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Enhancing students' perceived employability through employer engagement events in higher education: evidence from a quasi-experimental study

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Abstract

Purpose – The study aims to integrate sustainable career ecosystem theory and employability research to assess the impact of employer engagement (EE) events – a specific initiative within university career support services – on students' perceived employability (PE). In addition, it explores whether the effectiveness of EE events differs across student subgroups defined by gender and degree type.

Design/methodology/approach – The study employs a quasi-experimental design using a pre-post-test questionnaire, collecting data from 277 students at a public university in Italy between 2021 and 2022, before and after their participation in career services. Data analysis was conducted using non-parametric statistics, ordinary least squares regressions, and propensity score matching to test whether EE events enhance PE more effectively than career services without employer participation.

Findings – Results show that EE events effectively enhance students' PE. Specifically, students who participate in employer-led events experience a greater increase in their PE than those taking part in internally focused career support initiatives. Moreover, subgroup-specific analyses indicate that the effectiveness of EE events, relative to internally focused career services, is more pronounced among male and students outside science, technology, engineering and mathematics.

Originality/value – The study contributes to the debate on career services and students' transitions into the labor market, highlighting the critical role of EE in enhancing students' PE. It also contributes to sustainable career ecosystem theory by shedding light on the importance of effective university–employer interaction within career services to foster students' awareness of their employment prospects and support their transition into the labor market.

Keywords Perceived employability, Higher education, Career services, Employer engagement events, Quasi-experiment

Paper type Research article

Introduction

Ensuring employment opportunities and fostering sustainable careers for university students remain core objectives of European Union and national employment strategies, with higher education institutions expected to contribute to national economic growth by preparing graduates for a smooth transition into the labor market (Anderson and Tomlinson, 2021). Furthermore, the structural challenges within the graduate labor market have been exacerbated by the recent crisis triggered by the COVID-19 pandemic, further highlighting the importance of universities in equipping students with the necessary resources to successfully navigate their transition from education to employment (Lopez-Minguens *et al.*, 2021; Pereira *et al.*, 2020).

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A growing body of research has focused on the concept of perceived employability (PE), which reflects students' perceptions of their ability to secure and maintain employment after graduation (Vanhercke *et al.*, 2014; Qenani *et al.*, 2014). PE is especially critical in turbulent labor markets, as it shapes students' confidence, adaptability, and decision-making regarding their career paths (Clarke, 2018; Donald *et al.*, 2019; Monteiro *et al.*, 2021; Van Harten *et al.*, 2022). Previous studies have shown that universities can foster students' PE by helping them develop career-relevant skills, confidence, and personal resources through structured employability programs and co-curricular initiatives, such as career counseling, job search preparation, internships, and employability workshops (e.g. Jackson and Wilton, 2017; Álvarez-González *et al.*, 2017; Hughes *et al.*, 2023). Despite their strategic role in many higher education institutions, the impact of co-curricular initiatives on students' PE remains unclear and understudied (Jackson and Bridgstock, 2021), especially in terms of which initiatives are most effective and for which student groups (i.e. by gender, degree type, year of study) (Jackson *et al.*, 2024).

Much of the literature has also tended to focus on the university side of career preparation, underestimating the importance of employer involvement in the process (Orazbayeva *et al.*, 2019, 2021). By contrast, sustainable career ecosystem theory (Donald *et al.*, 2024; Donald and Jackson, 2023) argues that successful transitions to work require cooperation among interconnected actors, particularly universities and employers. Employer participation in career services is thus increasingly seen as a promising avenue to support employability development (Arranz *et al.*, 2022; Mason *et al.*, 2022). Despite this, the impact of employer engagement (EE) in career services on students' employability remains largely unexplored (Orazbayeva *et al.*, 2019).

This study addresses these gaps by assessing the added value of EE events (Mason *et al.*, 2022)—structured workshops organized by university career services that involve direct student–employer interaction—compared to other internally focused career services. While both types of interventions aim to support students' employability, EE events are distinctive in offering students opportunities to develop networks, engage directly with employers, gain insights into employer expectations for graduates, and continuously learn through knowledge sharing (Donald *et al.*, 2019). During these events, human resources managers presented their organizations, detailed available positions and the overall selection process, and provided students with opportunities to submit their Curriculum Vitae (CVs) and participate in real job interviews. In contrast, internally focused career services, such as professional development workshops (PDWs), are delivered by university staff without employer participation and involve informing, guiding, and assisting students to evaluate their desired careers critically while developing the necessary knowledge and skills, including training sessions on CV writing, interview techniques, and career orientation (Ho *et al.*, 2023).

By adopting a quasi-experimental pre–post design, this study tests whether EE events enhance PE more effectively than career services that do not involve employer participation, such as PDWs. It also examines whether the effectiveness of EE events differs across gender and degree type—two variables that may shape how students experience and respond to career services. Data were gathered from 277 students who voluntarily engaged in different types of career services provided by a public university in Italy between 2021 and 2022, with PE measured before and after participation. To test the effectiveness of EE events and isolate the added value of employer involvement in shaping students' perceptions of their employability, non-parametric analysis, ordinary least squares (OLS) regressions, and the propensity score matching (PSM) technique were employed.

The contribution of this study is manifold. First, the quantitative approach provides additional evidence on the effectiveness of co-curricular (or parallel) career services in enhancing students' PE, which is frequently overlooked in empirical literature (Jackson and Bridgstock, 2021). Second, the study provides insights into the role of university–employer collaboration within career services in supporting students' employability (Mason *et al.*, 2022;

Arranz *et al.*, 2022) and offers empirical support for the interaction between different meso-level actors in the career ecosystem (universities and employers) in preparing students for their transition to work (Donald *et al.*, 2024; Donald and Jackson, 2023). Third, the study examines whether the effectiveness of employer involvement in career services varies for different groups of students (by gender and degree type), thereby helping to prevent rather than reinforce social inequalities in the labor market (Jackson and Dean, 2023; Jackson *et al.*, 2024). Finally, this study overcomes the methodological limitations associated with cross-sectional analysis in previous research on career services effectiveness (Ho *et al.*, 2023) by providing robust evidence through a rigorous quasi-experimental pre-test/post-test control group research design.

Literature review and hypothesis

Graduate perceived employability

Graduate PE refers to the perceptions and expectations students hold regarding their future employment status, career opportunities, and ability to find and maintain employment (Vanhercke *et al.*, 2014). Graduate PE includes internal and external dimensions (Rothwell *et al.*, 2008, 2009). The former focuses on students' personal psychological attributes, while the latter considers students' evaluation of university reputation, demand for their degree qualification, and labor market conditions, including demand for their profession (Ng *et al.*, 2022; Balaku *et al.*, 2021).

PE is critical for graduates and has been positively associated with a successful transition from study to work, employment status, and job quality indicators, including salary, job satisfaction, and job–person fit (Lo Presti *et al.*, 2022). Students with higher levels of PE are more likely to make effective decisions about their professional development, experience greater job satisfaction, and achieve greater career success (Pitan and Muller, 2020). In addition, perceiving oneself as employable enhances confidence, motivation, and resourcefulness, contributing to more effective labor market behavior, better job performance, and greater resilience and adaptability to change (Qenani *et al.*, 2014). As a result, students' perceptions of employability during university serve as a valid predictor of their objective and subjective career outcomes after graduation (Martini *et al.*, 2023).

EE events and perceived employability

Previous research suggests that universities can play a key role in sustaining PE through co-curricular and optional employability-support initiatives aimed at preparing students to enter the labor market (Bradley *et al.*, 2022). Such career services include programs aimed at developing soft and transversal skills, training sessions on CV writing and job interview techniques, career guidance, and numerous initiatives designed to connect students with employers (Álvarez-González *et al.*, 2017; Donald *et al.*, 2019; Padgett and Donald, 2022; Petruziello *et al.*, 2022). Overall, universities can stimulate students' PE by promoting employability-oriented services that enhance students' perceptions of their professional preparedness (Chieng *et al.*, 2024). Moreover, co-curricular career services constitute a growing share of employability initiatives offered by universities, and their voluntary nature makes them particularly relevant for exploring patterns of self-selection, differential impact across student groups, and implications for inclusive policy design (Jackson *et al.*, 2024). Despite this, compared to curriculum-embedded initiatives, optional career services have received limited empirical attention, and their actual effectiveness in supporting students' PE is still not well established (Jackson and Bridgstock, 2021).

Sustainable career ecosystem theory (Donald *et al.*, 2024; Donald and Jackson, 2023) has recently suggested that the effective development of students' PE and the overall success of

university-to-work transitions depend on the active cooperation between interconnected and interdependent actors across higher education institutions and workplace contexts (Blokker *et al.*, 2023; Delva *et al.*, 2021). Consistently, empirical research has provided some positive evidence linking employer involvement in university employability initiatives to favorable outcomes (Jackson and Rowe, 2022; Mason *et al.*, 2022; Ishengoma and Vaaland, 2016; Thune and Støren, 2015). Ishengoma and Vaaland (2016), for example, found that university–industry linkage activities, particularly student internships, joint projects, and company involvement in curriculum modernization, were strongly perceived as enhancing student employability. Mason *et al.* (2022) revealed that career services, including structured event-based engagement with employers, can enhance students' employability by helping them focus on career goals, promoting career self-efficacy, and developing social capital. Furthermore, involving employers in university career services—such as through internships, industry project units, career fairs, career talks, networking opportunities, and job application support—improves students' understanding of the labor market and their confidence regarding future employment (Donald *et al.*, 2019; Bridgstock *et al.*, 2019). Overall, these findings suggest that a collaborative approach between universities and employers in career service design and delivery can contribute to the development of students' PE.

The present study specifically focuses on EE events, which are structured workshops organized by the university's central career services, where students interact directly with employers, learn about job opportunities, and may participate in CV submissions and real job interviews. EE events operationalize the sustainable career ecosystem principle (Donald and Jackson, 2023) by placing students in direct, reciprocal exchanges with employer representatives. Consequently, EE events can enhance students' internal and external PE through multiple mechanisms (Mason *et al.*, 2022). First, employers' presentations and Q&A sessions reduce information asymmetry about job requirements and recruitment processes, increasing students' knowledge and awareness of labor market opportunities (Vanhercke *et al.*, 2014). In doing so, EE events enhance students' PE by offering direct insight into labor market expectations, which helps them formulate more specific and aspirational career goals (Hughes *et al.*, 2023; Greco and Kraimer, 2020). Furthermore, face-to-face networking with human resource managers and recruiters and the possibility of résumé submission and job interviews help students expand their social capital, which positively relates to PE (Rothwell *et al.*, 2008). Indeed, these events expand students' professional networks, granting access to valuable resources such as information, advice, and support that facilitate career development and goal achievement (Fugate *et al.*, 2004; Inceoglu *et al.*, 2019). Moreover, participation in employer interactions—such as interviews—can strengthen students' career self-efficacy and awareness of their strengths by providing mastery experiences, opportunities for social modeling, and a greater sense of confidence in performing career-related tasks (Jackson and Wilton, 2017).

Drawing on these mechanisms, participation in EE events could lead to greater year-on-year gains in PE than participation in other career services that lack employer involvement. The latter, such as PDWs, are typically one-to-one sessions managed directly and exclusively by university staff, focusing on the development of transversal skills useful for CV building, job interview preparation, and active job search. As such, these career support services primarily act on the human capital and internal dimensions of PE (Ho *et al.*, 2023), while they may be less effective in reducing labor market information asymmetry, expanding professional networks, and increasing students' awareness of their strengths.

Based on the above discussion, the current study seeks to test whether EE events enhance PE more effectively than career services that do not involve employer participation (PDWs). Specifically, the study focuses on testing the following hypothesis:

HP1. Students who participate in EE events (experimental group) experience a greater increase in PE than those who participate in PDWs (control group).

Gender and degree differences in the effectiveness of EE events

The literature on higher education and employability also highlights that career co-curricular employability initiatives undertaken by universities risk excluding certain categories of students, particularly those who are more disadvantaged in the labor market (Jackson and Dean, 2023; Jackson *et al.*, 2024). Furthermore, students from equity groups tend to underutilize career services, despite potentially benefiting the most from them (Andrewartha and Harvey, 2017). Thus, the effectiveness of career services may differ according to specific student characteristics (e.g. Donald *et al.*, 2019).

The present study explores whether subgroup-specific patterns emerge in the association between employer involvement in career services and PE across student groups defined by gender and degree type. These two variables were selected because previous literature has highlighted their potential to influence how students engage with and benefit from employability-related initiatives (Jackson and Dean, 2023; Pitan and Muller, 2020). Rather than assuming static differences in PE between groups, the authors propose that gender and degree type may shape how students experience and respond to participation in EE events, resulting in subgroup-specific patterns of PE change.

With respect to gender, existing research presents mixed evidence. Some studies suggest that male students tend to report higher levels of PE compared to their female counterparts (Bennett *et al*., 2022; Donald *et al*., 2018, 2019; Pitan and Muller, 2020), potentially due to greater career confidence and alignment with employer expectations. Other studies, however, report no significant gender differences in PE (Jackson and Wilton, 2017; Karli, 2016). When it comes to the impact of employer-led initiatives, such effects may not be uniformly distributed across genders. While both male and female students can benefit from participating in EE events, the magnitude of the impact may differ. Male students may be particularly responsive to employer interactions, perceiving them as opportunities to validate their employability and boost self-efficacy. In contrast, female students—although equally competent—may experience the same events in more cautious or reflective ways, potentially due to heightened awareness of gendered labor market barriers (Jackson and Dean, 2023).

Similarly, degree type may influence the extent to which students benefit from EE events. While some studies suggest that non-science, technology, engineering, and mathematics (STEM) students often face more uncertain and fragmented career pathways (Okay-Somerville and Scholarios, 2017), there is also evidence that STEM students may be particularly responsive to EE, given the strong relevance of technical qualifications, labor market demand, and direct recruitment pipelines (Ma *et al.*, 2024; Donald *et al.*, 2018). EE events may provide STEM students with clearer opportunities to showcase domain-specific competencies, engage in targeted networking, and receive validation from employers whose selection criteria align closely with their academic preparation. These mechanisms could amplify the positive effects of employer interaction for STEM students, enhancing their PE more strongly than for non-STEM peers, whose career paths may be more diverse and less directly connected to specific technical profiles.

Based on this reasoning, the study tests the following hypotheses:

HP2. The effectiveness of EE events in enhancing students' PE differs across gender, such that male students exhibit stronger treatment–control differences in PE than female students.

HP3. The effectiveness of EE events in enhancing students' PE differs across degree type, such that students enrolled in STEM programmes exhibit stronger treatment–control differences in PE than students enrolled in non-STEM programmes\

Methodology

Participants and settings

The present study employed a quasi-experimental pre-test–post-test non-equivalent control group design (Hoyle *et al.*, 2002) to evaluate the effectiveness of EE events offered as optional awards by the central career services at a public university in Italy in promoting students' PE. The study was conducted in Northern Italy, within the Lombardy region, which traditionally shows stronger graduate employment outcomes compared to other areas of the country. In 2024, the employment rate one year after graduation reached 78.6% for first- and second-level graduates nationwide (AlmaLaurea, 2025). However, graduates who resided or studied in Northern Italy displayed significantly higher chances of employment (+41.4% and +46.9%, respectively) compared to their peers in Southern regions, reflecting the region's greater economic vitality and more dynamic labor market. Understanding how university employability interventions work in such a context is particularly relevant, as it provides insights into how institutional career services can strengthen PE even in relatively advantageous environments, while also informing policies aimed at reducing inequalities across regions.

As the current study seeks to test whether EE events enhance PE more effectively than career services that do not involve employer participation, it focused on students who voluntarily participated in various co-curricular career service initiatives provided by the university between March 2021 and December 2021. The treatment group included 70 students who participated in EE events. These events were structured workshops organized by the university's career services, lasting 3–4 h, in which students had the opportunity to directly interact with prospective employers. During these events, human resources managers presented their organizations, detailed available positions and the overall selection process, and provided students with opportunities to submit their CVs and, during a subsequent career day, to take part in real job interviews. From March to December 2021, a total of ten EE events were delivered (approximately one per month), some of which were offered to all students at the university, while others were targeted to those enrolled in specific degree programs. All students in the treatment group took part in at least one EE event: specifically, 55 students participated in a single workshop, 10 in two workshops, and 5 in three workshops.

The control group, on the other hand, consisted of 207 students who, in the same period, attended short PDWs aimed at teaching practical skills such as job application techniques, résumé writing, interview preparation, and LinkedIn profile creation. Unlike EE events, PDWs were managed directly by university career center staff and did not involve businesses or employers.

EE events and PDWs were offered as optional career initiatives by the university, and students chose to participate in one or the other service freely and voluntarily. Thus, the study focused exclusively on students who participated in career services during the period under investigation, excluding those who did not engage in any career initiatives. On the one hand, this allows for a direct comparison between two commonly implemented but distinct types of career services: one externally oriented (EE events) and one internally focused (PDWs), enabling a more precise understanding of which components most effectively enhance students' PE. On the other hand, this approach helps reduce selection bias by ensuring that the control and treatment groups included students who voluntarily chose to invest in their employability and career preparation, selecting individuals who were as similar as possible in terms of personal attitudes toward career and employability programs.

To evaluate the effectiveness of EE events, the study assessed their contribution to enhancing students' PE. PE was measured through a two-wave online survey conducted between January and February 2021 (Time 1) and January and February 2022 (Time 2), corresponding to the periods before (T1) and after (T2) students' participation in career services. The pre-test questionnaire administered at T1 also collected data on students' socio-demographic characteristics, human capital, social capital, work experience, and degree course. In addition, administrative data provided by the university were integrated to obtain

information on students' family income averages and exam grades. This study received ethical approval from the university's Ethical Committee.

A total of 1,554 students participated in one or both career services between T1 and T2. Among them, 424 also completed the online questionnaires at both time points. As the dependent variable in this study is the change in PE between T1 and T2, students who did not respond to PE-related questions at either T1 or T2 were excluded. Furthermore, to specifically assess the effectiveness of EE events, students who participated in both EE events and PDWs during the study period were also excluded. The final sample comprised 277 students, of whom 70 participated exclusively in EE events (treatment group) and 207 participated only in PDWs (control group).

Measures

PE was measured at T1 and T2 using a well-established self-perceived employability scale (SPES) for graduate students (Rothwell *et al.*, 2008, 2009). The SPES scale, with some modifications, has been employed in countries such as Turkey (Karli, 2016), Spain (Vargas *et al.*, 2018), and Finland (Räty *et al.*, 2018). The SPES scale contains 16 items measured on a seven-point Likert scale (1 = completely disagree, 7 = completely agree). Factorial analysis was performed using the principal components method. Results showed that the items loaded onto a single factor, with loadings ranging between 0.5 and 0.8, explaining 44.5% of the total variance in the pre-test and 46.5% in the post-test. However, as the factor loadings of item 1 ("*I achieve high grades in relation to my studies*") and item 2 ("*I regard my studies as a top priority*") were below 0.3 in the pre- and post-test, they were excluded, and the reduced fourteen-item scale was used to measure PE. Cronbach's alpha was 0.92 in the pre-test and 0.93 in the post-test. Finally, to ensure comparability of the PE scale across the pre and post-test, we tested longitudinal measurement invariance through a sequence of multigroup confirmatory factor analysis models. Configural, metric, and scalar invariance were supported (ΔCFI <0.01), indicating that the construct was measured consistently at T1 and T2.

A set of control variables was included in the pre-test questionnaire to account for demographic characteristics, human and social capital, personality traits, and academic factors that could influence PE and the effectiveness of career services. Gender was measured using a binary variable (1 = male, 0 = female). High school graduation marks served as a proxy for prior academic performance, while parental education, measured as the average education level of both parents and categorized into five levels (with Ph.D. or postgraduate coursework as the highest), represented social capital. Given the potential influence of personality traits on both PE and participation in EE events, the study controlled for the Big Five traits—extraversion, agreeableness, openness, conscientiousness, and neuroticism—each measured with three items on a Likert scale from 1 to 5. Academic performance was assessed through the grade point average over the past 12 months, calculated as the mean of exam scores between Time 1 and Time 2 (ranging from 18 to 31, based on the Italian grading system). A binary variable was included to indicate final-year enrollment (1 = final-year student, 0 = otherwise). Degree type was controlled using a dummy variable (1 = STEM degree, 0 = non-STEM). In addition, three binary variables captured participation in key activities between Time 1 and Time 2: the Erasmus program, internships/traineeships, and university-provided soft skills courses (between courses), as these may influence PE variation over time. Finally, a binary variable indicated whether the respondent graduated between T1 and T2 (1 = graduated, 0 = otherwise).

Sample's characteristics

The sample composition is as follows: 68% of participants were female, and 17% had work experience during their university studies, though none were employed at Time 2 of the survey. The average exam grade for the academic year under investigation was 27.7. Fifty percent of the sample were final-year students, and 23% had graduated between T1 and T2; these students graduated during the official graduation sessions scheduled by the university between

October and December 2021 and participated in the career services held in the months prior to graduation. Regarding the field of study, 35% of students were enrolled in sciences (STEM), while 65% pursued non-STEM degrees (economics, educational sciences, law, psychology and sociology). Finally, the analysis of participation in extracurricular programs between Time 1 and Time 2 revealed that only 2% of students participated in the Erasmus program, 3.5% attended at least one between course, and 13% completed an internship or traineeship during this period.

Findings

Test for selection effects

Intergroup pre-test comparisons were conducted to assess the suitability of the sample for intergroup analysis. Mann–Whitney tests examined differences between the control and treatment groups across socio-demographic characteristics, personal traits, and academic background (see Table 1).

No significant differences were found between groups in terms of gender ($p = 0.103$) or high school grades ($p = 0.374$). However, parental education level showed a marginally significant difference ($p = 0.089$), indicating a higher level of social capital among students in the treatment group. No significant differences between groups emerged for any personal trait. Academic career variables also did not differ significantly between groups. No differences were observed in students' average exam grades over the past 12 months ($p = 0.475$), final-year enrollment rates ($p = 0.428$), or graduation rates within the past year ($p = 0.787$). Likewise, participation rates in the Erasmus program ($p = 0.625$), internships ($p = 0.204$), and course transitions ($p = 0.726$) were similar. In addition, no significant differences were found in STEM versus non-STEM classification ($p = 0.266$). Overall, the preliminary analysis

Table 1. Pre-test characteristics between groups

Variables	Total n. 277	Control group n. 207	Treated group n. 70	*p* value Treatment vs control
Socio-demographics characteristics				
Male	32%	30%	40%	0.1035
High school grade	82	82	81	0.3745
Parents' education	2.95	2.91	3.06	0.0897
Personality traits				
Openness	4.63	4.62	4.64	0.5450
Extroversion	4.22	4.15	4.41	0.1622
Agreeableness	5.06	5.06	5.05	0.7880
Conscientiousness	4.97	4.93	5.10	0.1871
Neuroticism	4.54	4.50	4.65	0.3607
Academic career				
Working experience	17%	18%	16%	0.6803
Average exams grade over the last 12 months	27.7	27.7	27.6	0.4747
Enrolled in the final year	50%	51%	46%	0.4277
STEM degree	36%	37%	30%	0.2659
Graduated in the last 12 months	23%	23%	24%	0.7866
Erasmus program	2%	2%	1%	0.6245
Between courses	4%	3%	4%	0.7264
Stage/internship	13%	15%	9%	0.2036
Perceived employability				
PE (T1)	4.74	4.66	4.97	0.0345

Source(s): Authors' own work

reduced the likelihood of selection bias and systematic pre-existing group differences that could confound the examination of treatment effects in the data. However, significant differences emerged in pre-test (T1) PE scores, with the control group reporting lower PE levels (M = 4.66) than the treatment group (M = 4.97; $p = 0.0345$), suggesting that students with higher levels of PE might be more likely to self-select into EE events, while those with lower PE may prefer to attend PDWs.

Hypothesis testing

To test our hypothesis, non-parametric analysis, OLS regressions, and PSM were employed.

The Mann–Whitney test was performed for difference-in-difference pre-test/post-test comparisons between the experimental and control groups. This analysis was conducted on the overall sample, as well as separately for gender (male/female) and degree type (STEM/non-STEM), in order to verify whether there were statistically significant differences in PE variation between T1 and T2 across groups. These tests served as a precondition for conducting parametric analyses and for exploring the differential impact of EE events across student subgroups. Specifically, we adopted a subgroup comparison strategy, comparing treated and control students within each subgroup (e.g. males in the treatment group vs. males in the control group; STEM students in the treatment group vs. STEM students in the control group), rather than testing formal interaction effects. This approach enables the identification of potential variation in the effect of EE events across different categories of students. Results of the non-parametric analysis are reported in Table 2.

Analyses of the entire sample indicate that PE improved in the treatment group at T2 ($\Delta PE = 0.16$), whereas it slightly declined in the control group ($\Delta PE = -0.08$), with a statistically significant difference between groups ($p = 0.011$). These findings suggest that EE events contributed to enhancing students' PE more than PDWs.

Gender-specific analyses revealed no significant differences in PE variation among females, as those in the treatment group showed only a slight increase ($\Delta PE = 0.06$), while those in the control group experienced a minor decrease ($\Delta PE = -0.09$; $p = 0.1551$). Conversely, males in the treatment group exhibited a notable increase in PE ($\Delta PE = 0.31$), whereas those in the control group showed a slight decline ($\Delta PE = -0.05$), with a statistically significant difference ($p = 0.0303$). These results support HP2 that the effectiveness of EE events, relative to internally focused career services, differs across gender, with significant treatment–control differences emerging for male students but not for female students.

Similarly, analyses by degree type demonstrated that non-STEM students in the treatment group experienced a significant increase in PE ($\Delta PE = 0.23$) compared to a slight decline in the control group ($\Delta PE = -0.06$; $p = 0.0158$). However, no significant effects were observed

Table 2. Perceived employability: means difference between groups

	Total	Control group	Treated group	Sig.
Whole sample	*Total n. 277*	*Control group n. 207*	*Treated group n. 70*	*p value*
Δ PE – between T1 and T2	−0.02	−0.08	0.16	0.0110
Female sample	*Total n. 188*	*Control Group n. 146*	*Treated Group n. 42*	*p value*
Δ PE – between T1 and T2	−0.06	−0.09	0.06	0.1551
Male sample	*Total n. 89*	*Control Group n. 61*	*Treated Group n. 28*	*p value*
Δ PE – between T1 and T2	0.06	−0.05	0.31	0.0303
No-STEM degree sample	*Total n. 178*	*Control Group n. 129*	*Treated Group n. 49*	*p value*
Δ PE – between T1 and T2	0.02	−0.06	0.23	0.0158
STEM degree sample	*Total n. 99*	*Control Group n. 78*	*Treated Group n. 21*	*p value*
Δ PE – between T1 and T2	−0.09	−0.11	0.00	0.4527

Source(s): Authors' own work

among STEM students, as PE remained unchanged in the treatment group (ΔPE = 0.00) while declining in the control group (ΔPE = −0.11; $p = 0.4527$). These findings contradict HP3, suggesting that the effectiveness of EE events, relative to internally focused career services, differs across degree type, with significant treatment–control differences emerging for non-STEM students but not for STEM students.

To assess whether these subgroup-specific patterns reflect statistically significant differences in PE changes among treated students themselves, we additionally conducted within-treatment comparisons of ΔPE across gender and degree type. These analyses did not reveal statistically significant differences between male and female students, nor between STEM and non-STEM students ($p = 0.1647$ and $p = 0.1468$, respectively).

OLS multivariate regressions were conducted to evaluate the impact of EE event participation on ΔPE, compared to PDWs, while controlling for socio-demographic characteristics, personal traits, and academic background. Results are presented in Table 3.

Table 3. EE-events and PE: OLS regressions

	Model 1 ΔPE	Model 2 Female ΔPE	Model 3 Male ΔPE	Model 4 No STEM ΔPE	Model 5 STEM ΔPE
EE-events	0.225**	0.102	0.423**	0.290**	0.121
	(0.035)	(0.453)	(0.031)	(0.029)	(0.552)
Male	0.097	–	–	−0.161	0.364**
	(0.379)			(0.290)	(0.036)
No-STEM degree	0.152	0.299**	−0.078	–	–
	(0.130)	(0.018)	(0.686)		
Parents' Education	0.016	−0.016	0.093	−0.004	0.016
	(0.804)	(0.842)	(0.482)	(0.962)	(0.886)
High school grade	0.003	0.001	0.008	−0.004	0.012
	(0.445)	(0.837)	(0.349)	(0.519)	(0.126)
Openness	−0.033	−0.014	−0.053	−0.014	−0.097
	(0.421)	(0.783)	(0.499)	(0.793)	(0.172)
Extroversion	0.017	−0.001	0.030	−0.003	0.080
	(0.650)	(0.989)	(0.713)	(0.946)	(0.228)
Agreeableness	−0.030	0.028	−0.152	−0.058	0.004
	(0.535)	(0.628)	(0.119)	(0.360)	(0.957)
Conscientiousness	−0.053	−0.060	−0.039	0.009	−0.141
	(0.277)	(0.311)	(0.686)	(0.883)	(0.074)
Neuroticism	−0.030	−0.004	−0.051	−0.040	−0.005
	(0.429)	(0.937)	(0.431)	(0.438)	(0.938)
Average exams grade in the last 12 months	−0.025	−0.021	−0.046	−0.035	−0.015
	(0.210)	(0.379)	(0.206)	(0.204)	(0.635)
Enrolled in the final year	0.137	0.130	0.213	0.241**	−0.031
	(0.164)	(0.277)	(0.270)	(0.048)	(0.868)
Erasmus program	0.048	0.307	−0.139	0.136	–
	(0.880)	(0.494)	(0.780)	(0.667)	
Between courses	0.126	0.310	−0.048	0.237	−0.140
	(0.607)	(0.334)	(0.911)	(0.428)	(0.760)
Stage/internship	−0.055	−0.002	0.014	0.010	−0.027
	(0.695)	(0.993)	(0.964)	(0.958)	(0.912)
Graduated in the last 12 months	0.265**	0.272*	0.268	0.221	0.332
	(0.022)	(0.053)	(0.237)	(0.137)	(0.091)
N. obs	277	188	89	178	99
R-squared	0.083	0.091	0.183	0.101	0.178

Note(s): ***$p < 0.001$; **$p < 0.05$; *$p < 0.10$

Source(s): Authors' own work

Model 1 includes the full sample of students and shows a positive and significant association between EE event participation and ΔPE (B = 0.225, $p = 0.035$), supporting HP1. To examine gender differences, regressions were conducted separately for female (Model 2) and male (Model 3) students. Results reveal no significant effect of EE events on ΔPE for females (B = 0.102, $p = 0.453$), whereas a significant positive effect was observed for males (B = 0.423, $p = 0.031$). These findings indicate that EE events are associated with a significant increase in PE among male students when compared to internally focused career services, whereas no significant treatment–control differences emerge for female students, in line with HP2. Additional regressions were conducted for non-STEM (Model 4) and STEM (Model 5) students to test whether the effect of EE events varies by degree type. A significant positive association was found for non-STEM students (B = 0.290, $p = 0.029$), while no significant effect emerged for STEM students (B = 0.121, $p = 0.552$). These results indicate subgroup-specific treatment–control patterns by degree type, with EE events being associated with significant gains in PE among non-STEM students relative to internally focused career services, whereas no significant treatment–control differences emerge for STEM students, contradicting HP3.

A limitation of this study is the potential for self-selection bias due to the elective nature of treatment and control conditions, as participation in EE events or PDWs was voluntary. Consequently, the observed positive impact of EE events on PE may partly reflect students' personal and unobservable characteristics, which could influence both their decision to engage in this career service and the variation in their PE between T1 and T2 (Delis and Jones, 2023). To address this concern, PSM was applied to test whether OLS estimation accurately captures the causal effect or overestimates the impact of EE events on PE (see Jones *et al.*, 2017; Delis and Jones, 2023). PSM simulates a randomized design by matching students in the treatment and control groups based on their predicted probability of participation, using observed characteristics. Each treated student is matched with a control counterpart with similar attributes. The average treatment effect (ATE) measures the mean improvement in PE for treated students compared to controls. Pre-treatment variables included PE at T1, gender, parental education, high school grades, average exam grades, graduation status, personality traits, STEM enrollment, final-year status, and participation in Erasmus, between courses, and internships.

The Nearest Neighbor Matching method was used to estimate ATE (Jones *et al.*, 2017), and results are reported in Table 4. Findings confirm a significant effect of EE events on PE (B = 0.239; $p = 0.020$), indicating that attendees experienced an average increase of 0.24 points compared to those attending PDWs. Importantly, PSM results align with OLS estimates, supporting HP1. Further analysis examined variations by gender and degree type. Consistent with non-parametric and OLS findings, PSM results indicate gender-specific treatment–control patterns, with EE events being associated with a significant increase in PE among male students relative to internally focused career services (B = 0.338; $p = 0.018$), whereas no significant treatment–control differences emerge for female students (B = 0.006; $p = 0.957$). Males in the treatment group reported an increase of 0.34 points in PE compared to

Table 4. ATE of students choosing to participate at EE-events on PE

Group	Coefficient	Std. Error	*p*-value	N. of obs
Total	0.239	0.102	0.020	277
Male	0.338	0.142	0.018	89
Female	0.006	0.118	0.957	188
No-STEM	0.263	0.222	0.236	99
STEM	0.192	0.146	0.186	178

Source(s): Authors' own work

controls, while no significant effect was observed for females, confirming HP2. By contrast, PSM results diverged from non-parametric and OLS analyses with respect to degree type: after controlling for self-selection bias, no significant effects were found for either non-STEM (B = 0.263; $p = 0.236$) or STEM students (B = 0.192; $p = 0.186$). Thus, PSM findings do not support HP3.

Discussion and conclusion

This study adopted a pre–post experimental quantitative design to test whether students participating in EE events—university career services involving employers—experience a greater increase in PE than those taking part in other co-curricular career services without employer participation. It also investigated whether the effectiveness of these career services differs across student groups defined by gender and degree type. Results from non-parametric analysis, OLS regressions, and PSM confirm HP1: students who participated in EE events experienced a greater increase in PE compared to those in PDWs. These findings align with prior studies, suggesting that co-curricular employability-support services involving employer interaction provide a distinctive benefit to students' employability development, beyond gains obtained from workshops focused on personal competences (e.g. Ho *et al.*, 2023; Bridgstock *et al.*, 2019; Thune and Støren, 2015; Ishengoma and Vaaland, 2016; Jackson and Rowe, 2022). The study thus highlights the unique contribution of labor market-oriented engagement within university career support. This contribution is particularly notable, given consistent evidence that students' PE declines over time in higher education (e.g. Jackson and Wilton, 2017; Qenani *et al.*, 2014). By adopting a pre-test/post-test design, this study demonstrates that EE event participation not only prevents deterioration in PE but also fosters an increase from one year to the next.

Interestingly, the control group—students participating in PDWs—experienced a slight decline in PE over time. On one hand, the observed decline may suggest that PDWs were less effective than EE events in countering the natural decrease of students' PE during their final academic year. However, it is also plausible that participation in PDWs helped to partially buffer a potentially stronger decline, particularly given that these students started with lower baseline levels of PE and might otherwise have experienced an even greater decrease. Thus, while PDWs appear less impactful than EE events in fostering gains in PE, they may still offer important support by raising awareness of job search strategies and strengthening individual preparation for labor market entry.

Overall, the results reveal differences in changes in PE across student groups participating in different types of career services. However, it is important to note that subgroup-specific differences in PE change primarily emerge in treatment–control comparisons, while within-treatment analyses show that changes among students participating in EE events are broadly similar across gender and degree type. Accordingly, the observed heterogeneity should be interpreted as reflecting differential effectiveness relative to alternative career services rather than strong moderation effects.

Results related to HP2 indicate gender-specific differences in the effectiveness of employer involvement in career services. In particular, analyses show that EE events are associated with significant gains PE for male students when compared to internally focused career services, whereas no significant treatment–control differences emerge for female students. Several explanations for the differences that emerge between the two groups are possible. Gender stereotypes in the labor market may lead female students to perceive more barriers, reducing the confidence-boosting effect of EE. In addition, women often report more cautious perceptions of employability, even when equally qualified. Although EE events provide networking opportunities, female students may feel less able to capitalize on them due to lower confidence in their abilities. These findings partly support criticisms regarding the equity of voluntary, centrally organized career services (Jackson *et al.*, 2024; Jackson and Bridgstock,

2021; Jackson and Tomlinson, 2021), which may benefit stronger candidates while failing to support disadvantaged students.

Finally, regarding HP3, results point to degree-type-specific treatment–control patterns. In particular, EE events are associated with significant gains in PE among non-STEM students relative to internally focused career services, whereas no significant treatment–control differences are observed for STEM students. This result suggests that initiatives involving employers may particularly benefit less employable groups. However, PSM results do not confirm this effect; once self-selection bias is controlled for, the positive relationship between EE events and PE among non-STEM students is no longer significant. This implies that improvements for non-STEM students may partly reflect unobservable characteristics rather than the events themselves.

Theoretical implications

Theoretically, this study contributes to the literature on the sustainable career ecosystem (Donald *et al.*, 2024; Donald and Jackson, 2023) by examining the interaction between meso-level actors—universities and employers—in supporting students' PE. It provides empirical evidence on the importance of university-business cooperation (Arranz *et al.*, 2022) and, specifically, employer involvement within career services (Mason *et al.*, 2022). The findings indicate that EE events enhance internal and external dimensions of PE (Rothwell *et al.*, 2008; Vanhercke *et al.*, 2014). Internally, employer interaction strengthens students' confidence, career self-efficacy, and clarity regarding readiness. Externally, understanding employer expectations and labor market trends reduces information asymmetry and improves students' perceptions of their labor market fit. EE events thus serve as a mechanism bridging self-perceptions with external realities, reinforcing PE in both dimensions.

The study also nuances existing theory by highlighting subgroup-specific patterns in how PE responds to EE activities. While formal tests do not indicate statistically significant heterogeneous treatment effects, the findings suggest that the effectiveness of EE-events may vary in how it is experienced across different student groups, highlighting the need to account for interactions between meso-level interventions and micro-level factors such as identity, field of study, and expectations (Hughes *et al.*, 2023). Meso-level interventions do not operate in isolation but interact with individual attributes in shaping employability trajectories.

Practical implications

The present study also has managerial and practical implications. More specifically, the study highlights the importance of facilitating university students' exposure to the world of work by designing and providing career services with the engagement of employers to enhance students' awareness of their employment and career opportunities after graduation. However, it is important to note that an increase in PE is not necessarily the only positive outcome. For some students, especially those with unrealistically high expectations, participating in EE events may lead to a more grounded and accurate understanding of labor market realities. In such cases, a decrease in PE could reflect a recalibration of their self-assessment rather than a failure of the intervention (i.e. PDW). As such, a decline in PE should not always be interpreted as a negative outcome but rather as an indication of critical reflection and alignment with employer expectations.

In addition, results suggest that EE events may be beneficial for specific groups of students (e.g. males and non-STEM students) but may not be equally effective for others. In this regard, it might be worthwhile for universities and career services to design alternative initiatives and gender-sensitive formats. For example, to make EE events more inclusive and effective for female students, universities could raise awareness among employers to adopt fairer and more inclusive approaches to recruitment; involving female professionals as speakers or interviewers, for instance, could help reduce perceived distance and foster identification. In addition, universities could incorporate preparatory coaching sessions or post-event debriefs

focused on confidence-building that might support female students in recognizing their strengths and increasing confidence in their employability. Furthermore, career services could collaborate with gender equality offices or student associations at the universities to co-design sessions that address barriers women may perceive in the labor market. These adaptations, while modest, could make EE events more inclusive and impactful across gender lines.

Finally, the study highlights that students with lower levels of PE tend to opt for internally focused career services (PDWs), which, while useful, are less effective than employer-led events. To address this equity issue, universities could adopt targeted strategies to encourage participation among these students, such as offering preparatory empowerment sessions, sending personalized invitations, engaging academic figures (e.g. tutors, faculty advisers) to encourage active participation in EE events, or even designing inclusive event formats to avoid overly competitive settings that may discourage less confident students. Alternatively, universities could consider integrating a portion of EE events into the curriculum (e.g. within orientation or internship courses) to ensure access even for students who would not choose to participate voluntarily.

Limitations and future research

While this study provides valuable insights, certain limitations must be acknowledged, as they may affect the generalizability and interpretability of the findings.

First, the study is limited to one Italian university, making it difficult to generalize the findings to other cultural and institutional contexts. For example, the analysis does not account for potential cross-country variations in EE practices and labor market conditions. Future research should consider multi-country and multi-institutional data to better isolate the effects of EE events on PE and increase the generalizability of the results. Furthermore, the present research was conducted in Lombardy, a region characterized by relatively favorable labor market conditions and a high concentration of employment opportunities for graduates. Future research should therefore replicate this study in less advantaged regional contexts—such as Southern Italy or rural areas—where structural barriers to graduate employment are more pronounced. This would allow for a deeper understanding of how EE initiatives function in weaker labor markets, and whether their impact on PE differs across territorial contexts with varying levels of employment opportunity and economic development.

Second, although the study employs pre-test/post-test measures, causality remains a challenge because students self-select into EE events and PDWs. It is therefore possible that the two groups differ in unobservable characteristics that could influence their PE over time, independently of any effects attributable to participation in a specific career service. Future research on co-curricular and optional career services should employ alternative methods, such as instrumental variables or randomized controlled trials, to strengthen causal inference.

Furthermore, while the theoretical framework highlights the risk of exclusion associated with optional career initiatives, the present study is also affected by self-selection bias. To mitigate this bias, the authors focused exclusively on students who participated in career services, excluding those who did not engage in any such initiatives. However, this design implies that the findings reflect the experiences of students who were already motivated and able to access optional services. Consequently, students from more disadvantaged backgrounds—who often face greater barriers to participation—may be underrepresented in the sample. The positive effects observed may therefore not extend to individuals with fewer resources, potentially reinforcing existing inequalities in employability outcomes. For example, the female students included in the sample may be more career-confident than the average female student, which could have influenced the results. Although PSM was applied to reduce observable bias, unmeasured factors may still have played a role. The authors have thus been cautious in interpreting the effectiveness of the interventions and recommend exploring ways to broaden access to impactful career services through inclusive design, institutional support, and targeted initiatives.

A further limitation concerns the analysis of heterogeneous effects across student groups. Although subgroup-specific treatment–control comparisons suggest differential patterns by gender and degree type, additional within-treatment comparisons comparing changes in PE across gender and degree type among students participating in EE events did not yield statistically significant differences. This indicates that the observed heterogeneity should not be interpreted as evidence of strong moderation effects, but rather as differences emerging in comparison with alternative career services. It is worth noting, however, that stratifying the treatment group by gender and degree type results in very small subgroup sizes, which may limit statistical power. Accordingly, the absence of statistically significant within-treatment differences should be interpreted with caution, as modest subgroup differences may be difficult to detect with such small samples. Future research employing larger samples and formal interaction models could further examine whether and under what conditions EE initiatives generate differential effects across student groups.

Finally, the present study does not allow for a full understanding of why and how EE events are more effective than PDWs, nor of the mechanisms through which subgroup-specific differences in effectiveness emerge across gender and degree type. Thus, future research may adopt mixed-method approaches that combine quantitative analysis with qualitative interviews or focus groups to explore the mechanisms through which different career services contribute (or fail to contribute) to strengthening students' PE, and to uncover how different groups of students (e.g. female and STEM students) experience and interpret these services.

Conclusion

In conclusion, this study suggests that EE events are effective in strengthening students' PE. Specifically, by involving employers in career services and employability-related initiatives, universities can enhance graduate students' awareness of their skills and attributes, as well as their employment and career prospects in the labor market. The study also suggests that EE events may generate differential effectiveness across student groups when compared to internally focused career services, underscoring the importance of designing and implementing diverse initiatives to support employability for different target audiences.

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