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ORIGINAL ARTICLE

An Empirical Analysis of the Effects of Student Work and Academic Performance on the Probability of Employment[☆]

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Abstract

The theoretical relationship between student work and post-college probability of employment is ambiguous, due to the opposing direct and indirect effects on human capital accumulation. Student work may on one hand lower academic performance and thus harm the likelihood of getting a job, while on the other hand enabling students to acquire skills that increase their labour market odds. In this paper, we provide an answer to the question, whether the policy should encourage or limit student work, by using rich data which allow us to compare the effects of the two investments in human capital on the likelihood of employment. We use personal characteristics, socio-economic background, and academic performance in the propensity score matching to calculate the differences in the probability of employment for different amounts of student work. We find that only work experiences up to two years have a beneficial effect on employment prospects, while much larger effects are observed for improvements in educational attainment, like graduation and improvement in GPA. In the end, our results provide support for setting limits to the extent of student work during college, but certainly not for its prohibition.

Keywords: Student work experience, Academic performance, Probability of employment, Propensity score matching

JEL classification: I23, J21

Introduction

The debate on the advantages and disadvantages of student work is vibrant and has been ongoing for decades, not only because of the high percentage of students who work during college, but also because of its opposing direct and indirect effects. The latter work through academic performance on employment prospects (in the first years after leaving college), which according to the evidence, appears to have long-term effects on future employment and/or earnings (see, for example, Ellwood, 1982; Gregg & Tominey, 2005;

Mroz & Savage, 2006; Nilsen & Reiso, 2011; Nordstrom Skans, 2011; Oreopoulos et al., 2012; Ryan, 2001; Schmitten & Umkehrer, 2017).

In economics, two competing theoretical views explain the existence of positive effects of academic performance and work experience on the success of post-college entry on the labour market. The first is the human capital theory (Becker, 1962, 1964, 1993), according to which the skills accumulated in education or at work enhance an individual's productivity, resulting in improved labour market outcomes. The second theoretical view is the screening/signalling theory (Arrow, 1973; Spence, 1973), which is based on the premise that education

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and previous work experience serve only as a signal of an individual's productive characteristics.

Although the causes of the effect of education and student work experience on the post-college labour market outcomes are different in the theories listed above, they all predict a positive impact of the acquisition of both types of skills/credentials on employment probability. Concurrently, the theory of time allocation (Becker, 1965) provides foundations for a negative association between student work and academic achievement—students must allocate a limited time between the two activities, thus putting more hours into the accumulation of work experience likely harms academic performance. This is also supported by empirical evidence. Stinebrickner and Stinebrickner (2003), Auers et al. (2007), DeSimone (2008), Callender (2008), Kalenkoski and Wulff Pabilonia (2010), and Beerkens et al. (2011) found a negative effect of student work during college on GPA. In addition, Ehrenberg and Sherman (1987), Beerkens et al. (2011), Kosi-Antolič, Nastav and Šušteršič found a negative effect of student work on 'graduation-on-time', while Darolia (2014) discovered a negative effect on the number of credits per term. The adverse effects of student work on GPA, number of exams passed and the probability of passing a year are also found in a paper analysing similar data as used in this study (Bartolj & Polanec, 2018). In sum, the indirect effect of student work on post-college labour market outcomes is negative.

The relevant question for policymakers, institutions, and students that we attempt to address in this article is the following: Should student work during college be limited or not? To answer the question, we present evidence-based advice founded on a comparison of two effects: the effect of student work experience on the probability of employment, and the effect of academic performance on the probability of employment. For this purpose, we use administrative data on a set of Slovenian undergraduate students, who were enrolled in 4-year undergraduate programs offered by the School of Economics and Business during the period 1997–2008 and were seeking work between 2002 and 2010. To our knowledge, this study presents the first attempt to compare the relative impacts of student work and educational performance on the probability of getting a job after college, using one data set and the same methodology to estimate both effects. The differences in the estimated effects thus cannot be attributed to

the discrepancies in the institutional contexts, measurement and/or estimation method. The only analysis that is comparable to ours examined only males in the U.S. during the period 1972–1979. In addition, it concentrated on the effects on earnings and found evidence of a positive effect of higher grade-point averages, but failed to find any relationship between student work and post-college earnings.

A distinguishing feature of our empirical analysis is also the application of propensity score matching, which has not yet been used in this specific context.¹ On the one hand, this method allows us to compare labour market outcomes of students with different academic performance but similar student work experience, personal characteristics, and socio-economic background. On the other hand, we can observe differences in the probability of employment of students with similar academic performance, personal characteristics, and socio-economic background, but diverse student work experience. We consider its property of putting emphasis on observations with similar regressors and thus giving low or no weight to observations at a margin as an advantage over the methods that minimize squared errors and give such observations a high weight.

In line with the theoretical predictions, our results, based on the data on the students of business and economics studies in Slovenia, confirm positive effects for both types of skills/credentials (work experience and education) on the probability of being employed after college. However, the returns to student work experience seem to be diminishing. We find that 10–24 months of student work experience (gained within the four years of studies) were associated with an approximately 10 percentage point increase in the probability of employment, though increasing student work experience beyond 2 years was not beneficial. A similar increase in the probability of employment was also related with ranking among the top 25% of class, as opposed to the bottom quartile of the class, based on the grade point average (GPA). Nevertheless, writing and defending a thesis, which was supposed to take one year, is found to have been associated with more than a 20 percentage points increase in the probability of employment in comparison to passing all exams but not graduating. We also find that the type of student work experience was highly relevant. Our analysis shows that acquisition of student work experience in high-skilled jobs that were related to the field of study increased the probability of getting

¹ Quasi-experimental methods based on propensity score matching (PSM) are, however, still frequently used in evaluation of various treatments on the labour market outcomes. In fact, the seminal contribution by Dehejia and Wahba (1999) considered the effects of training—a form of investment in human capital—on earnings. PSM has been used in more than 50 studies of active labour market policies alone (Vooren et al., 2018).

a job after college by almost 16 percentage points in comparison to student work experience in low-skilled jobs that were unrelated to the college major.

The analysis provides support for setting limits on the extent of student work during college, at least for the students of SEB UL. As the benefits of student work experience do not seem to exceed those of the analysed academic performance indicators per required unit of time, it is not worthwhile to sacrifice academic success in return for higher student work experience. Furthermore, results suggest that the optimal amount of student work coincides with the cumulative length of college school holidays, during which student work minimally harms academic success. Thus, the policies, such as the one in Belgium that limits student work to up to 475 h per year, seem to be well-grounded and the most efficient.

1 Review of empirical evidence

The bulk of relevant literature on the association between academic performance and labour market outcomes is concentrated on earnings. The most substantial part of this literature deals with the estimation of returns to education (for a review of estimation approaches see Heckman et al., 2006; for the most recent review of results, see Psacharopoulos & Patrinos, 2018; and for returns to education in Slovenia—the country used in this study—see Bartolj et al., 2013). The global average private return to a year of schooling based on these estimations is 9% a year (Psacharopoulos & Patrinos, 2018). The vast literature also provides evidence on the positive relationship between earnings and GPA, school quality and/or diploma. Seminal papers in this fields of research include Jones and Jackson (1990) on the impact of grades, Card and Krueger (1992) and Betts (1995) on the impact of school quality, and Hungerford and Solon (1987) and Belman and Heywood (1991) on sheepskin effects. However, the relationship between education and the probability of employment is less explored. Recent exceptions are experimental studies by Deming et al. (2016) and Piopiunik et al. (2018) who consider the effects on the likelihood of a call back for two different treatments: completion of the online educational program (compared to the on-campus ones) and improvement of GPA. Deming et al. (2016) find 22% lower probability of a call back for business bachelors from for-profit online institutions than from non-selective public institutions, whereas Piopiunik et al. (2018) find that a one grade level increase in college GPA

results in a 38 percentage points higher likelihood of landing a job-interview.

The literature that analyses the relationship between student work experience and labour market outcomes can be divided on the basis of the level of education during which student experience is acquired—secondary versus tertiary education. The empirical studies that analyse the effects of high-school work experience on post-study labour market outcomes (e.g. Light, 1999; Light, 2001; Ruhm, 1997) cannot be generalized to work performed by college students, as college students are more likely to find jobs that are related to their field of study, and thus enjoy higher returns to work experience. Thus, we concentrate solely on the effects found in the studies that use data from college students. Recent experimental studies yield mixed results. For example, while Baert et al. (2015) find no causal evidence of mentioning student work experience in a resume on the likelihood of a call back in their field experiment with fictitious job applications, Piopiunik et al. (2018), on the other hand, show that longer internship increases the probability of being invited to a job interview. However, in the systematic literature review of the effectiveness of supervised work placements in higher education (i.e. students take time out of education to work full-time in an organization), Inceoglu et al. (2018) conclude that such placements elicit overall small positive effects on career outcomes. Less structured student work experience seems to be positively related to post-college labour outcomes as well. For example, Hotz et al. (2002) find that returns to college employment range between 4.6 and 5.4% for whites. These results are confirmed by Häkkinen (2006), who also shows that one additional year of in-school work experience increases the probability to be employed one, two and three year(s) after graduation by 5.6, 4.2 and 3.7 percentage points, respectively. Also, Scott-Clayton and Minaya (2016) do find a comparable relation between experience and the probability of employment, though the effects seem to be higher for the experience that is related to the field of study (Geel & Backes-Gellner, 2012).

2 Institutional context of the study

Our empirical study relies on the data from the largest Slovenian university. Our sample consists of full-time undergraduate students, who were first enrolled in the four-year programs at the School of Economics and Business,² the University of

² Until 2019, the name of the faculty was Faculty of Economics, University of Ljubljana.

Ljubljana (henceforth SEB UL), between 1997 and 2004, and were available in the labour market as regular employees between 2002 and 2010. Several studies have already used the Slovenian universities as their primary data source, which suggests that the data from the Slovenian tertiary institutions have been acknowledged as a suitable source for academic research (e.g. Bartolj & Polanec, 2012; Bartolj & Polanec, 2018; Farcnik & Domadenik, 2012; Čadež et al., 2017; Kosi-Antolič et al., 2013). Here, we provide a short description of the key characteristics of the institutional context for this study, while an interested reader can find additional information in Bartolj and Polanec (2012), Čadež et al. (2017), and Bartolj and Polanec (2018), which also make use of the data from SEB UL.

The sample of full-time students of SEB UL is nevertheless not representative of the respective cohorts of high-school graduates, as these could enrol in full-time four-year UG programs only, if they had completed any four-year high school and achieved sufficiently high weighted average grade³ among the nationally ranked applicants. For such students with a Slovenian residence, studies were tuition-free, which implies that payment of tuition costs was not a motive for supplying student work.⁴

SEB UL offered—during the period of analysis—three economics majors (banking and finance, international economics, and national economics) and five business majors (accounting and auditing, business informatics, finance, marketing, and management and organization). Business majors were chosen by a large majority of students, among which dominated finance, management and organization, and marketing majors. Students were expected to complete the four-year study program within five years (including the year for writing the final thesis), although study duration varied between four and six years and could extend to beyond ten years.

The grading scheme in Slovenian universities operates on a ten-point scale, with 1 as the lowest and 10 as the highest grade,⁵ and 6 as the minimum passing grade. Students can attempt to pass exams three times per academic year in each course.

The Slovenian regulation at the time limited student work to full-time students between 15 and 26 years of age, who were enrolled in any state-approved primary, vocational, high school, or

undergraduate program. The student work contracts, called referrals, were issued by licensed intermediaries—student employment agencies. The incentives for hiring student workers were strong during the analysed period, as regular employment contracts were subject to high social contributions, which amounted to 38.2% of gross wages, whereas student-employment contracts were not subject to any such tax. Regular employees were also entitled to a bonus for working night shifts, Sundays, holidays, higher wages for overtime, seniority and job performance bonuses, while no such rights were given to students. Further, regular employees were also paid tax-free costs for meals during working hours and daily commuting costs (SSC Act, 2001), and their incomes were subject to a progressive payroll tax.

Despite the advantageous tax regime, student work was subject to taxation. Specifically, employers had to pay concession fees (on top of student gross earnings), value-added tax on the concession fee, while students were subject to personal income tax. During the period of the analysis, the concession fee increased from 10 percent of students' gross earnings (1997–2003) to 12 percent (2004–2006), and then even further to 14 percent (2006–2008). As the VAT rate was 20% on the concession fee, the total cost for student work for employers in 2008 was EUR 1.168 for every EUR of gross earnings. Moreover, students' personal incomes were subject to positive tax rates above significantly higher incomes, due to additional (student-specific) personal tax deduction. Hence, net and gross earnings were the same for a vast majority of students.

The comparatively low cost of student work was the major driver of demand for this type of labour. In 2008, 114,391 Slovenian students in all types of tertiary education, as many as 927,809 student employment contracts were issued and 54,363,336 h of work performed. This amount of work is equivalent to work performed by 26,000 full-time employees or 2.9% of aggregate employment (inclusive of student work).

3 Data sources

We aim to estimate the causal effects of student employment and academic performance on the probability of employment (emphasized arrows in Fig. 1). For this purpose, we constructed an

³ This average was calculated from the grade percentage averages achieved in the third and fourth year of high school study and a national exam—matura—the Slovene equivalent of the SAT in the US.

⁴ Bartolj and Polanec (2020) study the determinants of labour supply decisions by UL students enrolled in four- to six-year undergraduate programs during this period.

⁵ However, grades below 5 were rarely used in practice, which led us to set such grades to equal 5.

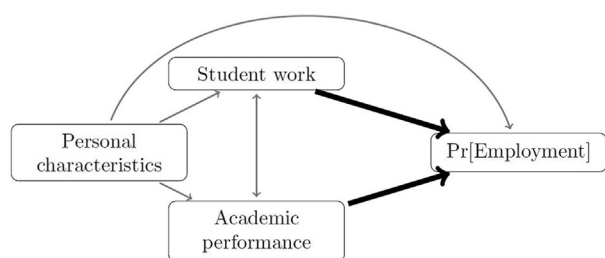


Fig. 1. Representation of causal chain.

individual-level panel of employment histories during and after studies, academic performance, earnings and personal characteristics of full-time undergraduate students at SEB UL, by merging individual-level data from the following sources in a secure room at the Slovenian Statistical Office (SORS):

- **Slovenian Tax Authority (TARS):** The data on student and regular-employee earnings are reported to TARS by student employment agencies and employers.⁶ TARS provided us with the information on the labour incomes earned by persons during and after the completion of studies. While students with sufficiently low earnings are typically not obliged to report personal incomes, student employment agencies have a legal obligation to report earnings received by each working high school or college student. In addition, TARS is also the source of data for incomes of students' families and post-college earnings of students. Personal income tax filings also include labour and capital incomes, which are an essential piece of information for the construction of the variable family income per member, i.e. one of the variables used in the propensity score matching procedure. Furthermore, labour incomes of families include not only wages and salaries, but also bonuses, perks, wages earned from short-term labour contracts, and royalties, while capital incomes include interest, dividends, rents, and incomes of sole proprietors.
- **SEB UL:** From this source of data, we use application-sheet data and the data on all attempts to pass exams, grades achieved for all students enrolled in the four-year programs, and year of graduation. We extract the information on age, gender, the location of permanent residence, chosen major, study year, grades and year of

graduation. Based on the enrolment history of each student, we also at this point construct variables that indicate if students passed a year, repeated a year, or dropped out of a program. In addition, exam results are used to construct variables on study performance of students.

- **National Examination Center:** We extract information on the third- and fourth-year average grades and the grades from the final (external) examination called matura from this source. These grades are used to construct the high school GPA.
- **SORS:** We obtain the data from the Central Registry of Population, which allow us to establish the identity of the students' parents, using a unique person identifier for each student, and also attribute family incomes and transfers to each student. Knowing the identity of parents enables us to determine their educational attainment and family income. From this source, we also obtain information on all scholarships received by students, such as social scholarships, targeting students with low-income families, scholarships for talented individuals (Zois scholarships) and scholarships granted by prospective employers.

For a subsample of students, we also use data from a student employment agency, e-Študentski servis. This is an agency with a market share exceeding 50 percent in student work intermediation. As this employment agency has more outlets in central Slovenia, its market share in total student employment is likely even higher for SEB UL students, who typically select a student employment agency that intermediates the student work transactions. Their data contain not only information on the incomes paid for each student worker, but also information on the number of working hours, the identity of the employer, and the types of jobs for all students who used their services. Unfortunately, the information from this source of data is limited to referrals issued between January 2006 and December 2010, which reduces our sample to roughly half of all observations.

4 Description of variables and summary statistics

As already mentioned on pages 4 and 5, we restricted our sample to a set of full-time

⁶ A standard procedure for data collection by tax authorities is reporting incomes by individuals, which was also the case in Slovenia during the period of our analysis. However, the data we use were reported by employers for regular employment or student employment agencies for student work, and were initially used for inspection purposes.

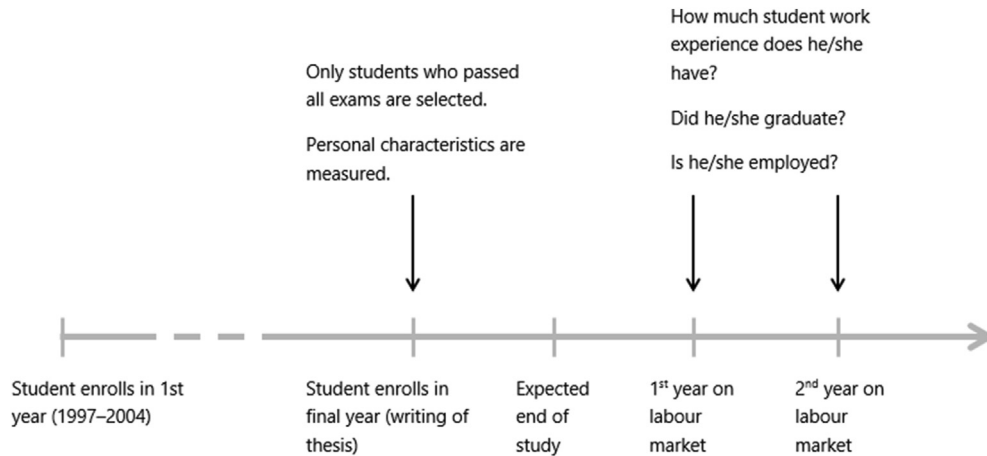


Fig. 2. Representation of the sample.

undergraduate SEB UL students, who started studies during the period from 1997 to 2004, were 18–20 years old when enrolling in the first year, and passed all mandatory exams during the entire four-year study. These students were expected to finish their study with a defence of the thesis within one year after passing the exams. We refer to this period the final year of study. As we have no information on the actual start of the search for a regular job, we assume the first and the second years on the labour market to be one and two *calendar* years after the expected year of studies (inclusive of the final year). We determine the amount of student work experience, the post-college employment status and academic performance for these two periods, which refer to the time period from 2002 to 2010 for our sample of students (see also Fig. 2).

The sample consists of 2616 and 2347 observations in the first and second year on the labour market, among which around 60% are females (see Table 1). Note that in the vast majority of cases, the employment status for the same person is observed in the first and the second calendar year after the final year of study. The post-college employment status is measured with an indicator variable that assumes value 1, if a person worked at least 1 h and earned positive earnings in regular employment in a calendar year, and value 0 otherwise.⁷ Table 2, which contains the summary statistics, reveals that 65.0% and 86.3% of persons were employed for at least 1 h in the first and second year, respectively.

One of the main questions that we aim to address is whether student work experience has any effect on the likelihood of post-college employment. We construct a measure of student work from earnings

Table 1. Sample size by gender.

	1st Year	2nd Year
Number of observations	2616	2347
Males	1068	952
Females	1548	1395

Table 2. Summary statistics.

	1st Year		2nd Year	
	Mean	Sd	Mean	Sd
Employed after college	0.650	0.477	0.863	0.344
Student work experience in years	1.833	1.147	1.868	1.156
Graduated	0.661	0.473	0.809	0.393
Time to final year	4.522	0.749	4.521	0.741
No. of exam attempts	54.718	12.620	54.454	12.451
Avg. grade	6.801	0.750	6.808	0.744
Age (at enrolment to faculty)	18.895	0.407	18.885	0.414
High school GPA	0.511	0.155	0.518	0.153
University or higher—mother	0.208	0.406	0.206	0.404
University or higher—father	0.235	0.424	0.235	0.424
Family business	0.162	0.369	0.156	0.363
Step parent	0.235	0.424	0.239	0.426
No. of siblings	0.790	0.750	0.804	0.746
Student parent	0.006	0.085	0.006	0.085
Non-labour income	8005	5794	7920	5682
Conditional income share	0.147	0.232	0.153	0.237
Capital income share	0.042	0.088	0.041	0.088
Expected net wage	15.852	2.484	15.749	2.452
Year	2006.7	2.2	2007.3	1.9

Note: All income-related variables are in constant (2004) Euros. The exchange rate in 2004 was 1 EUR = 1.24 USD. Variables describing family characteristics and the economic conditions of students during studies are measured in the final year of study.

reported by student employment agencies. As we do not have information on the actual hours of work performed, we use information on the average hourly gross wage rates, reported annually by the largest student employment agency for regular

⁷ We also considered alternative (stricter) definitions of employment status, like employment with indefinite contracts, and found qualitatively similar results.

college students, to calculate the total number of working hours.⁸ Table 2 shows that the average total student work experience—calculated by dividing hours of student work by the total number of hours of a full-time employee per year—was roughly 1.8 years. Assuming the average duration of studies (5.5 years), the average amount of work was around 3.3 months or 11 h per week.

In addition to the effects of student work experience, we are also interested in the treatment effects of study outcomes on the probability of employment, as employers seeking regular workers may select them based on their study results, as shown by Pinto and Ramalheira (2017) for business students. The first such indicator pertains to graduation, which assumes value 1, if the student graduated (passed all exams and successfully defended their thesis), and 0 otherwise. This variable aims to capture the well-known ‘sheepskin’ effect (Belman & Heywood, 1991; Hungerford & Solon, 1987). Table 2 reveals that the majority of SEB UL students defended their theses on time, as the share of graduates in the first year was 66.1%, while by the second year this share increased to 80.9%. The other measures of study performance are time-needed to reach the final year, the total number of attempts to pass all exams, and the average grade achieved in all exams. Table 2 shows that the average time to the final year was around 4.5 years, which implies that students needed roughly half a year more than expected. While the total number of exams was 38, the average number of exam attempts was significantly higher—54. The average grade for all exams was around 6.8.

Next, we describe a set of variables, based on which we perform propensity score matching. This set covers the students’ own and their families’ characteristics, values, and the structure of non-labour incomes, major-specific expected net wages, indicator variables for year of entry to the labour market, and the region of permanent residence of students. Starting with personal characteristics, Table 2 reports the average age when enrolled at university, and high school GPA, a measure of general ability. As a result of the construction of our sample, which includes only full-time students, who chose programs offered by the SEB UL immediately after completing high-school studies, the average age was only 19 years. Our measure of general

ability, namely high school GPA, is calculated from grades achieved in the third and fourth year of study and the final exam. We then normalize the measure to range between 0 and 1 (by subtracting 2, the minimum passing grade, and further dividing this difference by 3). The average normalized GPA is around 0.5 in both periods.

Turning to family characteristics, we use the data on the educational attainment of parents, ownership of family business by either of the two parents, having a step parent, number of siblings below the age of 27, and parental status before entry into the labour market. These variables are included in the estimation of propensity scores, as these may affect student work and academic success, as well as labour market outcomes. The educational attainments of parents are measured with the indicator variables that assume value 1, if they completed at least a four-year undergraduate college degree, and value 0 otherwise. Table 2 shows that around 20% of mothers and fathers had a college degree, while roughly 16% of students had parents who owned a family business. On average, 24% of students had step parents, and less than 1% had a child during their studies. When entering the labour market, persons had on average less than one sibling under the age of 27.

The economic situation of a student during the last year of study is captured by three variables: non-labour income, conditional income share and capital income share in non-labour income. Non-labour income is calculated as the sum of all incomes that are unrelated to student work: (i) net family income per family member, which is constructed as the sum of parental net income, divided by the number of family members⁹, and serves as a proxy for parental transfers; (ii) scholarships; and (iii) pension received after deceased parents. The share of income that depends on academic success (conditional income share) is calculated as a share of scholarships and pension benefit payments from a deceased parent¹⁰ in the student’s non-labour income. Capital income share, on the other hand, is the share of capital incomes in non-labour income, where we use information on capital gains, dividends, copyright income, etc. from personal income tax statements. The average non-labour income in the final year of study for persons who had entered the labour market was EUR 8,005, 14.7% of which

⁸ The observed differences in hours could in principle also reflect the differences in hourly wage rates. However, this limitation of the data could not be avoided.

⁹ We count parents and children under the age of 27 as family members, following the income tax act that defines a dependent family member as a person up to the age of 26 (in addition to other requirements).

¹⁰ Children have the right to receive a pension after their deceased parent until the end of their schooling or until they are 26 years old. Therefore, students who are not enrolled in a program lose pension.

depended on academic success, and 4.2% of which the income pertained to capital.

Finally, Table 2 also contains summary statistics for the expected net hourly wage, which is calculated separately for each year, major, and gender. We presume that students formed expectations based on the most recent net wage of persons who graduated in their major.¹¹

To capture the differences in the specific labour market conditions, our empirical model also includes indicator variables for year of observation (Table 2), major (Table 3), and region of permanent residence of persons (Table 4). Table 3 reveals a significant variation in the popularity of different majors. The most popular were business majors, such as finance, marketing, and management and organization, while among the economics majors, banking and finance dominated.¹² The regional structure reveals that the students were most likely to originate from the Osrednjeslovenska region, where SEB UL is also located (see Table 4).

5 Estimation method

In order to estimate the effect of student work on the probability of employment after college, as well as the effect of academic performance on post-college probability of employment, we employ the propensity score matching technique (see e.g. Angrist & Pischke, 2009; Lee, 2005). This type of estimation enables us to match students with different work histories during their studies, but with similarly predicted probabilities or propensity scores of student employment level, and compare their post-college labour market outcome. Analogously, we can compare the post-college employment status of ‘similar’¹³ students, who differed ‘only’ in their academic performance. The advantages of propensity score matching are two-fold: (i) it avoids the dimensionality problem of finding matched subjects, if there are many control variables, and (ii) it imposes minimal structure on estimation. Another advantageous property of matching is the fact that it emphasizes observations with similar regressors, namely, observations at margin are likely to get lower weights. In contrast, OLS tries to minimize squared errors and thus gives observations at margin relatively high weights.

The estimation of treatment effects is done in two steps. In the first step, we estimate propensity

Table 3. Structure of sample by major.

Major	1st Year	2nd Year
National Economy	1.22	1.24
International Economics	6.27	6.99
Banking and Finance	9.59	10.31
Marketing	19.07	18.07
Finance	31.65	31.23
Accounting	9.29	9.08
Management and Organization	13.38	13.98
Business Informatics	9.52	9.12

Note: Table presents shares in percent of the respective column total.

Table 4. Structure of sample by region.

Region	1st Year	2nd Year
Pomurska	1.45	1.62
Podravska	1.26	1.24
Koroška	1.80	1.62
Savinjska	7.11	6.90
Zasavska	2.14	1.96
SpodnjePosavska	2.33	2.39
Jugovzhodna	9.25	9.76
Osrednjeslovenska	45.95	45.97
Gorenjska	13.38	12.82
Notranjsko – Kraška	2.48	2.39
Goriška	7.19	7.37
Obalno – Kraška	5.66	5.97

Note: Table presents shares in percent of the respective column total.

scores. Since we measure academic success and student work experience at the end of studies, extensive student work could have harmed academic success in a current year, but at the same time, poor academic performance could have lowered student work in the subsequent year (this is presented with a double headed arrow in Fig. 1). Thus, the logit regression for the probability of working k hours during study (denoted SW_k), includes not only the students' personal and family characteristics, amounts and structure of non-labour incomes, major-specific expected net wages, indicator variables for year of entry to labour market, region of permanent residence of students (denoted x), but also academic performance (A) as explanatory variables. Similarly, we use the variables in x and student work as explanatory variables in the estimation of the propensity scores for academic performance:

$$Pr[SW_{ki} = 1] = \alpha_0 + \alpha_1 x_i + \alpha_2 A_i + u_i \quad (1)$$

¹¹ Bartolj and Polanec (2012) demonstrated that SEB UL undergraduate students make college major choices based on past net wages, which suggests that the assumed formation of expectations is reasonable.

¹² Note that Slovenian employers often require specific fields of specialization in job advertisements.

¹³ Similar in values of the observed variables.

$$Pr[A_{ji} = 1] = \beta_0 + \beta_1 x_i + \beta_2 SW_i + e_i \quad (2)$$

This conditional probability of working k hours during the study (or achieving level j of academic performance), given the explanatory variables, is used to match the students who worked different numbers of hours during the study (or performed differently in terms of study outcomes), but have similar propensity scores values. The matching algorithm used in our analysis is radius matching with replacement and imposed common support. As suggested by Austin (2011), we use a calliper equal to 0.2 of the standard deviation of the logit of the propensity score.¹⁴

We expect different levels of student work to have different impacts on labour market outcomes. Therefore, we create six different indicator variables, which allows an estimation of six different treatment effects. We estimate these weighted average conditional differences (WACD), using the same mathematical formulas that are used in estimating the average treatment effects on the treated (ATETs). However, as we cannot explain the full variation of the selected treatments with the observable variables, our estimated effects reflect both the differences in treatment levels and the differences in unobserved characteristics. Consequently, the estimated effects do not have causal interpretation, and we hence abstain from using the term average treatment effect on the treated.

As shown in Table 5, we compare students who had less than 10 months of student work experience¹⁵ with those with 10–24 months of work experience (WACD₁₁), students who gained 2–3 years of work experience (WACD₁₂), and students with more than three years of work experience (WACD₁₃). Similarly, we compare students who gained 10–24 months of work experience with those with 2–3 years of student work experience (WACD₂₂), and so on. The benefits of such estimation are described in Bartolj and Polanec (2018). The effects of academic performance on labour market outcomes are estimated by comparing students with, on one hand, similar propensity scores (described with Equation (2)) and, on the other hand, differences in two measures of academic

Table 5. Estimated WACDs based on the amount of student work experience.

Student work experience	10–24 months (32%)	2–3 years (23%)	more than 3 years (22%)
less than 10 months (23%)	WACD ₁₁	WACD ₁₂	WACD ₁₃
10–24 months (32%)		WACD ₂₂	WACD ₂₃
2–3 years (23%)			WACD ₃₃

Note: Values in parentheses present the share of students in the sample that belongs to each group.

success—cumulative grade point average (GPA) of all exams taken in college and graduation.

All effects are estimated for the first and second year on the labour market. It should be noted that we do not estimate the ‘dynamic model’, which would include the lagged employment in the estimation of propensity scores for the second year,¹⁶ because we are interested in the impacts that reflect the total effects, including the indirect effect of for example student work on labour market outcomes in the second year through the outcomes in the first year on the labour market. Nevertheless, we recognize the fact that propensity score matching could only reduce the part of the endogeneity bias that is captured by observable determinants of student work and academic performance. While these might be correlated to unobservable characteristics, such as motivation, ability or preferences, we cannot be certain that conditioning on observable characteristics fully eliminates the effect of selection on unobservable characteristics. In this case, our estimated associations reflect both the effects of the variables of interest and unobserved heterogeneity. That is why we do not interpret them as the average treatment effect on the treated (ATET), as is usual in the propensity score matching literature.

6 Results of the empirical analysis

6.1 Student work and post-college probability of employment

Let us start the discussion of our results by focusing on the relationship between student work and the probability of employment after college (represented by an emphasized arrow running between student work and Pr[Employment] in Fig. 1). Before commenting on the results, note that the

¹⁴ We also tried other matching algorithms and other calliper values, but obtained qualitatively similar results. This method is selected based on the recommendation by Lee (2005) in order to make a comparison group as localized as possible and the baseline differences between treated and controls as small as possible.

¹⁵ The upper bound of this interval is an equivalent of five-years of 2-month summer jobs.

¹⁶ Hotz et al. (2002) show that estimated returns from working while in high school or college dramatically diminish, when a dynamic selection model is used.

Table 6. Estimated WACDs between student work and probability of employment.

	Student work experience		
	10–24 months	2–3 years	More than 3 years
1st Year			
Student work experience less than 10 months	0.093** (0.027)	0.059 (0.034)	0.103* (0.041)
10–24 months		–0.031 (0.026)	0.006 (0.030)
2–3 years			0.038 (0.032)
2nd Year			
Student work experience less than 10 months	0.056** (0.022)	0.097** (0.029)	0.122** (0.033)
10–24 months		0.023 (0.019)	0.044* (0.021)
2–3 year			0.032 (0.023)

Note: * $p < 0.05$; ** $p < 0.01$. Standard errors are reported in parentheses.

propensity score matching procedure balances all the included variables in the logit regression. In Table 6, we report the estimated WACDs, corresponding to the theoretical effects of student work on the probability of employment described in Table 5. The estimated effects are mostly positive and seem to exhibit diminishing returns to work experience, both one and two years after the entry on the labour market. Focusing on the estimated $WACD_{11}$, $WACD_{12}$ and $WACD_{13}$, we find that students in the first (second) year after entering labour market, who worked 10–24 months, 2–3 years, and more than three years during their study had, on average, 9.3 (5.6), 5.9 (9.7), and 10.3 (12.2) percentage points higher probability of being employed than comparable students (in terms of observed socioeconomic characteristics and academic success) who obtained less than 10 months of work experience, respectively. With one exception, gaining work experience beyond two years did not yield a statistically significant effect on the likelihood of employment. The size of the effects is comparable to those reported in the existing studies (e.g. Häkkinen, 2006; Hotz et al., 2002; Scott-Clayton & Minaya, 2016).

6.2 Related versus unrelated student work experience

Next, we examine whether different types of student work affect student labour market outcomes differently. The effects are estimated on a

subsample of students who used referrals issued by one of the student employment agencies (e-Studentski servis) in the period 2006–2010. The total number of observations is 1186 and 983 in the first and the second year on the labour market, with approximately 70% of females. This data set contains information on the actual type of work performed by students, as e-Studentski servis distinguishes between more than 100 occupations and reclassifies them according to the International Standard Classification of Occupations (ISCO 1988). We sort these occupations into three groups: i) related high-skilled occupations (e.g. business analysts, accountants, programmers),¹⁷ ii) related but less-skilled occupations (e.g. office work, data preparation),¹⁸ and iii) unrelated low-skilled occupations (e.g. serving tables).¹⁹ Since we do not observe the entire employment histories of students who used the services of this agency, we cannot estimate the relations in the same manner as shown in Table 6. Instead, we compare students who performed at least some hours of related less-skilled work and related high-skilled work, with those who performed only unrelated, low-skilled work. Then we compare those with related less-skilled student work experience with those that had related high-skilled work experience. In the estimation of propensity scores, we add the amount of student work experience as an additional control variable.

The summary statistics of the subsample in Table 7 reveals that, compared to the full sample, the average student work experience is lower. This can

¹⁷ ISCO broad categories 1 and 2.

¹⁸ ISCO broad categories 3, 4, 5, and 6.

¹⁹ ISCO broad categories 7, 8, and 9.

Table 7. Summary statistics for the subsample with information on the type of student work.

	1st Year		2nd Year	
	Mean	Sd	Mean	Sd
Employed after college	0.659	0.474	0.859	0.349
Hourly gross wage after college	4.391	6.684	6.852	11.063
Student work experience in years	1.373	0.898	1.452	0.920
Graduated	0.593	0.492	0.743	0.437
Time to final year	4.582	0.774	4.601	0.789
No. of exam attempts	55.899	13.071	55.713	13.011
Avg. grade	6.761	0.736	6.768	0.737
Age at enrolment	18.908	0.393	18.894	0.402
High school GPA	0.486	0.156	0.496	0.155
University or higher—mum	0.221	0.415	0.221	0.415
University or higher—dad	0.232	0.422	0.229	0.420
Family business	0.145	0.352	0.130	0.337
Step parent	0.225	0.418	0.233	0.423
No. of siblings	0.770	0.741	0.777	0.733
Student parent	0.004	0.077	0.002	0.045
Non-labour income	8487	6623	8381	6514
Conditional income share	0.135	0.229	0.143	0.238
Capital income share	0.047	0.095	0.046	0.095
Expected net wage	15.944	2.522	15.722	2.463
Year	2008.4	1.2	2008.8	1.1

Note: All income-related variables are in constant (2004) Euros. The exchange rate in 2004 was 1 EUR = 1.24 USD. Variables describing family characteristics and economic conditions during studies are measured in the final year of study.

be attributed to the observation period, which put more weight on the years during the financial crisis, which decreased student work hours (see Bartolj et al., 2015). Furthermore, persons in the subsample had poorer academic results (lower graduation rates, a higher number of exam attempts) and higher non-labour income. We attribute the latter to the concentration of the e-Študentski servis branch network in the wealthier parts of the country.

Complementing the results of Geel and Backes-Gellner (2012), we find (see Table 8) that related high-skilled student work was associated with a 15.8 (10.7) percentage points higher probability of employment in the first year on the labour than unrelated low-skilled (related less-skilled) student

work. On the other hand, we find no statistically significant effects in the second year on the labour market, which suggests that the effects of the different types of student jobs are temporary.

6.3 Academic performance and probability of employment

The last set of results provides evidence on the effect of academic performance on labour market outcomes. In this study, we concentrate on two measures—graduation and GPA—which we believe are most likely to be observed by employers in the selection process of regular workers, and may thus have the highest impact on the post-college labour market outcomes. More specifically, we compare students with a similar socio-economic background and student work experience, but different GPA rank and graduation status. We define two types of treatment: (i) GPA in the first quarter of the distribution and (ii) student has graduated. In our data, the average GPA in the top quartile was 7.86, whereas the average GPA below the 75 percentile was 6.45.

Before turning to results, we must point out that propensity score matching does not balance all the conditioning variables in the logit regression. Nevertheless, after matching, the balancing property is significantly improved. Namely, in the estimation of the average graduation effect on graduates, there are 15 unbalanced variables in the unmatched sample and only 2 unbalanced variables in the matched one (out of 43 variables). Furthermore, the differences in the mean values of variables between compared groups are significantly lower after matching.

The results in Table 9 show that graduation was associated with 28.6 and 21.7 percentage points higher probability of employment in the first and second year on the labour market, respectively. The differences in employment likelihood of persons with different GPA were smaller in size. We find that persons with an above average GPA had a 9.0 percentage points higher probability of employment

Table 8. Estimated relation between different types of student work and probability of employment.

	1st year		2nd year	
	Related less-skilled	Related high-skilled	Related less-skilled	Related high-skilled
Unrelated, low-skilled	0.038 (0.034)	0.158* (0.057)	−0.001 (0.029)	0.019 (0.052)
Related, less-skilled		0.107* (0.049)		0.006 (0.039)

Note: Standard errors are reported in parentheses. *p < 0.05.

Table 9. Estimated relation between academic performance and probability of employment.

	1st Year	2nd Year
Graduated	0.286** ² (0.022)	0.217** ⁶ (0.025)
GPA in the 75th percentile or higher	0.090** ¹ (0.025)	0.028 (0.019)

Note ^{1–6}: Number indicates how many of the 48 explanatory variables are not balanced between compared groups at $p < 0.01$. ** $p < 0.01$. Standard errors are reported in parentheses.

in the first year than those who had a GPA below the 75th percentile—a much weaker effect than the one found by Piopiunik et al. (2018). While these results are informative for the SEB UL, it is important to note that these effects clearly do not translate to other study programs and other countries, due to the differences in the curricula and preferences of employers.

6.4 Comparison of the two effects

Direct comparison of the effect of student work on the probability of employment and the effect of academic performance on the probability of employment is only meaningful, if both input and output variables are measured in the same units, rewards have the same temporal structure and risks are similar. Clearly, this is not the case for these two types of investments in human capital—they require different amounts of time and returns are likely to exhibit different risks. These differences prevent us from making any statements regarding an optimal allocation of time between the two types of investments.

Nevertheless, some guidelines can be given even on the basis of these results. The investigation of the effect of student work on the probability of employment shows that it is worth working 10 months or more. It does not, however, pay off for the student to acquire more than 2 years of student work experience. In other words, for 10 months to 2 years of effort put into student work, persons could gain an approximately 9 percentage point increase in the probability of employment. A similar effect on the chances of getting a job is associated with ranking in the top 25% of the class, according to the GPA. However, this kind of academic success requires 4 school years invested in studying. Therefore, it seems that the highest payoff could be obtained by graduating, after students pass all the exams. The writing and the defence of the thesis are supposed to take one year and are associated with a more than 20 percentage points increase in the probability of employment.

7 Conclusions

In this paper, we estimate the effects of two types of investment in human capital—student work and academic performance—on the probability of employment, by comparing the labour market outcome of persons with similar socio-economic characteristics and human capital that differed only in the investigated dependent variable. We find that both types of investments positively and significantly affect the likelihood of regular employment. Our results show consistent benefits of increasing work experience from less than 10 months to 10–24 months during undergraduate study, especially when it is high-skilled work in occupations related to college major. Additional student work experience has positive effects, but the size of these effects is small and typically statistically insignificant, which gives support to the policies that limit the amount of student work. Although direct comparison of the estimated relations is not possible due to the variation of inputs, time structure of rewards and riskiness, our rule of thumb comparison suggests that the preparation of the final thesis was associated with higher gains than any amount of student work.

Although we base our results on the data from a single educational organization that is located in a small economy, we believe that our work bears relevance for other countries. Slovenia is an open economy within the European Union, and we expect its employers to be influenced by similar economic forces as their counterparts in other EU economies. While the two types of investments in human capital might have different returns in different countries, employers should exhibit broadly similar relative preferences to those reported in our analysis. However, employers may attach different value to student work experience in jobs filled by students of other study programs (e.g. jobs in IT) that we do not analyse in this research, and thus, the relative sizes of the impacts of student work and academic performance might be different for those students.

Further research should try to overcome two main limitations of this study. Firstly, while we were able to control for a rich set of variables that are correlated with the preferences for working after college (such as family income, parental education, high-school performance), our estimations might be biased, if there were significant differences in the inclination to work after college among for example those who graduated and those who did not. In addition, our data do not allow us to observe the actual hours of student work. And even though Bartolj and Polanec (2018) show that hours

calculated in the manner that is employed in this research is a good enough proxy, further analysis should try to estimate these effects by applying data on the actual hours of student work.

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Data availability statement

The data that support the findings of this study are available in the secure room of the Statistical Office of the Republic of Slovenia. Restrictions apply to the availability of these data. For more details see <https://www.stat.si/StatWeb/en/StaticPages/Index/For-Researchers>.

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