Obs.	grad. age 26-28		grad. age 29-35		Obs.
1	0.043	[0.052]	-0.023	[0.066]	368	-0.035	[0.058]	-0.056	[0.087]	463
2	-0.013	[0.054]	0.024	[0.071]	499	0.070	[0.047]	0.048	[0.071]	613
3	0.035	[0.049]	-0.062	[0.064]	573	-0.031	[0.049]	0.008	[0.073]	705
4	0.047	[0.046]	0.010	[0.059]	623	-0.021	[0.046]	-0.091	[0.067]	772
5	0.007	[0.052]	0.008	[0.067]	646	0.023	[0.048]	-0.059	[0.068]	820
6	0.032	[0.050]	0.070	[0.063]	669	0.011	[0.044]	-0.115*	[0.063]	856
7	0.000	[0.051]	0.059	[0.066]	677	0.016	[0.045]	-0.052	[0.065]	881
8	0.022	[0.047]	-0.027	[0.061]	678	-0.066	[0.046]	-0.169**	[0.068]	896
9	0.014	[0.051]	0.036	[0.067]	684	-0.033	[0.040]	-0.107*	[0.059]	912
10	0.017	[0.049]	-0.014	[0.064]	683	-0.047	[0.039]	-0.095*	[0.056]	911

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, contractual arrangement (private employee, public employee, para-subordinate, self-employed), sector of activity, weeks of labour market experience until the graduation year and its square term, experience since graduation and its square term. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.



Table 7a: OLS estimates of annual earnings by distance from the year of graduation.

	grad. age 26-28		grad. age 29-35		Obs.
1	0.083	[0.080]	0.047	[0.112]	869
2	0.125*	[0.064]	0.091	[0.091]	1133
3	-0.049	[0.061]	-0.059	[0.086]	1298
4	0.022	[0.053]	-0.136*	[0.073]	1425
5	-0.033	[0.053]	-0.136*	[0.071]	1487
6	-0.052	[0.050]	-0.022	[0.067]	1538
7	0.010	[0.046]	0.023	[0.063]	1570
8	0.005	[0.046]	-0.028	[0.063]	1575
9	0.034	[0.042]	-0.023	[0.058]	1594
10	0.000	[0.042]	-0.066	[0.058]	1594

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, gender, contractual arrangement (private employee, public employee, para-subordinate, self-employed), sector of activity, weeks of labour market experience until the graduation year and its square term. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.

Table 7b: OLS estimates of annual earnings by distance from the year of graduation, by gender.

	Males					Females				
	grad. age 26-28		grad. age 29-35		Obs.	grad. age 26-28		grad. age 29-35		Obs.
1	0.300**	[0.123]	0.346**	[0.158]	380	-0.051	[0.110]	-0.135	[0.165]	489
2	0.138	[0.102]	0.250*	[0.135]	507	0.112	[0.085]	-0.118	[0.130]	626
3	0.005	[0.094]	-0.018	[0.124]	582	-0.099	[0.082]	-0.151	[0.124]	716
4	0.069	[0.077]	0.085	[0.099]	631	0.005	[0.075]	-0.374***	[0.108]	794
5	-0.017	[0.073]	-0.015	[0.093]	649	-0.026	[0.076]	-0.231**	[0.108]	838
6	0.034	[0.063]	0.095	[0.081]	668	-0.098	[0.073]	-0.131	[0.105]	870
7	0.017	[0.070]	0.118	[0.091]	683	0.026	[0.063]	-0.078	[0.091]	887
8	0.062	[0.067]	0.026	[0.087]	679	-0.021	[0.064]	-0.096	[0.093]	896
9	0.047	[0.068]	0.090	[0.089]	684	0.026	[0.053]	-0.151*	[0.078]	910
10	0.067	[0.062]	-0.008	[0.081]	677	-0.053	[0.057]	-0.100	[0.083]	917

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, contractual arrangement (private employee, public employee, para-subordinate, self-employed), sector of activity, weeks of labour market experience until the graduation year and its square term, experience since graduation and its square term. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.

Table 8: OLS estimates of total worked weeks and total earnings in the ten-year period after the graduation

	Worked weeks		
	Full sample	Males	Females
grad. age 26-28	16.301 [10.724]	28.094 [17.908]	11.455 [13.713]
grad. age 29-35	6.966 [14.559]	38.157* [22.980]	-19.644 [19.473]
Earnings			
	Full sample	Males	Females
grad. age 26-28	0.008 [0.043]	0.080 [0.068]	-0.043 [0.057]
grad. age 29-35	-0.107* [0.059]	0.087 [0.088]	-0.286*** [0.081]
Obs.	1774	756	1017

The reference category for graduation age is graduated in the age class 22-25. Control variables: regional and cohort of graduation fixed effects, gender, prevalent contractual arrangement (private employee, public employee, para-subordinate, self-employed), prevalent sector of activity, weeks of labour market experience until the graduation year and its square term. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: own elaborations on AD-SILC data.