Labour Market Returns of the Investment in Non-Academic Tertiary Education: the Role of Course Quality

Le ricadute sul mercato del lavoro dell'investimento nell'istruzione terziaria non accademica: il ruolo della qualità dei corsi

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This paper investigates the labor market returns of non-academic tertiary education in Italy, focusing on the role of course quality within the ITS system. Using administrative data from 2013 to 2023, the study finds a strong positive correlation between course quality and employment outcomes, even when controlling for structural factors. Key quality components—such as course attractiveness, practical training, and interregional networks—emerge as significant drivers of employment rates, particularly in southern regions where labor market conditions are weaker. The findings support merit-based funding policies and suggest that investing in course quality can enhance education-to-work transitions, especially in disadvantaged areas.

KEYWORDS: HUMAN CAPITAL; REGIONAL DISPARITIES; VOCATIONAL EDUCATION AND TRAINING; COURSE QUALITY; EMPLOYMENT OUTCOMES.

Questo lavoro indaga i ritorni sul mercato del lavoro dell'istruzione terziaria non accademica in Italia, concentrandosi sul ruolo della qualità dei corsi all'interno del sistema ITS. Utilizzando dati amministrativi dal 2013 al 2023, lo studio rileva una forte correlazione positiva tra la qualità dei corsi e i risultati occupazionali, anche a parità di fattori strutturali. Le componenti chiave della qualità, come l'attrattiva dei corsi, la formazione pratica e le reti interregionali, emergono come fattori significativi nell'influenzare tassi di occupazione, in particolare nelle regioni meridionali dove le condizioni del mercato del lavoro sono più fragili. I risultati supportano le politiche di finanziamento basate sul merito e suggeriscono che investire nella qualità dei corsi può migliorare le transizioni tra istruzione e lavoro, soprattutto nelle aree svantaggiate.

PAROLE CHIAVE: CAPITALE UMANO; DISPARITÀ REGIONALI; ISTRUZIONE E FORMAZIONE PROFESSIONALE; QUALITÀ DEI CORSI; RISULTATI OCCUPAZIONALI.

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Introduction

Italy is the European country with the highest share of young people aged 15-29 Not in Employment, Education, or Training (NEETs), and the lowest share of people aged 25-34 with a tertiary education attainment (OECD, 2024). Besides the persistent 'youth issue' in the Italian labour market, the post-COVID-19 rebound of the economy has significantly increased companies' difficulties in filling positions requiring advanced technical skills (Unioncamere, 2024). Indeed, firms demand technical skills that are too advanced to be trained in secondary education and not usually taught in standard Bachelor's programs. The development of tertiary VET, in the form of Higher Technological Institutes (*Istituti Tecnologici Superiori*, or ITS Academies), has been advocated as an effective solution to increase the share of the population with tertiary education while reducing the skill mismatch in the labour market (Cedefop, 2023). From a formal standpoint, in the international classification of educational qualifications (ISCED), the ITS diploma is an intermediate qualification between an upper secondary school diploma and a university degree.

Even though ITS graduates are currently in high demand, and forecasts suggest upward trends in the following years (Unioncamere, 2024), there is, however, no clear empirical evidence yet on how firms perceive ITS graduates in terms of relative productivity compared to secondary school graduates and university degree holders. Moreover, ITS programs have certain distinctive features that may significantly influence the quality of teaching and the skills acquired by graduates: a) the active involvement of companies in the design and delivery of courses, including hands-on and laboratory-based teaching by industry professionals; b) the ex-post evaluation of course quality, based on a comprehensive set of indicators aimed at assessing, one years after course completion, factors such as attractiveness, employment outcomes, and teaching quality.

In light of these features, in this paper, we contribute to the growing economic literature on the labour market returns to non-academic tertiary education by focusing on the Italian context, where such programs are offered through the ITS. Specifically, we investigate whether the quality of ITS courses is associated with differential employment outcomes among graduates. While much of the existing empirical research focuses on the U.S. or dual vocational systems in Central Europe (Germany, Austria, and Switzerland), Italy's ITS model provides a unique institutional setting characterized by strong industry involvement and a

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centralized performance-based funding mechanism. By leveraging administrative data on course characteristics and employment outcomes, this paper provides new evidence on the economic value of vocational education in a country where such programs are still relatively unexplored.
To investigate the relationship between ITS course quality and employment outcomes, we first computed a revised quality indicator excluding employability to avoid mechanical correlations. We then analyzed the relationship between this adjusted quality score and its components and graduates' employment rate using pairwise correlations and multivariate OLS regressions. These regressions control for ITS Academy characteristics (e.g., location, technological area, and year of establishment) and time fixed effects. The analysis also explores heterogeneity across technological areas and geographical regions.
The paper is organized as follows. Section 2 outlines the theoretical framework based on the Becker's human capital theory and reviews the existing economic literature on the returns to non-academic tertiary education, focusing on how course quality shapes outcomes. Section 3 overviews the Italian ITS system and details how course quality is defined and measured. Section 4 presents an empirical analysis of the relationship between course quality and employment outcomes. Finally, Section 5 discusses the main findings in light of the theoretical model and concludes with policy implications and suggestions for future research.

The economic approach to the investment in non-academic tertiary education: a theoretical and empirical review

In recent decades, economic research on the returns to post-secondary education has advanced significantly, moving beyond the early view of education as a homogeneous investment. The literature now recognizes the high degree of heterogeneity across different educational pathways, where the differences depend on the institutional type, the program content, the credential level, and the alignment with firms' demand. This recent framework is especially relevant in analyzing short-cycle, non-academic options such as Italy's ITS programs, which provide an alternative to traditional university degrees.
Within the foundational human capital framework (Becker, 1962), education is seen as an investment that enhances individual productivity and future earnings. However, contemporary analyses — such as those by Lovenheim and Smith

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(2022) and Altonji and Zhong (2021) — highlight that returns to education are far from uniform. They vary depending on the learner's characteristics (e.g., ability, preferences, prior achievement) and the nature of the educational investment itself, including its quality, field of specialization, and duration.
Under this framework, individuals are assumed to select their educational path based on expected labour market outcomes, program quality, personal fit, and perceived opportunity costs. Educational choices are no longer viewed as a simple binary decision (e.g., university or not), but as a selection among multiple differentiated options — such as ITS diplomas, professional certifications, and academic degrees — each associated with distinct expected returns. The success of these choices depends critically on how well a given program aligns with the individual's skills and labour market demands.
The economic literature identifies two main mechanisms through which education affects employment outcomes:

1. *Occupational Sorting Effect* – Education increases the likelihood of accessing certain occupations, particularly those offering greater stability, specialization, or remuneration. For instance, vocational programs can serve as gateways to technical roles that would otherwise be inaccessible.
2. *Productivity-Enhancing Effect* – Education improves individuals' skills and competencies, making them more productive and therefore more valuable in the labour market. This effect typically translates into higher wages or better job performance within a given occupation.

These mechanisms often work simultaneously. A well-designed vocational course not only increases access to targeted sectors but also increases productivity within them. Significantly, the strength of each channel may vary across programs and regions. For example, ITS courses with strong ties to industry may be more effective at occupational placement, while those emphasizing practical training may have greater productivity impacts.
Moreover, educational returns are mediated by institutional and individual heterogeneity. Two students attending similar programs may experience different outcomes due to differences in ability or background. Likewise, two ITS programs in the same field may yield different returns based on their quality, employer involvement, selectivity, and regional context. Altonji and Zhong (2021) emphasize

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that the interplay between educational pathways and individual characteristics is crucial to understanding both the magnitude and the sources of returns.
Overall, this theoretical framework supports a nuanced view of vocational education as a multi-dimensional investment. The effectiveness of programs such as ITS diplomas cannot be understood solely in terms of formal credentials. Still, it must consider program quality and the interaction with local labour market conditions. These insights also underscore the importance of empirical strategies that control for such variation when estimating the employment returns to tertiary vocational education.
Both mechanisms can be strengthened in the Italian setting, where non-academic diplomas are delivered by ITS Foundations (Fondazioni ITS, public-private partnerships composed of secondary schools, universities, and firms). The involvement of universities and secondary schools helps ensure that productivity gains are grounded in genuine skill acquisition and knowledge development, thereby supporting the human capital enhancement channel. At the same time, the active participation of firms in the design and delivery of training programs ensures that the competencies acquired by students are closely aligned with current labour market needs. This alignment not only improves the likelihood of employment in relevant occupations, but also enhances match quality, increasing the efficiency and effectiveness of the education-to-work transition. The vocational nature of these courses, together with the extensive on-the-job learning (compulsory traineeship of about 40% of the course), directly facilitates job placement in well-aligned firms. Thus, the structure of Italy's ITS system is particularly well-suited to simultaneously foster occupational access and within-occupation productivity gains. Furthermore, one key feature of the Italian system that may play a role in shaping returns to post-secondary non-academic education is the ex-post evaluation of the performance of ITS courses. Based on this evaluation, courses receive differential funding through a merit-based funding system, which aims to reward high-performing courses. This mechanism introduces incentives for ITS foundations to invest in quality improvements, such as strengthening employer partnerships, refining curricula, and enhancing placement services, in order to secure additional resources. In theory, these efforts should translate into improved employment outcomes, thereby improving the overall labour market returns of the programs.
This incentive structure is relevant to both key mechanisms described above. First, by improving program quality and relevance, the system can enhance the

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probability that graduates enter higher — value or more stable occupations — a sorting effect. Second, by aligning curricula more closely with industry needs and improving instructional quality, students may acquire more productive, job-specific skills, leading to higher earnings within those occupations — a productivity-enhancing effect. Thus, the Italian model exemplifies how institutional incentives tied to performance evaluation can influence both the allocation of individuals across occupations and their productivity within them, ultimately reinforcing the skill-matching process that underpins returns to vocational education (Lovenheim & Smith, 2023; Altonji & Zhong, 2021).

The most examined outcome by the empirical economic literature is earnings, because of its availability in administrative and survey data and because wages offer a direct signal of marginal productivity in many labour market contexts (Card, 1999; Heckman, Lochner, and Todd, 2006). Another key outcome often considered is employment, which is particularly salient in the Italian setting, where youth unemployment and the incidence of NEETs (young people not in education, employment, or training) remain persistently high (European Commission, 2023). Indeed, both mechanisms highlighted in the model have implications for employment: improved occupational access raises the probability of securing a job — particularly one aligned with the individual's field of study — while increased productivity enhances retention and reduces the risk of displacement in competitive labour markets (OECD, 2014; Hanushek et al., 2017a).

The empirical literature studying returns to non-academic tertiary degrees focuses mainly on the United States, where this type of education is largely provided by community colleges, a distinctive feature of the American higher education institutional setting[1]. A large body of research consistently finds that these programs yield significant positive returns in terms of earnings. For instance, studies by Jepsen et al. (2014), Dadgar and Trimble (2015), Carruthers and Sanford (2018), and Stevens et al. (2019) show that completing an associate degree or vocational certificate results in substantial wage premiums, particularly in health, technical, and business fields. These findings are underpinned by rigorous identification strategies, commonly using individual fixed effects and time trends to mitigate selection bias. More recent work, such as Baird et al. (2022), further supports the conclusion that occupational credentials — licenses

[1] These institutions offer short-cycle, sub-baccalaureate programs, including associate degrees and technical certificates, aimed at vocational and occupational training rather than academic advancement.

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and certifications — yield high returns for workers without a bachelor's degree, particularly among women and those in sub-baccalaureate labour markets.
Regarding employment outcomes, U.S.-based research also suggests that completing non-academic tertiary programs significantly improves labour market attachment. Graduates from community colleges or holders of occupational credentials have higher employment rates compared to those without such credentials. The marginal treatment effects estimated by Baird et al. (2022) indicate a substantial increase in the probability of employment, with returns concentrated among specific subgroups, including women and individuals without four-year degrees. This employment premium is often linked to the signaling function of vocational credentials, as well as the specific human capital they confer. These findings reinforce the view that non-academic tertiary education serves as an effective mechanism for workforce entry and stability.
Outside of the U.S., empirical evidence on the returns to non-academic tertiary education is relatively limited and more heterogeneous, reflecting differences in institutional structures and educational pathways. In several European countries — particularly those with dual vocational education and training (VET) systems such as Germany, Austria, and Switzerland — non-academic tertiary education includes universities of applied sciences or polytechnics, which offer career-focused programs with strong ties to industry. Studies like Oswald-Egg and Renold (2021) demonstrate that in Switzerland, graduates who transitioned from dual VET to higher education benefit from faster job placement and initial wage premiums. However, these effects tend to diminish over time. Overall, while European models exhibit positive returns to VET, especially for employment outcomes in dual systems, the variability across countries highlights the importance of institutional design in shaping these returns.
As far as we know, returns to non-academic tertiary education have not been studied yet in Italy.
While much of the literature highlights the generally positive returns to non-academic tertiary education, emerging evidence suggests that the quality of institutions and programs significantly moderates these returns. In the U.S., community colleges and vocational programs differ substantially in resources, faculty expertise, industry connections, and program rigor, influencing labour market outcomes. Lovenheim and Smith (2023) note that returns to sub-baccalaureate credentials are highly heterogeneous, with higher returns often found in institutions with stronger employer linkages, better funding, and more selective

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admission processes. Similarly, Baird et al. (2022) show that certifications and licenses yield larger wage and employment benefits when paired with high-quality training environments that emphasize occupation-specific competencies. In Europe, Oswald-Egg and Renold (2021) find that the effectiveness of vocational education depends not only on the dual nature of training (school and workplace) but also on the systemic integration of quality assurance mechanisms, such as standardized curricula and formal employer involvement. These findings underscore that the mere presence of a non-academic tertiary credential is not sufficient to grant employment success; the value of such credentials depends critically on program quality, institutional reputation, and the extent to which training aligns with labour market needs.

Measuring course quality in Italy

As discussed above, one of the distinctive features of the Italian tertiary VET system is the ex-post evaluation of the performance of the ITS courses. Since 2015, around 70% of total national resources have been distributed to the Regions based on the number of ITS Foundations and courses and the number of students enrolled. Each region is responsible for allocating public funds to each ITS foundation, usually through specific annual calls, based on an ex-ante assessment considering the number of ITS courses and students planned by each ITS foundation. The remaining 30% of national funds are distributed two years after course completion and awarded on the basis of an articulated system of ex-post performance evaluation. An external national agency (INDIRE, *Istituto Nazionale Documentazione Innovazione Ricerca Educativa*) is responsible for monitoring and evaluating the quality and effectiveness of the ITS courses, on the basis of a large set of indicators established by law since 2015 and revised in 2022.

Before the 2022 reform, the final quality score was the weighted average of five main components, each measured through a sub-set of indicators: attractiveness (weighting 25% of the final score), employability (40%), students' experience in firms/traineeship (15%), firms' involvement in teaching (10%), and inter-regional networks (10%). Table A1 in the Appendix reports the detailed indicators by component and their specific weights. For example, selectivity is measured through five indicators capturing both selection and graduation rates, traineeship includes two indicators on the relevance of internship in terms of hours

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and companies involved, and firms' involvement in teaching is made of five indicators, referring to the incidence of labs and the share of hours taught by external teachers, especially from private companies and universities.
The 2022 reform, which will be applied for the first time to the evaluation of courses concluding in 2024[2], has also revised the performance evaluation system, distinguishing between two-year ITS courses (corresponding to EQF level 5) and three-year ITS courses (EQF level 6). Focusing on the former — which are more common and more comparable to previous courses — the new performance evaluation framework considers six main components: attractiveness (15% of the final score), practice-based learning (20%), apprenticeship (5%), academic outcomes (20%), employment outcomes (35%), and student satisfaction (5%). Table A2 in the Appendix provides details on the specific indicators and their respective weights.
Compared to the pre-reform system, the new framework places greater emphasis on the student experience during the course and highlights the role of apprenticeships. It also clearly separates academic and employment outcomes, assigning a lower weight to the latter compared to the weight given to employability in the previous version. This distinction is crucial because, although ITS courses aim to train qualified technical professionals in response to local firms' skill needs, employment outcomes may be more influenced by local labour market conditions than by the intrinsic quality of the course. As a result, high-quality courses — measured by the quality of teaching and instructors — could be unfairly penalized (or insufficiently rewarded) in economically depressed areas.
Moreover, the new employment indicator is a weighted average of three components: the number of 'coherently employed' graduates (i.e., those working in sectors or occupations aligned with the technological area of their course; weight=1), the number of 'non-coherently employed' graduates (weight=0.3), and the number of ITS graduates enrolling in a university program (weight=0.5). Unlike the standard employment rate used in the previous evaluation system, this new indicator partially acknowledges the value of transitions from ITS to university education.
Finally, the increased weight assigned to academic outcomes may encourage greater investment in soft and transversal skills, which are likely to enhance

[2] Since the evaluation considers employment outcomes twelve months after graduation, it is usually conducted between June and September, one year after the course ends. The new performance evaluation will be carried out for the first time between June and September 2025.

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workers' resilience and capacity for re-skilling as the specific technical skills acquired in ITS programs become obsolete. This is particularly important given evidence in the literature suggesting that the technical skills generated by vocational education facilitate the transition into the labour market (thus increasing the employment probability in the short run). Still, they often become obsolete at a faster rate than general/soft skills (Hanushek et al., 2017b).
Compared to the prevailing measures of quality in the economics literature, which often refers to selectivity as it can be measured by expenditure per student, socio-demographic characteristics or average academic ability of the enrolled students (Lovenheim and Smith, 2023), this system encompasses different aspects of the learning and teaching environment, including some peculiarities of the vocational track, such as firm's involvement and the relevance of practical learning.
The final score ranges from 0 to 100 and it is used to rank all the active ITS courses in the reference year of assessment. The final score and the corresponding ranking are computed and updated each year on the basis of past information, usually with a two-year lag. For example, the latest ranking available was published in 2025 on the basis of 2023 data. Based on their total quality score, ITS courses are classified into four groups:

- awardable courses (score equal to 70 or higher);
- sufficient courses (score between 60 and 69);
- problematic courses (score between 50 and 59);
- critical courses (score below 50).

Among the best courses, those that are actually rewarded with additional funds should meet additional criteria based on the number of graduates and the number of employed (for more details, see INDIRE, 2025).
According to the 2025 ranking, which is still based on the old evaluation system, 260 out of 450 monitored ITS courses (corresponding to 57.8% of the total courses) are rewarded with additional funds. 18 courses reach a score of 70 or higher, but they do not meet all the additional criteria for graduates and employment. 77 courses are classified as sufficient, 41 as problematic, and the remaining 54 as critical. The share of awarded courses varies across technological areas, ranging from 25% in the home/construction industry to more than 86% in the mechanical sector. The highest share of critical courses is registered in the

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agri-food industry (25%, twice as high as the national average), followed by the fashion system and firm services (around 20% in both cases). Interestingly, no courses are classified as critical in the technological area of new technologies for life.

Significant regional differences also emerge, reflecting the well-known North-South divide: the share of awarded courses ranges from nearly 67% in the North, to 50% in the Center, and drops to less than 40% in the South, where three regions (Molise, Calabria, and Sardinia) had no awarded courses.

To better understand the relationship between course quality and the employment returns of an ITS degree, using the information reported in the INDIRE monitoring reports, we constructed a dataset with all the courses monitored by INDIRE between 2013 and 2023. The final dataset consists of 804 courses offered by 146 ITS Foundations. For each course and year, we collected information on quality and outcome (i.e., number of graduates and number of employed) indicators, as well as some characteristics of the offering ITS Academy (year of birth, province, number and type of partners, number of sites, number of laboratories).

Table 1 shows some descriptive statistics of the outcome, i.e. employment rate. As can be seen, there is considerable variation in employment rates across both technical and geographical areas. On average, ITS courses report a high employment rate one year after graduation (82.8%), though the standard deviation of 15.2 points indicates significant heterogeneity. The best performance is registered by courses in Sustainable Mobility, with an average employment rate of 86.5%, while courses in Energy Efficiency lag slightly behind at 79.2%. From a regional perspective, the North-East shows the highest employment outcomes (86.8%), whereas the South records the lowest average employment rate (76.3%) and the highest dispersion, reflecting underlying structural differences in local labour markets.

Table 1: Descriptive statistics. 2013-2023.

		Employment rate:			
	Number of graduates	Average	SD	Min	Max
Total	19.4	82.8	15.2	12.5	100
Technical area					
Energy efficiency	17.2	79.2	17.0	12.5	100.0
Sustainable mobility	18.4	86.5	14.9	18.2	100.0
Biotech	19.4	80.8	12.2	47.1	100.0

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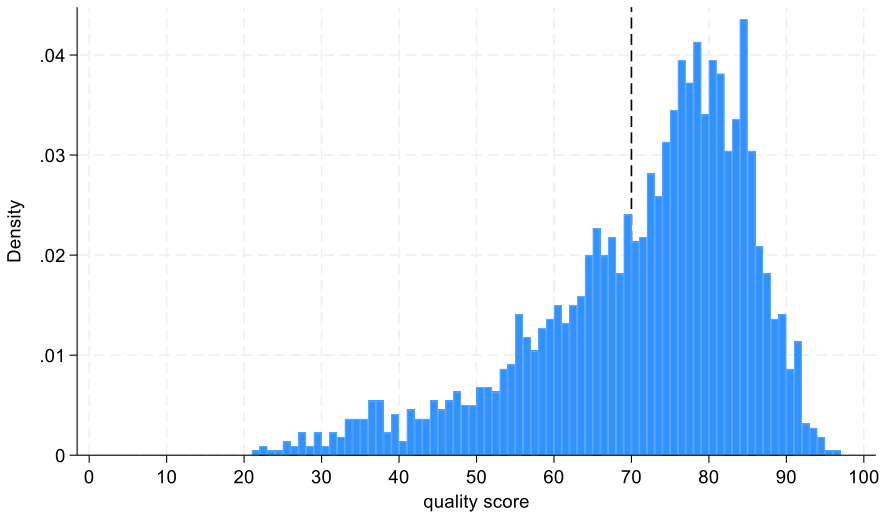
Made in Italy	20.0	82.3	14.8	20.0	100.0
ICT	21.0	81.7	15.2	20.0	100.0
Culture and tourism	19.3	84.3	14.6	37.5	100.0
Geographical area					
Nord-East	20.0	86.8	11.2	33.3	100
Nord-West	20.4	84.6	13.0	26.3	100
Centre	18.9	82.3	14.6	33.3	100
South	17.5	76.3	19.5	12.5	100

Figure 1 shows the distribution of the final quality score over the period considered, reporting also a dashed vertical line in correspondence with a score of 70, which is the minimum score required for becoming a rewardable course. The figure shows large heterogeneity in the score quality: the average is 71.3, but it ranges from 20 to 96, and around 37.4% of the courses do not reach the minimum threshold of 70 to be classified as awardable courses.
Large differences also emerge across the five main components of the summary quality indicators, ranging from 52.8 for interregional networks to 91 for traineeship. Courses perform relatively well also for active teaching (74) and employability (70.8), while the average indicator for attractiveness is around 66.7.

Figure 1: Distribution of the overall quality score, 2013-2023



Note: The Figure shows the distribution of the final score, which is a weighted average of the following quality indicators: attractiveness (25%), employability (40%), traineeship (15%), firms' involvement in teaching (10%), and interregional networks (10%). The vertical dashed black line indicates the score above which extra fundings are provided to high-performing courses.

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Considering the evolution over time, the average quality has slightly decreased from 2013 (70.3) to 2015 (65.8), and then it progressively increased, reaching its peak in 2022 (74.2). Since employability accounts for 40% of the final indicator, these changes partly reflect the evolution of labour market conditions in the last decade, especially the rebound after the COVID pandemic.
Concerning the remaining components, the indicators related to traineeship and firms' involvement in teaching are those that have experienced the largest improvement over time, while the quality of inter-regional networks has been slightly declining.
Overall, these trends suggest increasing involvement of private firms in the ITS activities, but the focus on the local labour market makes it quite difficult to create synergies across regions, especially when they are characterized by quite different productive systems and heterogeneity in demand for technical skills.

The role of course quality in shaping the ITS returns

Building on the previous discussion, this section empirically examines whether variations in course quality are reflected in differential employment returns among ITS graduates. If higher-quality courses are those associated with higher employment rates, this creates incentives for individuals to enroll in high-quality courses and justifies the allocation of public resources to improve course quality. Furthermore, since quality is a composite and multidimensional indicator, it is important to understand whether specific quality components drive such correlation. However, to perform this analysis, we should consider that employability is one of the main components of the overall quality indicator, and hence, a positive correlation between quality and the employment probability may be a mechanical result due to how the overall quality score is computed. Hence, in this part of the analysis, we compute a new quality score that excludes the employability component[3].
For the sake of comparison, Table 2 reports the pairwise correlation between the employment rate (measured as the percentage of graduates who are employed one year after the end of the course), the two overall quality indicators, and each component.

[3] Specifically, starting from the initial weights and excluding employability, we construct a new set of weights such that their sum is equal to 100, and use them to weight the remaining four components (that is, attractiveness, traineeship, firms' involvement in teaching and inter-regional networks).

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Table 2: Correlation between the employment rate and quality indicators, 2013-2023

Quality score	0.5807*
New score	0.2409*
Employability	0.7112*
Attractiveness	0.2313*
Traineeship	0.1100*
Teaching	0.0287
Networks	0.0827*

Note: Analysis based on course-year data. 'Quality score' is the overall indicator computed by INDIRE, 'New score' is the overall indicator that we computed excluding employability and reweighting the other four components. *=statistically significant at 5%.

The correlation between the employment rate and quality is always positive, regardless of the indicator or component considered. As expected, the correlation significantly declines when we exclude employability from the total score, but it remains statistically significant at the conventional level. Among the other four components, attractiveness is the one displaying the highest positive correlation with the employment rate, followed by traineeship. Interestingly, the indicator capturing firms' involvement in teaching seems uncorrelated with the employment returns of an ITS diploma.

Simple pairwise correlations may be driven by structural differences across ITS Academies, different from course quality: for example, if high-quality courses are concentrated in technological or geographical areas characterized by higher labour demand, the positive correlation between the employment rate and course quality may be driven by these factors rather than by quality per se.

In order to take into account these composition effects, we perform a simple regression analysis and estimate the following model:

$$ER_{ijt+1} = \alpha + \beta Quality_{ijt} + \delta X_j + \gamma Year_{it} + \varepsilon_{ijt} \qquad [1]$$

where the dependent variable *ER* is the employment rate in course *i* offered by the ITS Academy *j* one year after the end of the course (t+1), *Quality* is the new score or one of its four components, *X* is a vector of ITS Academies' characteristics (year of establishment, main technological area and province)[4], *Year* is a set

[4] We estimated different specifications, including a model with ITS fixed effects. Estimates (available upon request) are very similar to those reported in Table 3.

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of dummy variables capturing time fixed effects (such as the Covid shock or the business cycle) at the end of the course, ε is the usual error term. Standard errors are clustered at the course level. In this setting, we can compare courses with different quality, which ended in the same year, that are ideally offered by two identical ITS Academies (in terms of age, location, and technological area). Hence, the β coefficient can be interpreted as the effect of a 1-unit change in the quality indicator considered on the employment rate, keeping all the other ITS characteristics constant.

Table 3 reports the main estimates of the coefficient β of Equation [1] using different quality indicators: the new overall score in column 1 and one of each of the four components from columns 2 to 5. Finally, in column 6, we include all four components together.

Table 3 – The relationship between the course quality and the employment rate. OLS estimates. 2013-2023
Dependent variable: share of employed graduates one year after the end of the ITS course

	(1)	(2)	(3)	(4)	(5)	(6)
new quality score	0.227***					
	(0.045)					
attractiveness		0.109***				0.099***
		(0.025)				(0.025)
traineeship			0.057**			0.054*
			(0.029)			(0.029)
teaching				0.045		0.022
				(0.032)		(0.033)
networks					0.057***	0.040*
					(0.020)	(0.021)
Constant	78.709***	85.431***	87.693***	89.625***	90.300***	79.423***
	(11.139)	(10.799)	(10.596)	(10.710)	(10.605)	(11.149)
Observations	2,197	2,204	2,204	2,204	2,197	2,197
R-squared	0.335	0.331	0.322	0.321	0.324	0.335

Note: All models also include controls for the ITS Academy's year of establishment, technological area, province, and the year in which the course ended. Standard errors are clustered at the course level. *** p<0.01, ** p<0.05, * p<0.1.

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Estimates in Table 3 confirm the positive and strong relationship between the course quality and the employment returns of the ITS diploma. If we consider the overall score (column 1), an increase of the quality score of 10 points (roughly corresponding to one standard deviation) is associated with an increase in the employment rate of 2.3 percentage points (0.227*10). Attractiveness seems to be the component that is more strongly related to the employment rate, followed by traineeship and networks. Firms' involvement in teaching seems the least relevant component, in line with the pairwise correlations discussed above. Interestingly, the estimated correlation for each component does not significantly change when we include all the quality indicators in the same model, confirming that they capture different aspects of the quality course. Furthermore, the coefficient estimated for the overall quality score is much higher than that of each specific component, suggesting the existence of synergies between the different quality aspects in influencing the employment rate.

The regression results can be interpreted through the lens of the two mechanisms that, according to the theoretical model, shape the returns to education: occupational sorting and productivity enhancement. The strong association between the overall quality score and employment outcomes suggests that higher-quality ITS courses are more effective in facilitating graduates' entry into the labour market and in equipping students with a better set of skills, which translates into higher productivity. Among the components, attractiveness — which captures elements of course selectivity and student performance — is particularly relevant. While this may reflect a sorting effect, whereby more capable students choose better courses and access better jobs, it may also operate through the productivity-enhancing channel: more selective programs tend to enroll higher-ability students, who are, in turn, more productive and employable.

Similarly, the traineeship and interregional network components likely act through both channels. They increase students' exposure to real-world work contexts and expand their mobility and matching opportunities, while also equipping them with job-relevant skills that enhance productivity within firms. On the other hand, the firms' involvement in teaching, although conceptually aligned with both mechanisms, shows weaker statistical relevance — possibly due to measurement issues or the indirect nature of its effect. Overall, the findings support the idea that ITS course quality affects labour market returns via multiple and overlapping pathways, where both who gets into the course and what is learned during it matter for employment success.

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Estimates in Table 3 capture the average employment returns of course quality. However, such returns may differ substantially by technological or geographical area. We then re-estimated equation [1] for each technological area and macro-region separately. Results for the overall quality indicator are reported in Table 4.

Table 4 – The relationship between the course quality and the employment rate by technological area and macro-region. OLS estimates 2013-2023.
Dependent variable: share of employed graduates one year after the end of the ITS course

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Energy efficiency	Sustainable mobility	Tecnologies for life	Made in Italy	ICT	Culture/ tourism	North-West	North-East	Center	South
new score	0.435***	0.291***	-0.042	0.237***	0.027	-0.055	0.044	0.269***	0.175*	0.625***
	(0.164)	(0.103)	(0.153)	(0.068)	(0.165)	(0.135)	(0.067)	(0.078)	(0.098)	(0.118)
Constant	41.479***	76.352***	74.269***	60.535***	54.010***	82.867***	73.851***	62.066***	60.874***	4.400
	(9.938)	(7.500)	(7.393)	(5.651)	(14.568)	(11.794)	(5.583)	(7.674)	(6.641)	(13.601)
Observations	202	414	124	979	249	229	729	555	374	462
R-squared	0.344	0.384	0.351	0.376	0.415	0.407	0.272	0.321	0.284	0.421

Note: All models also include controls for the ITS Academy's year of establishment, technological area (columns 7-10), province, and the year in which the course ended. Standard errors are clustered at the course level. *** p<0.01, ** p<0.05, * p<0.1.

Estimates in Table 4 highlight that the course quality is significantly related to the employment rate only in three technological areas (energy efficiency, sustainable mobility, and the Made in Italy). Interestingly, the course quality seems to matter the most in the South of Italy. On the contrary, quality seems irrelevant for employment in the North-West. Notice that the value of the constant estimates in each column corresponds to the employment probability when the quality of the course is zero. Estimates by macro-region reveal that such probability is very low, virtually zero, in the South, while it is above 60% in the Center and North-East, and it peaks at almost 74% in the North-West. Hence, course quality is a necessary condition to grant significant employment opportunities in the South, where labour demand is likely to be more depressed.

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Conclusions

In this paper, we investigated the employment returns to non-academic tertiary education in Italy, with a specific focus on the role of course quality. Drawing on economic theory, we framed vocational education as an investment in human capital that can affect labour market outcomes through both occupational sorting and productivity enhancement. Our empirical analysis shows that, even when excluding the mechanical influence of employment indicators in quality scoring, higher-quality ITS courses are significantly associated with better employment outcomes. This evidence supports the idea that quality in vocational training, particularly as captured by features such as course attractiveness, practical training, and interregional networking, contributes to improving the effectiveness of the education-to-work transition. The strong association between employment returns and attractiveness highlights that part of the labour market success of an ITS course stems from the selection of the best students, and from a more accurate match between students and courses. Other than a pure sorting effect, more selective programs may also be more effective in improving individual productivity, also due to the fact that the best students are likely to learn more and faster than the other.

Moreover, the analysis reveals heterogeneity in the mediating role of course quality across both technological areas and geographic regions. Course quality appears to have the strongest impact on employment outcomes in the South of Italy, where labour market conditions are less favorable, and the baseline employment probabilities are much lower. These findings suggest that investing in course quality may be particularly valuable in contexts with weaker labour demand, where structural disadvantages make it harder for young people to access employment. At the same time, some quality components — such as firms' involvement in teaching — do not show a strong independent effect, possibly reflecting either measurement limitations or the complexity of translating employer engagement into actual employability gains.

From a policy perspective, our results reinforce the rationale behind the Italian merit-based funding system (*sistema di premialità*), which allocates additional resources to high-performing ITS courses based on ex-post evaluations. However, given that employment returns are not uniformly linked to all quality dimensions, policymakers should fine-tune the evaluation system to more precisely reward those components that demonstrably drive positive labour market

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outcomes. We will see if the recent reform is a clear step in this direction. Furthermore, in economically disadvantaged regions, broader strategies may be needed to ensure that even high-quality vocational programs can achieve their full employment potential. Continued monitoring and research will be essential to inform effective funding allocation and to support evidence-based expansion of Italy's non-academic tertiary education system.

While our analysis provides robust evidence on the role of course quality in shaping employment outcomes, it has some limitations. First, the quality indicators rely on administrative data and may not fully capture qualitative dimensions such as teaching effectiveness, curriculum design, or the competencies students actually acquire. Second, although we control for time-invariant academy characteristics and include year fixed effects, unobserved time-varying heterogeneity across academies or student cohorts may still bias our estimates. Third, our outcome measure focuses solely on employment status one year after graduation and does not account for longer-term career progression, job mismatch, or earnings.

Future research could address these limitations by incorporating richer data sources, such as student-level datasets or employer assessments (e.g., wage information), to better capture the multidimensional nature of course quality. Longitudinal analyses following graduates over time could also provide deeper insight into the long-term impact of tertiary vocational education on employment and career trajectories.

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Appendix

Table A1: Indicators of ITS course quality evaluation established in 2015

	Description	Weight of each sub-indicator	Weight of the indicator
Attractiveness	1. Selection rate	10	
	2. N. students who took the admission test	10	
	3. Eligibility rate	20	
	4.Academic success (n. graduates+n. certificates*0.3)/n. enrolled students*100	20	
	5. N. graduates	40	
		100	**25**
Employability	6. Employment rate 12 months after graduation	50	
	7.N. employed 12 months after graduation	50	
		100	**40**
Experience within firms	8.% traineeship hours	60	
	9.N. students for each firm involved	40	
		100	**15**
Active participation	10.N. hours taught by teachers from the private sector	35	
	11. N. hours taught by teachers from schools/universities	25	
	12. N. teachers from private sector	15	
	13. N. teachers from schools/universities	10	
	14. N. hours in the lab	15	
		100	**10**
Inter-regional networks	15. % exchange students	35	
	16. N. hours of traineeship in firms outside the region	35	
	17. % teachers outside the region	10	
	18. N. hours taught by teachers from firms outside the region	10	
	19. N. hours taught by teachers from schools/universities outside the region	10	
		100	**10**

Source: Own elaborations on Accordo Conferenza Unificata del 17/12/2015

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Table A2: New system to assess ITS course quality

	Description	Weight of each sub-indicator	Weight of the indicator
Attractiveness	1. N. students who took the admission test	20	3
	2. Participation rate to the admission test	33	5
	3. N. of enrolled students	33	5
	4. % enrolled students from regions different from that of the ITS	13	2
		100	**15**
Practice-based learning	5. % traineeship hours	15	3
	6. % traineeship hours and other training activities carried out outside the region of the ITS course or abroad	15	3
	7. % hours taught by teachers from the private sector	15	3
	8. % hours in the lab	15	3
	9. % hours dedicated to developing digital skills in the lab	25	5
	10. % of firms that contributed to the course design (in total firms)	15	3
		100	**20**
Aprenticeship	11. % enrolled students with a 'Level III' apprenticeship contract	**100**	**5**
Academic outcomes	12. N. of graduates	50	10
	13. Academic success (n. graduates + n. certificates*0.3)/n. enrolled students*100	50	10
		100	**20**
Employment outcomes	14. Employment value (n. 'coherent' employed+ n. 'not coherent' employed * o.3 + n. enrollment in university courses * 0.5)	50	17.5
	15. Employment value/n. graduates*100	50	17.5
		100	**35**
Students' satisfaction	16. Average satisfaction for tutoring, traineeship, teaching, and job placement	**100**	**5**

Source: Own elaborations on DM n. 229/2023

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