From Training to Employment: An Evaluation of the ESF 2014–2020 Vocational Training Programme in Aosta Valley

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Abstract Policy evaluation is central to assessing the efficiency of programmes such as those financed by the European Social Fund (ESF), whose primary objective is to support initiatives that enhance participants' skills and knowledge, facilitate their entry into the labour market, and promote social inclusion. Despite its relevance, empirical and methodological contributions in this area remain limited. Thus, using a dataset on vocational training courses funded under the ESF 2014–2020 programme in the Aosta Valley region, this paper applies both classical and Bayesian logistic regression models to evaluate its efficiency. Preliminary results suggest that effective training policies to increase employment must consider multiple and interacting factors.

Key words: Logistic regression, Bayesian methods, policy evaluation, European Social Fund, employment outcomes, vocational training.

1 Introduction

In recent decades, policy evaluation has become a central tool for guiding public-decision making, generating empirical evidence on the effectiveness of interventions and supporting the design of more targeted policies [1]. Although evaluation practices are now widespread globally, no single standardized approach exists, as methods vary substantially across countries and contexts. This diversity reflects the complexity of contemporary policymaking, increasingly characterised by multiple actors and plural perspectives [9]. A relevant policy evaluation domain is training policies. The latter aim to develop skills and knowledge directly applicable to the labour market, complementing formal education by equipping individuals with practical and professional competences [6]. Vocational training is strongly supported by EU

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funds, notably the European Social Fund (ESF), which finances programmes to enhance employability and social inclusion, generating both short-term skill improvements and long-term benefits in terms of competitiveness, innovation, and inclusion. Methodologically, evaluating training policies is challenging, as observational studies must address causal inference issues, typically using propensity scores, matching techniques, and regression methods to control for differences between treated and untreated groups [7]. Recent advances in supervised machine learning provide additional tools to capture complex patterns and non-linear relationships in employment outcomes, complementing traditional econometric approaches, although they require careful adaptation to the casual framework [8].

To explore the potential of combining classical and Bayesian econometric models, this paper consider as a test-bed the ESF 2014–2020 training interventions in the Aosta Valley. Using a rich administrative dataset, the study evaluates post-training employment outcomes and investigates the factors influencing labour market integration.

2 ESF 2014-2020 Programme in Aosta Valley

The autonomous Aosta Valley region in northwestern Italy is a small Alpine area comprising 74 municipalities, characterized by a mountainous landscape and a strategically important cross-border location. It represents an interesting case study for different reasons. Settlements are mainly concentrated along the Dora Baltea river basin in the valley floor, whereas upland communities face typical mountain disadvantages, such as limited accessibility, dispersed populations, and higher costs for residents and businesses[5]. However, the regional labour market has shown positive trends in recent years. Employment reached about 57,200 in 2024, rising by 0.6%, while unemployment fell to 3.9%, well below the national average. Female employment rates are also higher than the Italian average, indicating a relatively resilient labour force [3]. Nevertheless, structural challenges persist, including seasonal employment patterns, the limited size of the local labour market, and skill mismatches. In Aosta Valley, the ESF 2014-2020 Operational Programme (Investments for Growth and Employment), implemented between 2015 and 2023, aimed to address structural and socio-economic challenges, such as youth unemployment, gender inequalities, and the risk of social exclusion. A significant share of resources (€ 8.013.705,31) was allocated to 79 vocational training projects, targeting both young people at risk of social exclusion - the Not in Education, Employment, or Training (NEETs) - and adults seeking to upskill or requalify [2, 4]. The training projects targeted employed workers, unemployed individuals, and students in vocational pathways. Resources were focused on sectors aligned with local labour demand, including construction, digital skills, healthcare, hospitality, and business administration. Overall, the programme integrated employment support, social inclusion, and skills development, translating European priorities into interventions tailored to the socio-economic context of the Aosta Valley.

3 Data, Methodology, and Empirical Results

This study analyzes the administrative dataset provided by the ESF Managing Authority and the Regional Economic and Social Observatory, collected through employment surveys conducted between 2021 and 2024. The dataset includes 1435 individuals (63% female and 20% under 30 years old) who participated in ESF-funded vocational training programs.

The empirical analysis combines a classical logistic regression model (logit) with a Bayesian Markov Chain Monte Carlo (MCMC) approach, both showing that prior employment status is the most reliable positive predictor of post-training employment. The findings show a substantial increase in the probability of being employed after seven months for those already employed at the starting point. For the sample considered, neither gender nor country of birth are significant. In contrast, age at course entry has a significant negative effect on employment outcomes: younger participants exhibit higher probabilities of being employed after course completion. Another significant determinant is participation in professionalizing training courses. Programs with a strong practical orientation and a focus on job-specific skills are associated with significantly higher employment probabilities compared to more general or transversal courses. Considering training fields and taking "Transversal Skills" courses as the baseline, the "Commerce", "Tourism and Hospitality", and "Transport" sectors show a lower probability of employment. In contrast, the "Care Services" sector has a significant positive effect, with training in this area notably increasing employment likelihood due to rising demand for care-related skills. Other fields, including "Financial, Insurance, Banking, and Real Estate Activities", "Construction", "Craft and Manufacturing Industry", and "Business Services", do not show statistically significant effects compared to the baseline.

The consistent results from both methods increase confidence in the findings, identifying prior employment, age at entry, and participation in professionalizing courses as key predictors of short-term employment outcomes, while the Bayesian approach enhances uncertainty assessment through credible intervals.

4 Conclusion

This study analyzed the effectiveness of ESF 2014–2020 vocational training interventions in the Aosta Valley. Using a rich administrative dataset and combining classical logistic regression with Bayesian methods the analysis identified key determinants of post-training employment. Prior labour market experience, age, and participation in professionalizing courses emerged as the most relevant factors, while sectoral effects showed heterogeneous impacts. The convergence of results across methodologies reinforces the robustness of the findings. Overall, the evidence highlights the importance of tailoring training programs to local labour market conditions, integrating practical skills, and considering participants' background to maximize employment outcomes. To further enhance the analysis, several supervised

machine learning algorithms could be implemented, including Naive Bayes, Decision Tree, Random Forest, and XGBoost, to explore non-linearities, interactions, and complex predictive patterns. Future research could extend this analysis by applying mixed-effects MCMC models, allowing for a more nuanced understanding of hierarchical and project-level heterogeneity. These insights can inform the design of future regional training policies, ensuring they are both targeted and effective in promoting employability and social inclusion.

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