The academic performance of student-workers in higher education – increasing rapidly regions' intellectual capital

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Abstract

Although in recent years access to higher education in Portugal has expanded, there are still some people who interrupt their academic progression and enter the labour market not because of lack of skills but because of monetary constraints. Thus, returning to school is considered of great importance to mitigate this discrimination and, at the same time, to reinforce regions' intellectual capital and workers' qualification, promoting labour productivity and firms' competitiveness in the short run – being therefore important for both dimensions of equity and efficiency.

Even though the determinants of academic performance, as a proxy for the effective acquisition of skills and growth of intellectual capital, have been deeply studied for the traditional students, the different characteristics, the lack of time and the multiple motivations of adult student-workers justify them to receive an independent treatment. In particular, it is expected for adult student-workers that job characteristics play an important role determining their academic success. Therefore, based on an extended set of observed attributes, which allow us to control for individual and degree characteristics, we develop two regression models to find out how job characteristics affect the academic performance (measured by the final grade point average – GPA, and by the completion time) of adult student-workers in higher education.

We use a longitudinal dataset constituted by 332 student-workers that have enrolled in an undergraduate program at Leiria Polytechnic Institute (IPLeiria) in 2008 or 2009 and have completed it until 2015. The data was obtained by matching an internal dataset of IPLeiria with data from the Ministry of Education and Science, Portugal.

The results show that student-workers who finish their degrees behave similarly to the non-worker students in their academic performance, but with different determinants explaining it, especially in the case of final GPA, where job characteristics play a more important role than individual and degree characteristics. In detail, we found that self-employment and enrolling in a degree from a scientific field unrelated with the professional activity have a positive effect in the final GPA of male student-workers, and that exercising a qualified job or being employed in the private sector may limit academic performance as these workers tend to choose more demanding degrees. In addition, flexible professional schedules, peer effects, higher average grades within-degree and improved academic integration all seem to contribute positively to the academic performance of student-workers.

We expect that our work contributes to develop policies that improve the academic success of student-workers and increase the participation of adult workers in higher education, thus enhancing regions' intellectual capital, labour productivity and firms' competitiveness in the short run.

Keywords: academic performance, student-workers, adult education, intellectual capital, higher education, job characteristics.

JEL Codes: I23, I21, C21

1. Introduction

The positive impacts of education, and particularly of tertiary education, on the welfare of an economy are well recognized. Indeed, beyond being associated with many social and cultural developments, such as better values and attitudes, higher literacy, etc., education plays a key role on the economic dimension by helping individuals to develop skills and thus to increase their productivity (and wages) as workers, which contributes to increase the competitiveness of the firms and of the economy as a whole. Furthermore, there is also evidence for a positive impact of education on entrepreneurship performance (Van der Sluis et al., 2007; Van der Sluis and Van Praag, 2004). These results are highly documented and proved through the theory of human capital pioneered by Becker (1962).

A suitable education policy is thus of importance for any country in a process of convergence to the higher developed economies. Portugal is an example, in its race for achieving the average levels of the European Union. As the particular case of Portugal shows that the percentage of the population aged 30-34 who have successfully completed tertiary studies is approaching the average levels of the European Union in recent years (according to Eurostat data, this indicator was 19.5% for Portugal in 2007 and increased to 30.1% in 2015 whereas the EU average went from 31.9% to 38.7% in the same period), its education deficit lies mainly on active adults >35 rather than on younger individuals. Education of adult workers thus appears to be the main driver for increasing intellectual capital of active population in the short run and, therefore, for a rapid enhancement of workers' skills and productivity and firms' competitiveness. Moreover, the education of adult workers is also important to mitigate the discrimination that exists in accessing higher education caused by financial constrains that force some high skilled people to interrupt their academic progression and enter the labour market early. In short, adult education is an important instrument for promoting both efficiency and equity.

Academic performance is often seen as a proxy for the effective acquisition of skills by individuals and, therefore, it is expected to be positively correlated with labour productivity. Hence, efforts are required not only to attract more adult workers to tertiary education but also to promote their academic performance. The literature presents a lot of research on the determinants of academic performance in higher education, but leading to results that reveal a lack of consensus about the best predictors (Alves, 2014). For example, Betts and Morell (1999) found that, for a sample of institutions in California (USA), the most determining factors of academic performance are personal background, including gender, ethnicity and family income, and the socioeconomic environment of the school, assessed by the education and poverty levels of the adults in the neighbourhood of the school, while Naylor and Smith (2004) and Danilowicz-Gösele et al. (2014), in the United Kingdom and Germany, respectively, found that the best predictor for the academic performance in higher education is the performance achieved in prior qualifications, with personal and socioeconomic background playing a secondary role. Trapmann et al. (2007) added that the predictive power of the secondary school grades in the academic performance in higher education varies significantly across fields of study, being a best

predictor in the fields of engineering and natural sciences, as opposed to psychology, for example, and Marcenaro and Navarro (2007), using a sample of students from the University of Malaga (Spain), found that scholarships may also have a positive impact on academic performance. Finally, Alves (2014), for a sample of economics and management students from Lisbon Nova University (Portugal), found that the internal high school grade is a better predictor of achievement than the score of mathematics national exam, and that gender, age, economic background and distance between home and school seem to be significantly correlated with academic performance.

On the relationship between work and academic performance, most of the previous research has focused on whether or not employment (usually measured as a *dummy*) and/or work intensity (usually measured by the number of working hours per week) affect academic performance. For example, Canabal (1998), Lang (2012) and Darolia (2014) found no significant relation between employment and grades, while Stinebrickner and Stinebrickner (2003) alerted for possible endogeneity biases and concluded that employment may have a negative effect on grades. Additionally, Canabal (1998), Amann (2005) and Triventi (2014) found that employment may contribute to increase graduation time, even though the effect is less significant for part-time employment or low-intensity work, and Darolia (2014), in a national study in the USA, found that the effect of an increase in the working time on the number of credits completed per year is negative for full-time students (and non-significant for part-time students).

The literature is however still to investigate the determinants of the academic performance of adult student-workers in an independent manner, as most of the previously referred studies use pooled samples, constituted by both student-workers and non-worker students, thus ignoring their strong heterogeneity and, consequently, the likely event that the structural stability of a unique model estimated for both types of students gets rejected. Naturally, student-workers have less time to dedicate to the studying and research activities and, in general, they are older and are married and have kids more often, resulting in higher family responsibilities. Moreover, student-workers can have multiple motivations when enrolling higher education, varying from a job promotion perspective or the possibility of finding a new career to self-satisfaction only, and they often reveal more developed soft skills (as communication or time management skills, for example). This heterogeneity may indeed cause that the determinants of academic performance of student-workers have different effects or magnitudes than in pooled samples. For example, parents' education is likely to be less relevant for the academic performance of student-workers as compared to non-worker students, while gender probably plays a different role for adult students than for young ones. Furthermore, within student-workers, beyond the work-intensity usually considered in the literature, the qualitative characteristics of their jobs, such as, for example, the relation with the field of study, the position and responsibilities, and whether or not it

is a self-employment job, yet to be addressed in the literature, may constitute key determinants of academic performance.[1]

It is also important to note that studying while working and adult education are more directly related in some countries than in others. For example, while in the US student-workers are mainly young individuals who engage in part or full time jobs to help financing their studies, in Portugal student-workers are mainly adults that return to school after some years in the labour market in the hope of acquiring new skills that allow them to get a job promotion or to find a new career for which they have particular interest. This helps explaining why current estimates point out that, in the US, 80% of all undergraduate students work during school and, among the aged under 25, almost half work (Darolia, 2014), while in Portugal only 8.5% of undergraduate students are effective workers (2015/2016 data from DGEEC - *Direção-Geral de Estatísticas da Educação e Ciência* - of the Ministry of Education and Science, Portugal). Indeed, in the case of Portugal, studying while working and adult education are closely related.

This paper focuses precisely on determining the factors that drive the academic performance of adult student-workers in higher education, using a data sample of undergraduate student-workers of Leiria Polytechnic Institute (IPLeiria, Portugal), that have enrolled in 2008 or 2009 and completed their degrees until 2015. Among the factors in study, we focus on inputs that are observable in the enrolment moment so that the academic performance can be predicted at the beginning of the degree. Also, a special emphasis will be given to the qualitative characteristics of the job, namely to the relation between the field of study and the professional activity, to whether the professional activity is being developed in the private or in the public sector, to whether the professional activity is being developed as an employer (self-employment) or as an employee, and to whether or not the job is qualified, which are new to the literature. Additionally, in accordance to the majority of the literature, we control for gender, age, scholarship, nationality, marital status, parents' schooling level, proximity between residence and school and access regime. Information about the degree in which the student is enrolled was also collected, such as the field of study, the average and dispersion of final GPA, and the proportion of student-workers in each degree. Finally, we analyse the impact of these factors in each of two different indicators of academic performance: final GPA and time required to graduate (completion time).

The structure of the paper is as follows. In section 2, we provide a general background characterization of the student-workers enrolled at tertiary level institutions in Portugal and, more particularly, at IPLeiria. Section 3 describes the construction of the dataset and its variables and presents some summarizing descriptive statistics, and section 4 describes the modelling strategy. The results are

[1] The relation between the job and the field of study was recently introduced in the literature (Geel and Backes-Gellner, 2012; Robert and Saar, 2012; Weiss, Klein and Grauenhorst, 2014), but only with the purpose of investigating if working while studying in a job related with the field of study generates future returns in the labour market. They show that the answer is, in general, positive.

then presented and discussed in section 5 and, finally, the main conclusions and policy implications are drawn in section 6.

2. A characterization of student-workers in higher education in Portugal

In this section, we build a background characterization of the student-workers enrolled in higher education in Portugal, using information from the *Direção-Geral de Estatísticas da Educação e Ciência* (DGEEC) of the Ministry of Education and Science, Portugal. The aim is to highlight the importance of these students for Portuguese tertiary education institutions. Also, as the dataset that drives our empirical study is a sample of students from IPLeiria, whenever possible, we investigate whether or not the institution is representative of the Portuguese reality.

Figure 1 displays the evolution of the proportion of student-workers in tertiary education in Portugal and in Leiria Polytechnic Institute. The proportion of student-workers has been constantly decreasing since 2008/09, which, even though partially explained by the growing unemployment rate in Portugal after 2008 following the world financial crisis, reflects the growing difficulties of higher education institutions in recruiting students from the labour market and, consequently, of the economy in increasing workers' productivity and wages. In the case of IPLeiria, the proportion of student-workers was, in average, higher than the national proportion by 5 percentage points until 2013/14, when it started to decrease more rapidly, converging to the national level. This should be a concern for Leiria Polytechnic Institute given that it is located in a region where the unemployment rate is below the national average.

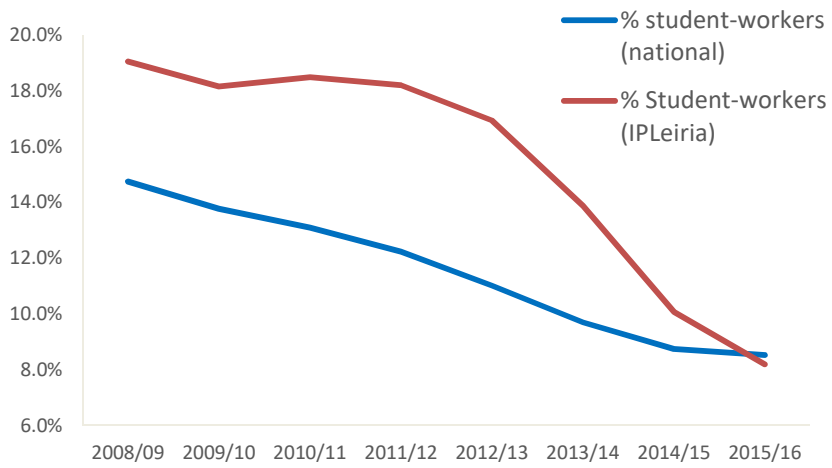

Figure 1: evolution of the proportion of student-workers in tertiary education in Portugal and in Leiria Polytechnic Institute.

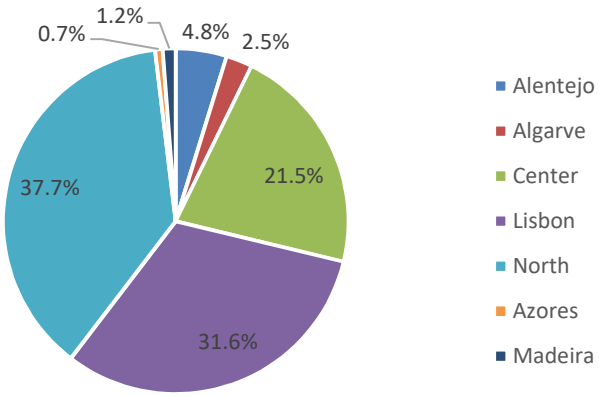

Figure 2: percentage of student-workers in tertiary education in Portugal, by geographical region, in academic year 2015/2016

Figure 2 displays the percentage of student-workers that study in schools located in each main region of Portugal, in the academic year of 2015/2016. It can be observed that the Center region, which includes Leiria Polytechnic Institute, has its importance in terms of presence of student-workers, considering that the majority of tertiary institutions are located in Lisbon or in the North (due to the higher concentration of people, firms and schools in these regions, as they include the metropolitan areas of Lisbon and Porto, respectively).

Regarding the field of study (Figure 3), in the academic year 2015/2016, the one with more student-workers in Portugal (left chart) was Social Sciences and Law, which accounted for more than one third of all student-workers, followed by Engineering and Health. This was also the case for Leiria Polytechnic Institute (right chart), where Social Sciences and Law accounted for 37.6% of all its student-workers in 2015/2016, followed by Engineering (31.2%) and Health (15.5%).

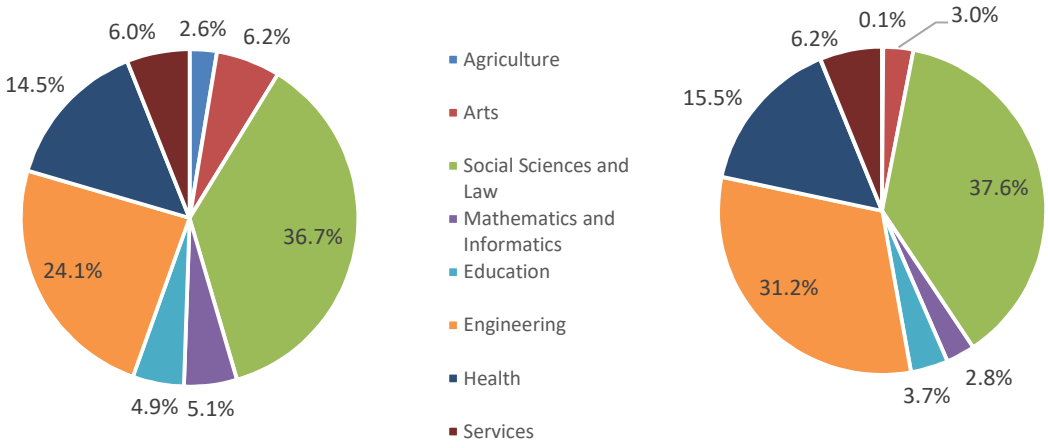

Figure 3: percentage of student-workers in tertiary education in Portugal and in IPLeiria, by field of study, in academic year of 2015/2016

As in Portugal higher education institutions are categorized in a binary system, constituted by polytechnic institutes – more directed to the development of technical and professional skills –, and universities – more directed to research and theoretical skills –, one may interested in observing whether or not the presence of student-workers is more evident in polytechnic institutions. According to the data from the DGEEC of the Portuguese Ministry of Education and Science relative to the year 2015/2016, 54% of the student-workers in higher education in Portugal were enrolled in polytechnic schools (46% in universities). This difference is even higher if we consider the percentage of student-workers in the total number of students in each system. Indeed, while only 6% of the university students were student-workers in 2015/2016, this percentage more than doubles (13.2%) in polytechnic schools.

Also, one finds that there are more student-workers in public schools than in private schools, with 86% of the student-workers in Portugal in 2015/2016 being enrolled in public schools (whether polytechnic schools or universities). This is easily explained by economic reasons. Students with less wealth are more likely to be student-workers and to enrol in public schools, which require less yearly expenditures. The difference is not so large if we consider the percentage of student-workers within each type of institution, though, as 8.8% of the students were student-workers within public schools and 7.2% in private schools.

Finally, considering other characteristics such as gender, nationality, scholarship and the partial-time student status, in 2015/2016, we observe that the majority of student-workers in Portugal were male (50.3%), Portuguese (96.6%) and don't have neither scholarship (92.2%) nor the partial-time student status (85.1%).

3. Data

This study uses longitudinal data on individuals that enrolled, as student-workers, in an undergraduate degree in Leiria Polytechnic Institute, in the academic year of 2008/09 or 2009/10.[2] From these, we considered the ones that completed their degree, as student-workers, until 2015, which resulted in a dataset with 332 observations.[3]

Our database was built by crossing data from three sources and by adding some constructed variables. First, two databases from IPLeiria with information at the student level were matched – *Sistemas de Apoio à Decisão - Business Intelligence (SAD-BI)* and *Inquérito Caixa Geral de Depósitos* - CGD – using a common identification number. Next, it was added information on the degrees and schools from DGEEC of the Ministry of Education and Science, Portugal. Finally, using this raw data, some additional variables were constructed by the authors to enrich the dataset.

[2] "Entry cohort is used, instead of the leaving cohort, in order to standardize for time-varying influences" (Naylor and Smith, 2004).
[3] Several observations were excluded from our data set since they concern students who, at some point of their degree, stopped being student-workers.

In the final dataset, information is given at an individual student-worker level and it includes the following variables:

a) individual characteristics (age, gender, nationality, marital status, residence county, school-residence geographical distance, parents' schooling level, scholarship, completion time, final GPA, first call admission, access regime, part-time status);

b) degree characteristics (field of study, day/post-work schedule, proportion of student-workers in the degree, average and standard deviation of final GPA in the degree);

c) job characteristics (qualified/unqualified job, public/private sector, self-employed worker/employee, business sector and job-degree match).

The detailed definition of the variables is given in Appendix 1 and the summary statistics are presented in Table 1. First, note that the final GPA (ranging from 10 to 20) is, on average, 14.11, with a small standard deviation of 1.63, which corresponds to a coefficient of variation also small, of 12% (=1.63/14.11). Completion time reveals a higher dispersion, with a coefficient of variation around 29%. Nevertheless, it is important to notice the low value of the average of this variable, which proves that the majority of graduated student-workers accomplished to finish their degree within the regular time (60% of total observations).

Table 1: Summary statistics (332 observations)

Variable	Mean (Standard Deviation)
Final GPA	14.11 (1.63)
Completion Time	3.18 (0.93)
Gender (Male)	37.7%
Marital Status (Married)	39.5%
Age	33.48 (8.45)
Nationality (Foreign)	1.5%
Parents' schooling	6.73 (3.48)
School-residence distance	38.63 (67.62)
Scholarship	5.4%
First call admission	87.7%
Part time status	1.2%
Day schedule	19.6%
Degree average final GPA	14.13 (0.83)
Degree final GPA standard deviation	1.33 (0.21)
Degree proportion of student-workers	0.46 (0.18)
Self-employed	5.1%
Job-degree match	2.68 (1.67)
Public sector job	38.3%
Qualified job	59.3%

From Table 1, it is also possible to observe that 37.7% of the students considered in the sample are male, 39.5% are married, 1.5% are foreign students and 5.4% received financial support to study. Additionally, they are, on average, 33 years old, ranging from 20 to 60 years old. The distance between school and residence is very heterogeneous, according to the value of the standard deviation. Also, there is a high dispersion on the level of schooling of parents, which is, on average, 6.7 years.

There are several ways of accessing higher education in Portugal. In the undergraduate level, the most common access regime for non-worker students is the National Admission Regime for Higher Education (CNAES). However, in case of student-workers the most usual access regime is M23 - designed for people over 23 years old. As it is shown in Figure 4, 42.2% of student-workers of our sample enrolled under the M23 access regime. It is also important to notice that, in general, the student-workers admitted through M23 differ from those admitted by CNAES regarding their professional path, by being the ones that return to school after some years in the labour market, while CNAES students are more likely to be younger students that enter the labour market almost at the same time they enrol in higher education. There are five other main access regimes at the undergraduate level in Portugal: graduation in a technological specialization (post-secondary) degree in a related field of study (CET), graduation in a different tertiary level undergraduate degree, re-admissions (returning to the same degree after at least one year of interruption), transferences between colleges (same degree or equivalent) and degree transitions (changing to a different degree), altogether representing 26.5% of the students in the sample.

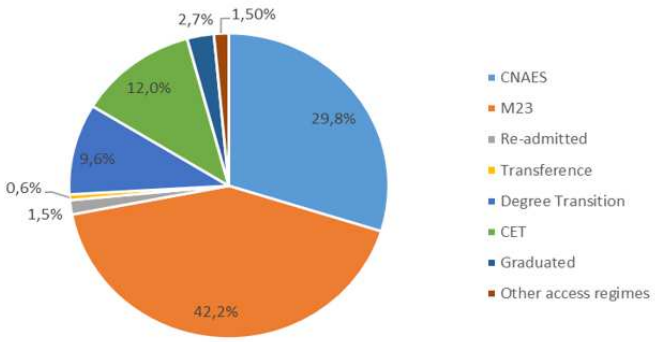

Figure 4: percentage of student-workers by access regime (sample)

Although the majority of student-workers are enrolled in degrees with post-work schedule (i.e. with classes occurring from 6 pm to 12 pm), about 20% attend degrees with day classes. This variable is generally associated with more labour flexibility and greater availability, for what it is expected to contribute favourably to academic performance. Moreover, even though policy-makers are sensitive to the difficulties of students in managing their time and allow them to apply for part-time status, extending

the duration of the degree over time and reducing the fee paid per year, only 1.2% of the student-workers in our dataset had adhered to this status.[4]

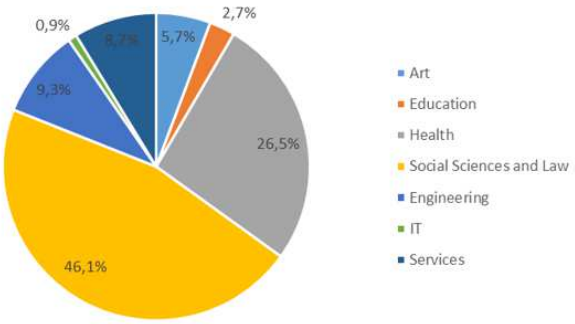

Figure 5: percentage of student-workers by field of study (sample)

One of the most important characteristics of a degree is its field of study, naturally relevant for the academic performance of students since it is associated to different levels of difficulty. By observing Figure 5, it is possible to verify that almost half of the observations was enrolled in degrees from the social sciences and law field. Health is also an important field of study for the student-workers that graduate in IPLeiria.

Using information about the degree characteristics available on the DGEEC of the Ministry of Education and Science, it was also possible to add to our dataset the average and standard deviation of final GPA within each degree (we considered all students, either student-workers or non-worker students, that had graduated within each degree) so as to capture the peer effect and degree heterogeneity. It is important to note that the differences between the average final GPA by degree in the sample and the average final GPA by degree obtained with all students are very small (14.11 and 14.13, respectively), which means that IPLeiria graduated student-workers seem not to perform worse than graduated non-worker students. Finally, degree characteristics also include the proportion of student-workers in the degree in order to capture the effect of social and academic integration.

The most innovate aspect of our dataset is however that it includes information about the job and employer characteristics. In our data, 59.3% of student-workers exercise qualified jobs, 5.1% are self-employed (3% male and 2.1% female) and 38.3% are employed in the public sector. By comparing the field of study with the field of the professional activity, we created a variable (job-degree match) that classifies their relation level in categories ranging from 1 to 5, with 1 standing for “no related at all” and 5 for “totally related”. We observe that 43% of the students in the sample enrol in a field of study

[4] This reflects the typical profile of a student-worker in Portugal, by being both full-time worker and full-time student.

non-related at all with their job (the percentage increase to almost 60% if only CNAES' students are considered).

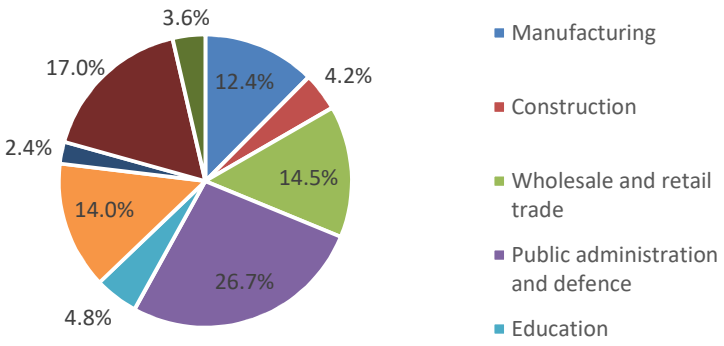

Figure 6: percentage of student-workers employed in each business sector (sample)

Finally, in Figure 6 it is possible to observe the distribution of the student-workers in the sample according to the business sector in which they are employed. Clearly, the service sector dominates, especially public administration, defence and health. Construction and trade are also important employer sectors of IPLeiria student-workers. On the other hand, only 12.4% of student-workers in our dataset have a job in manufacturing. Finally, the primary sector only is referred in four cases. The last result is not surprising due to the nature of the degrees offered by IPLeiria. More surprising is the lower percentage of students employed in manufacturing, given its importance to the Leiria region and to the IPLeiria's training offer.

4. Modelling

In our first model, we investigate how the variables described in the previous section affect academic performance measured by the final GPA.

As the final GPA is a discrete ordinal variable – ranging from 11 to 19 in our sample – we follow Naylor and Smith (2004) by using an ordered logit model to estimate the academic performance. The assumption is that there is a latent unobserved continuous variable (Y_i^*) that is a function of several observed variables, as follows:

$$Y_i^* = X_i\beta + Z_{j(i)}\delta + H_i\theta + u_i, \qquad (1)$$

where X_i denotes the vector of the observable individual characteristics of student-worker *i*, including gender, age, nationality, parents' schooling, scholarship, school-residence geographical distance, admission regime, first call admission, gender-marital status interaction and if it is a part-time student. $Z_{j(i)}$ contains the observable characteristics of degree *j* – the degree in which student *i* is enrolled – as the field of study, the average and standard deviation of final GPA within the degree, whether the degree has a day schedule or not, and the proportion of student-workers in the degree. Finally, H_i is the vector

that contains the information about job characteristics of student-worker *i*, including interactions between gender and self-employment, interactions between gender and job-degree match, whether is a qualified job or not, and if it is a public or private sector job.[5] u_i denotes the error term.

In this case, the continuous latent variable Y_i^* has eight threshold points, and it is possible to consider the following censored form of Y_i^*:

$$Y_i = 0 \; if \; Y_i^* \leq \mu_1$$
$$Y_i = 1 \; if \; \mu_1 < Y_i^* \leq \mu_2$$
$$Y_i = 2 \; if \; \mu_2 < Y_i^* \leq \mu_3$$
$$(...)$$
$$Y_i = 8 \; if \; Y_i^* > \mu_8, \qquad (2)$$

where μ_t are the unknown threshold points that divides the discrete classes. Finally, the probability of a student having, for example, the lowest grade, conditioned on the observed characteristics, will be given by:

$$P(Y_i = 0) = \frac{\exp\left(X_i\beta + Z_{j(i)}\delta + H_i\theta - \mu_1\right)}{1 + \left[\exp\left(X_i\beta + Z_{j(i)}\delta + H_i\theta - \mu_1\right)\right]}. \qquad (3)$$

Our second model will be used to identify the determinants of the completion time. As we have information not only on the year but also the month of enrolment and graduation, we were able to build a continuous variable $T_i = Graduation\ Date - Enrolment\ Date$, that was then used as the dependent variable of the following equation estimated by OLS:

$$T_i = X_i\gamma + Z_{j(i)}\pi + H_i\sigma + \vartheta_i, \qquad (4)$$

where X_i, $Z_{j(i)}$ and H_i are the same than in the first model.

5. Results

In this section, we present and discuss the results of the regressions performed for the two models developed in the previous section, highlighting the main findings and relating them to the previous literature.

5.1. Determinants of the final GPA

Table 2 summarizes the results of the ordered logit regressions performed for the first model. We estimated two equations, one (1) considering as regressors only the variables on job characteristics and the other (2) considering all regressors.

[5] Those interactions were included in the model because self-employment and job-degree match seem to have different effects in the academic performance of male and female students (the same occurs for marital status).

The results of the regressions suggest that job characteristics play a more important role than degree and individual characteristics when explaining final GPA, as both regressions are statistically valid (p-value of the Likelihood ratio test < 0.01) and the percentage of correct predictions didn't improve significantly in regression (2) as compared to regression (1), increasing only from 25.3% to 34.9%. Also, the p-value of the likelihood ratio test for the joint significance of the coefficients of the job related variables is 0.0045, supporting the importance of these characteristics for the final GPA of adult student-workers.

Within job characteristics, the results show that self-employment have a positive effect on the final grade of male student-workers, both in (1) and (2). This may reflect the higher flexibility of the agenda of the male self-employed, as compared to the other employees, and the consequent more efficient use of time, which seem to more than countervail the extended responsibilities of being an entrepreneur. The effect of self-employment in final GPA is however negative for females when controlling for all variables. In this case, the benefits of the more flexible agenda may be offset by the family and house responsibilities.

Somehow surprisingly, the match between the field of study and the professional area may have a negative effect on final grades. This is the case for male student-workers in regression (2). This may reveal that student-workers may be more motivated for school when they are investing on education so as to change their professional field/career.

Table 2: Summary results for the first model

Ordered Logit (n = 332)

Dependent variable: Final GPA

	(1)	(2)
Gender (Male)		1,2708***
Age		−0,0182
Nationality (Foreign)		−1,3406
Parents' schooling		−0,0710**
Scholarship		0,2948
School-residence distance		−0,0005
CNAES		−0,3221
Re-admitted		−3,0949***
Degree transition		−0,5568
Transference		−0,9652
Graduated		1,4881**
CET		−0,8093**
Other admission regimes		0,8991
First call admission		0,7524**
Married male		0,5948
Married female		0,1760
Part time status		0,8900
Arts		0,1402
Education		0,8201
Health		−0,0729

IT		−0,6860
Engineering		0,2360
Services		−1,6064***
Degree average final GPA		1,8226***
Degree final GPA standard deviation		−0,1185
Day schedule		2,1966***
Degree proportion of SW		3,0407**
Self-employed male	2,3093***	2,1412***
Self-employed female	0,1532	−1,0638*
Male job-degree match	−0,0862	−0,3075***
Female job-degree match	−0,0689	0,0229
Qualified job	−0,5798***	0,0370
Public sector job	0,7662***	0,1555
Correct predictions	25,3%	34,9%
p-value Likelihood ratio test	0,0000	0,0000

*p<.10, ** p<.05, *** p<.01

Regression (1) predicts that employment in a qualified job has a negative impact on final GPA, even though it loses significance in regression (2), when controlling for the remaining variables. As we verified a strong negative correlation between the qualified job variable and the average final GPA of the respective degree, it seems that the negative impact of qualified jobs on final GPA is due to the fact that qualified workers are likely to enrol in more demanding degrees.

On the contrary, public sector's employees tend to enrol in degrees with higher average final GPA, which may explain why regression (1) predicts a positive effect of employment in the public sector on final GPA and why this effect vanishes when controlling for the degrees characteristics (regression 2).

About degree characteristics, a higher average final GPA within the degree, a higher proportion of student-workers and day classes all seem to have a positive impact on final grades of student-workers. The first effect is straightforward and it also reveals the importance of peer-effects on academic performance while the second is associated with academic and social integration of student-workers. The third effect is a signal that being less tired when attending classes may promote students' performance and may as well reflect the higher time flexibility of student-workers that enrol in day schedule degrees. Also, for the field of study, note that final GPA were significantly lower in services than in social and law sciences (assumed as the baseline field in the model), arts, education and engineering.

Finally, with respect to the individual characteristics, the coefficients are significant for gender (male student-workers have higher final GPA than female student-workers, which is in accordance with Arulampalam, Naylor and Smith, 2012), parents' schooling (the lower the average number of schooling years of the parents, the higher the final GPA of student-workers), first-call admission (admission in the first phase rather than in subsequent phases – which is a proxy for higher previous grades, as secondary school grade and national exams – increases final grades) and access regime. An interesting result is the

negative effect of parents' level of schooling on final GPA, which is contrary to the finding of most of the literature, as for example Betts and Morell (1999), Naylor and Smith (2004) and Alves (2014) for non-workers students. Generally, and especially in case of a "high skilled student", if its background is positive, one expects this student to go directly into higher education. However, if a good student has a less favourable family background, he/she might be unable to study in the early years of his/her life (because of financial constraints), being able to do it only after several years of work and as a student-worker. As for the access regime, expectedly, final GPA is higher for those previously graduated (as compared to the ones accessing by M23, the assumed baseline access regime in the model), which reflects their high academic experience, and lower for readmitted (students that have interrupted the degree, frequently due to low academic performance) and for CET students (students who usually don't fulfil all requirements to apply by the CNAES regime).

5.2. Determinants of Completion Time

The results of the OLS model for completion time are summarized in Table 3. Again, two equations were estimated, one (3) considering as regressors only the variables on job characteristics and the other (4) considering all regressors.

Table 3: Results for the second model

OLS (n = 332)

Dependent variable: *Completion time*

	(3)	(4)
Const	3,1040	5,5401***
Gender (Male)		−0,4755***
Age		0,0078
Nationality (Foreign)		0,2369
Parents' schooling		0,0034
Scholarship		0,0754
School-residence distance		0,0003
CNAES		0,1329
Re-admitted		−2,2121***
Degree transition		−0,3765**
Transference		−1,5471***
Graduated		−0,5280*
CET		−0,0372
Other access regimes		−1,4654***
First call admission		0,1647
Married male		0,1858
Married female		−0,2208*
Part time status		1,2363***
Arts		0,2910
Education		−0,1187
Health		−0,2489
IT		1,1557**

Engineering		0,8201***
Services		0,4278**
Degree average final GPA		−0,1446*
Degree final GPA standard deviation		−0,7511***
Day schedule		0,0312
Degree proportion of SW		0,6953
Self-employed male	−0,5077	−0,4777
Self-employed female	−0,1372	0,2497
Male job-degree match	0,0788*	0,0673
Female job-degree match	0,0082	−0,0024
Qualified job	0,2226**	0,1626*
Public sector job	−0,3342***	−0,1456
R squared	0,0620	0,4019
p-value (F)	0,0019	1,01e-18
Adjusted R squared	0,0447	0,3357

*p<.10, ** p<.05, *** p<.01

The results are in general consistent with the ones in the first model, as both regressions are globally adherent (both p-values of the F-test are lower than 0.01), but with job characteristics losing the main importance here, as regression (3) generates a R squared of only 6%, as compared to the 40% achieved in regression (4), and the joint relevance of the coefficients of the job related variables is only significant at the 0.1 level (p-value of F-test = 0.099). Hence, degree and individual characteristics seem to play the main role when explaining the graduation time of adult student-workers.

Despite the above, on the characteristics of the job, as in the first model, the match between the field of study and the professional area may contribute to decrease the academic performance of male student-workers (it increases the duration of the degree in regression 1). The same occurs for the effect of qualified jobs. The more qualified the job, the higher the completion time of the degrees (both in regressions 3 and 4). Moreover, as in the first model, a job on the public sector promotes the academic success by decreasing the duration of the degree in regression (3), losing its relevance in the regression (4). The exception on the comparison between the first and second models is self-employment, which seems not to have a significant effect for the completion time of the degrees.

Regarding the degree characteristics, the significant coefficients stand only for the average GPA within the degree (as expected, a higher average GPA within the degree promotes a lower completion time) and for the dispersion of final GPA within the degree (the higher the standard deviation of final GPA within a degree, the lower the completion time). With respect to the field of study, completion time is significantly higher in informatics, engineering and services than in social and law sciences (the baseline field of study).

Finally, with respect to the individual characteristics, the coefficients are significant for gender (again, male student-workers seem to perform better than females), part time status (naturally, it increases the completion time of a degree), marital status (curiously, married females complete the degree faster than singles, which can be explained by money constraints and/or higher motivation) and

access regime (given the credited previous formation, it is natural that readmissions, course transitions, transferences and graduated student-workers complete the degree more rapidly than the ones accessing by CNAES or M23, which usually have no credited formation).

6. Conclusions and Policy Implications

In Portugal, student-workers in higher education represent currently around 8.5% of the total students and are mainly adults that have been in the labour market for several years and return to education for getting a new opportunity to increase their qualifications, as opposed to the case of many other countries, where the majority of the student-workers are young individuals that look for a job, often in part-time, to help them paying the costs of their education. These student-workers are indeed very different from traditional students in terms of their motivation to study (as they are already in the labour market, their motivation is usually the possibility of a job promotion or finding a new career, more in accordance with their already mature personal interests) and in terms of their characteristics (age, marital status, school-residence geographical distance, time available to study, time gap between the conclusion of secondary school and the enrolment in higher education, etc.), justifying different expectations with respect to the determinants of academic performance and the need of an independent treatment.

Furthermore, the consideration of detailed job characteristics, such as its relation with the scientific field of the degree and whether or not it is a qualified, public sector or self-employment job, as predictors of student-workers' academic performance is yet to be done, being particularly important in case of adult student-workers as those characteristics are prior to the decision on which degree to enrol. We addressed these gaps in the literature by estimating two econometric models for the determinants of academic performance of student-workers, measured by the final GPA and by the completion time.

Our dataset was obtained by matching two internal databases from IPLeiria and by complementing it with information from DGEEC of the Portuguese Ministry of Education and Science on the characteristics of degrees and schools and with information constructed by the authors using raw data resulting in an extensive set of information about student-workers, their degree and their job.

The results show that, within IPLeiria, student-workers who complete their degree behave similarly to the graduated non-worker students in terms of their final academic performance, as, in all degrees, their average final GPA is very similar to the average final GPA considering all students. However, taking into account the most standardized results in the literature on the determinants of academic performance in higher education, student-workers seem to have different determinants explaining their performance.

In fact, comparing our results with those reported in previous literature, the main conclusion is that individual and degree characteristics seem to be less important for student-workers than for non-

worker students when explaining their academic performance measured by the final GPA. Indeed, for student-workers, job characteristics play the key role.

Particularizing the results achieved on the job characteristics, the results show that self-employment and enrolling in a degree from a scientific field non-related with the professional activity have a positive effect in the final GPA of male student-workers. We also found that exercising a qualified job may harm the academic performance of students as they seem to select more demanding degrees. On the contrary, public sector's employees tend to enrol in degrees with higher average final GPA and thus to obtain themselves a higher final GPA than student-workers employed in the private sector. In addition, a flexible professional schedule may be important to increase the academic performance of student-workers. On the degree characteristics, we found that higher average final GPA within-degree, peer effects and better academic integration may contribute to increase academic success. Finally, the field of study seems also to be relevant, with the services field associated with a lower final GPA and the degrees from the IT and engineering fields more hard to conclude.

We check for the robustness of the results by running the final GPA model considering only students that access higher education through M23 regime (as they are the typical student-workers we want to study). The results of this regression, presented in Appendix 2, highly corroborate the results presented in Table 2 for all student-workers, as the coefficients of gender (male), parents' schooling, day schedule, degree average final GPA, self-employment, job-degree match (in case of males) and public sector job preserve their signal and statistical significance.

As our results are conditional on the fact that students achieved graduation, additional investigation is required to provide a more complete picture of the academic success of student-workers, namely by analysing dropouts and their causes.

We expect that our work contributes to the human capital literature by characterizing the profile of the student-worker and the way his/her characteristics predict his/her academic performance, which constitutes valuable information for both current and future student-workers, and especially for central policy makers and education institutions. In particular, our results may help IPLeiria and other similar institutions improving its "recruitment" and "operational" strategies so as to increase the participation of adult workers in higher education and to promote their academic success, thus contributing to increase regions' intellectual capital, labour productivity, wages and firms' competitiveness and profitability in the short-run.

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8. Appendix

Appendix 1: Description of the variables

Variable	Definition
Final GPA	Final grade point average obtained in the degree.
Completion time	Difference between the graduation date and the enrolment date.
Gender (Male)	Dummy: 1 if the student is male; 0 otherwise.
Marital Status (Married)	Dummy: 1 if the student is married; 0 otherwise.
Age	Continuous variable tracking student's age.
Nationality (Foreign)	Dummy: 1 if the student does not have Portuguese nationality; 0 otherwise.
Parents' schooling	Maximum number of schooling years among both parents.
School-residence distance	Average distance, in km, between the county of residence of the student and school's location.
Scholarship	Dummy: 1 if the student receives social support; 0 otherwise.
First call admission	Dummy: 1 if the student enrolled the degree in the first call (in September); 0 otherwise.
CNAES	Dummy: 1 if the student was admitted in the degree through the Portuguese national admission regime for higher education; 0 otherwise.
M23	Dummy: 1 if the student was admitted in the degree through the regime designed for people for over 23 years old; 0 otherwise.
Re-admitted	Dummy: 1 if the student was re-admitted in the degree after at least one year without attendance; 0 otherwise.
Transference	Dummy: 1 if the student was transferred from another school; 0 otherwise.
Degree Transition	Dummy: 1 if the student was transferred from another degree; 0 otherwise.
CET	Dummy: 1 if the student was admitted in the degree after the conclusion of a technological specialization degree (CET); 0 otherwise.
Graduated	Dummy: 1 if the student is already graduated; 0 otherwise.
Other access regime	Dummy: 1 if CNAES, M23, Re-admitted, Transference, Degree Transition, CET, Graduated are all equal to 0; 0 otherwise.
Part time status	Dummy: 1 if the student has the part time status; 0 otherwise.
Day schedule	Dummy: 1 if the classes of the degree occur between 8 a.m. and 8 p.m.; 0 otherwise.
Arts	Dummy: 1 if the degree is in the field of arts; 0 otherwise.

Education	Dummy: 1 if the degree is in the field of education; 0 otherwise.
Health	Dummy: 1 if the degree is in the field of health; 0 otherwise.
Social Sciences and Law	Dummy: 1 if the degree is in the field of social sciences or law; 0 otherwise.
Engineering	Dummy: 1 if the degree is in the field of engineering; 0 otherwise.
IT	Dummy: 1 if the degree is in the field of information technologies; 0 otherwise.
Services	Dummy: 1 if the degree is in the field of services; 0 otherwise.
Degree average final GPA	Average of the final GPA within the completed degree.
Degree final GPA standard deviation	Standard deviation of the final GPA within the completed degree.
Degree proportion of student-workers	Proportion of student-workers within the completed degree
Self-employed	Dummy: 1 if the student is a self-employed worker; 0 otherwise.
Job-degree match	Discrete variable going from 1 to 5, with 1 meaning that no relation exists between the job and the scientific field of the completed degree and 5 standing for the cases where the fields of the job and the degree are deeply related.
Male job-degree match	Dummy: 1 if the student is male and the fields of his job and his degree are strongly related; 0 otherwise.
Female job-degree match	Dummy: 1 if the student is female and the fields of her job and her degree are strongly related; 0 otherwise.
Public sector job	Dummy: 1 if the student works in the public sector; 0 otherwise.
Qualified job	Dummy: 1 if the student-worker exercises a qualified job; 0 otherwise.

Appendix 2: Results for the first model considering only M23 student-workers (140 observations)

	(5)	(6)
Gender (Male)		2,4036***
Age		−0,0093
Nationality (Foreign)		−2,3286
Parents' schooling		−0,0963*
Scholarship		−0,7290
School-residence distance		0,0040
First call admission		−1,7890
Married male		0,1015
Married female		0,5529
Part time status		1,6083*
Arts		−0,5381
Education		−1,8804
Health		−0,1576
Engineering		−1,3418*
Services		−2,5943***
Degree average final GPA		1,9940***
Degree final GPA st. dev.		−0,5249
Day schedule		1,6083*
Degree proportion of SW		2,8997
Self-employed male	2,3402***	2,8250***
Self-employed female	0,6505	−1,6552*

Male job-degree match	−0,0531	−0,5137***
Female job-degree match	−0,0753	0,0963
Qualified job	−0,4094	−0,1199
Public sector job	1,2948***	0,0915
Correct predictions	25.7%	43,6%
p-value Likelihood ratio test	0,0000	0,0000

*p<.10, ** p<.05, *** p<.01