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*Corresponding author: Ana Sofia Lopes, School of Technology and Management Polytechnic of Leiria, Campus 2, Morro do Lena – Alto do Vieiro, 2411-901 Leiria, Portugal
E-mail: analopes@ipleiria.pt

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PROFESSIONAL EDUCATION & TRAINING | RESEARCH ARTICLE

Supply and demand matching of VET skills - a regional case study

Ana Sofia Lopes^{1*}, Isabel Rebelo², Rui Santos^{3,4}, Rogério Costa² and Vitor Ferreira⁵

Abstract: The proper alignment between supply of Vocational Education and Training (VET) and labour market demand is critical to successfully achieve VET's main benefits, such as reduction of academic dropout rates, unemployment reduction and economic growth. This article presents the study carried out in Leiria region (Portugal) to define VET areas priorities at the secondary education level. A mixed methodology was applied by using both quantitative (employment

ABOUT THE AUTHORS

Ana Sofia Lopes (<http://orcid.org/0000-0003-0163-4833>) is a Professor in Economics at Polytechnic of Leiria and a researcher affiliated at the Centre of Applied Research in Management and Economics (Polytechnic of Leiria). She received her PhD in Economics (specialisation in Labour Economics) from the University of Coimbra.

Isabel Rebelo (<http://orcid.org/0000-0003-0786-8681>) is a Professor at the School of Education and Social Sciences of the Polytechnic Institute of Leiria. Her PhD is in Didactics from the University of Aveiro in 2005. The main activities are in the areas of initial and postgraduate teacher training.

Rui Santos (<https://orcid.org/0000-0002-7371-363X>) is a Professor of Statistics at the School of Technology and Management of the Polytechnic Institute of Leiria, and he is a member of CEAUL – Center of Statistics and Applications from the University of Lisbon, Portugal.

Rogério Costa (<https://orcid.org/0000-0001-5976-2745>) is a Professor at the School of Education and Social Sciences of the Polytechnic Institute of Leiria, completed his MSc in Probabilities and Statistics by the University of Lisbon and the DEA in Multimedia Engineering by the Universitat Politècnica de Catalunya.

Vitor Hugo Ferreira (<https://orcid.org/0000-0003-3400-5996>) has received his PhD from Lisbon University (ISEG) in Entrepreneurship & Innovation. He was the Executive Director of Leiria Business School in Portugal until 2020. He is an associate professor of Polytechnic Institute of Leiria and.

PUBLIC INTEREST STATEMENT

Our study develops a methodology, applied to a Portuguese region, that aims to understand which vocational education training fields are crucial for the future. We combine data from different sources, like employer surveys and interviews, to figure out what skills the market needs. The study involves the participation of a variety of people, including local policymakers and business owners, to make sure it captures the big picture. The findings showed some gaps between the skills people were learning and what employers needed. Our investigation can improve communication between educational system and employers, help decision-makers focus on the right educational areas and schools designing courses that match the real-world job market. By improving the quality of job training, the suggested policies can help reduce future imbalances between these programs and market needs, thus contributing to reduce unemployment, address age-population issues, support business growth, and encourage regional development.



microdata, employers survey and employment offers analysis) and qualitative (interviews, focus groups and documents analysis) instruments and techniques. A diverse group of stakeholders (e.g. regional policymakers and private and public sectors' employers) were heard in order to anticipate the market's needs for skills. The results, obtained through the various methodologies, point to the same skills' priorities and reveal several mismatches between demand and supply of qualifications. Thus, this study helps policymakers to prioritize areas of education and VET providers to design courses aligned with the real needs of the region's labour market. Additionally, several challenges are identified, as the need of a better dialogue between the VET system and employers. By increasing the quality of VET supply, our policy suggestions contribute to reduce future demand-supply imbalances, and therefore, to reduce unemployment, control the demographic problem, increase the companies' expansion and promote regional development.

Subjects: Study Skills; Sustainability Education, Training & Leadership; Education Studies

Keywords: vocational education and training; policy education; skills anticipation; skills mismatch; labour market

1. Introduction

According to CEDEFOP—European Centre for the Development of Vocational Training - (2018a), research shows that the economic crisis in the first decade of the century has led to an increase of labour market imbalances across Europe and to the awareness that skill mismatches, resulting from shifts in skill demand and supply, were worsening in the European Union (EU). In 2014 CEDEFOP undertook the first *European skills and job survey* and in 2021 a second one was put in place. The aim was to gather information to inform policymakers in Europe to address these issues that have great individual, social and economic consequences. CEDEFOP has since been working with several European countries to identify country-specific challenges and has put in place several tools, like the *CEDEFOP Skills forecast*¹ (that makes available international comparable data, allowing for cross-country comparisons regarding employment trends, occupations and qualifications) and *Matching skills—Inspiring policies for anticipating and matching skill needs*² (that gathers innovative and inspiring policy instruments that reflect actions of different countries). Also, according to CEDEFOP³ there is a great potential for each EU country to learn from the others concerning “skills anticipation and matching practices”, which makes relevant the reporting and sharing of specific country or regional-driven case studies that allow for decision-making, namely in the areas of educational policies and regulatory practices.

Despite the decreasing trend observed since 2013, the unemployment rate among individuals with secondary education, in Portugal, is higher than the global unemployment rate (8.4% and 7.0%, respectively in 2020).⁴ Investment on Vocational Education and Training (VET) was one of the adopted measures to reduce this rate. VET programs' goal is to equip students and trainees with “knowledge, skills, and competencies required to work in a specific occupation or more broadly on the labour market” (Rageth & Renold, 2020, 503). This type of education supplies skilled workers to the market, leading to gains in terms of human capital (Shavit & Muller, 2000; Özer & Eren Suna, 2020) which makes VET essential to countries' development (Bagale, 2015). Additionally, O'Dwyer and White (2019) stated that VET is playing an increasingly important role in providing the development of formal skills for several occupations that have historically been dominated by underqualified workers.

Considering the above, the present work focusses on VET supply of professional courses, which are double certification courses (both professional and academic), and an alternative route to attain secondary education in Portugal. They include a considerable number of hours of on-the-job

training and are expected to contribute to a reduction of dropouts from the educational system, promote a smoother transition into employment, facilitating young people's entry into the labour market (Rageth & Renold, 2020), while promoting access to better job opportunities.

To ensure that VET benefits are broadly realized, it is crucial for the qualifications offered by VET programs to correspond with the demands of local labour markets. Research that aids in pinpointing and minimizing potential discrepancies between skill availability and requirements is thus vital, and this is the primary objective of our work.

Thus, our first contribution is to examine recent demand and forecast future qualification needs for workers holding a secondary education VET diploma in a specific Portuguese region, namely Leiria. Despite Portugal's modest size, there are notable regional variations in terms of sectoral specialization, which in turn affect the skills employers seek. Consequently, regional studies that aim to anticipate these specific needs are becoming increasingly important for informing central and regional authorities' decisions regarding regional VET offerings. To achieve this, we employed a mixed research methodology, developing and utilizing tools to collect both quantitative and qualitative data. We gathered microdata on recent employment trends and applied forecasting techniques to better predict qualification demands in the region under investigation.

Subsequently, a list of anticipated qualification needs and professional opportunities at the regional level was developed through a participatory analysis of the collected data, which included a diverse group of stakeholders such as local and regional authorities, private and public employers, human resources managers, and representatives of the educational system (policymakers, teachers, trainers). This list was then compared with the compiled data on VET program offerings in the region, leading to the identification of the Education and Training Areas (ETA) where the most significant mismatches between supply and demand occur, marking our second contribution.

Based on this analysis, we proposed adjustments to the relevance scale of these areas for the Leiria region. Consequently, our research findings were utilized to update a decision-making educational policy tool that reflects the relevance scale of professional qualifications and integrates the National Catalogue of Qualifications (NCQ) and corresponding ETA. This tool is employed by local and national authorities to regulate the training supply network for professional education courses in the region. The implementation of this instrument aims to enhance professionals' skills, fosters the competitiveness of Portuguese enterprises, and facilitates the creation of high-skilled jobs (CEDEFOP, 2019, 22), further emphasizing the value of our study.

The structure of the paper is as follows. In the next section, a theoretical background is provided. In section 3 some information on professional education in Portugal is given, and in section 4 the context—Leiria region—is presented. The methodology used to anticipate the demand of qualifications is presented in section 5 and the results are exhibited next, including the outputs obtained from the diversified methods used and the qualifications mismatches resulting from comparing these outputs with the current VET supply. Finally, the discussion, main conclusions and policy implications are drawn in the last section.

2. Theoretical background

Skill mismatches that correspond to the imbalance between qualifications of job seekers and skills needed in the market can be divided into two types: vertical and horizontal mismatches. A vertical mismatch is related with the level of education and occurs when workers possess more years of schooling than their job requires (overeducation) or less education than required corresponding to undereducation (e.g. Kofol et al., 2022; Robst, 2007). A horizontal mismatch, on the other hand, occurs when the education field of graduates (supply side) is unrelated with the field required for a job/occupation (demand side) (e.g. Kofol et al., 2022; McGuinness et al., 2017).

Skill is a rather complex concept to measure (Brunello & Wruuck, 2019), therefore, analysing skill mismatch is deeply complex. According to Somers et al. (2018) the majority of the literature related to skills' mismatches is dedicated to the incidence of vertical mismatch of workers—over and undereducation—and its effects on, for example, wages.

The literature on horizontal mismatches is comparatively sparse and typically employs two alternative methodologies: subjective and objective approaches. The subjective approach is based on employees' self-reporting of their perception of the extent to which their current occupation aligns with their field of study (e.g., McGuinness et al., 2017; Robst, 2007; Schweri et al., 2020). The objective approach measures mismatches by comparing educational fields with the educational requirements for a given occupation, taking into account occupational codes (Nordin et al., 2010; Schweri et al., 2020; Somers et al., 2018). Subjective measures offer particular advantages when investigating lifelong mismatches, as they can consider knowledge acquired through job experience; however, they rely on the worker's perception, which may introduce self-report bias (Brun-Schammé & Rey, 2021; Somers et al., 2018). Consequently, this study adopts an objective approach to anticipate supply-demand imbalances immediately following graduation by identifying horizontal mismatches from comparing the importance of each field of education (ETA) – supply side—with the importance of qualifications required for the occupations—demand side.

Previous literature has identified mismatches at the worker level, enabling the investigation of their impact on wages (e.g., Nordin et al., 2010; Robst, 2007; Schweri et al., 2020) or job dissatisfaction (e.g., Bender & Roche, 2013). However, the effects of skill mismatches extend beyond employment conditions, potentially increasing the likelihood of unemployment and the difficulty companies face in hiring qualified workers. Structural unemployment may persist even when job vacancies outnumber job seekers if candidates' qualifications do not align with job requirements.

In Portugal, the population under 15 years of age has declined by 17.5% (approximately 295,000 young people) between 2000 and 2020, which will negatively impact the anticipated active population in the coming years. This situation heightens the importance of aligning the demand and supply of skills to ensure that employers can find workers with the necessary qualifications in a context of limited human resources, thus avoiding skill shortages (McGuinness et al., 2017).

Since analysing mismatches for individuals who are already employed does not allow for the identification of all effects, we contribute to the literature by developing a framework for anticipating demand and supply, thereby measuring skill mismatches not based on those currently existing in the market but rather on predictions of those that may arise in the near future. This anticipatory framework enables policymakers to adjust the education system before mismatches become effective. The proposed measure can also be employed to investigate the relationship between ETA mismatch levels and unemployment, for instance.

In their literature review, Somers et al. (2018) concluded that horizontal mismatches are highly dependent on the field of study. At the higher education level, Verhaest et al. (2017) discovered that horizontal mismatch is more prevalent among graduates of Services, Humanities and Arts, Agriculture, and Social Sciences. Robst (2007) corroborates the higher likelihood of demand-supply imbalances in the areas of Humanities and Arts, Social Sciences, but also in English, and Foreign Languages. In the realm of VET, Çidem et al. (2021) establish a notable heterogeneity among regions concerning the areas of study with the most pronounced mismatches. They observe that the primary production sectors of each region generally exhibit a surplus in skill demand. Considering the aforementioned arguments, our research question is: How do anticipated mismatches between skill demand and supply fluctuate across Education and Training Areas?

Bolli et al. (2018) assert that the equilibrium of skill supply and demand is contingent upon the quality of interactions between educational institutions and employers. Nonetheless, the authors acknowledge that existing literature offers limited insight into the execution and measurement of

education-employment linkages. Rageth and Renold (2020) argue that the distribution of decision-making power in matters such as curriculum design, application, updating, and quality assurance is a crucial dimension for classifying VET programs into three distinct types.

In the first scenario, the employment system wields complete authority, which is suboptimal for academic certification purposes. This is because, over time, graduates may become ineligible for higher education. Moreover, Caves et al. (2019) assert that the development of qualifications is a multifaceted process, and Huddleston and Laczik (2018) contend that stakeholders such as employers often lack the necessary technical knowledge, expertise, and experience to successfully navigate the diploma development process. This underscores the necessity for the involvement of educational actors.

The second scenario, in which the educational system possesses absolute power, is similarly undesirable, as it may produce graduates lacking the qualifications sought by employers. Consequently, employers might not recognize VET graduates as suitable employees. Mason (2020) emphasizes the importance of employer involvement in updating pertinent and emerging technical skills and identifying relevant generic skills, such as communication, problem-solving, teamwork, and customer handling.

Thus, the most favourable program typology would promote equilibrium between the educational and employment systems. This would entail active employer participation in the definition, implementation, and quality assurance phases of VET programs (Caves et al., 2019; Rees, 1997). Of particular significance to our study is the engagement of employers in the anticipation of skill needs. Lassnigg (2008, 13) highlights that in “dynamic economies, the demand for skills and competencies evolves through intricate relationships”. The International Labour Office (International Labour Office, 2015, 1) defines skill anticipation as “a strategic and systematic process through which labour market actors identify and prepare to meet future skill needs”, underscoring its importance.

It is widely acknowledged that the efficacy of this process in fostering human capital development and, consequently, enhancing labour productivity and competitiveness is deeply connected to employers’ involvement. Despite this general consensus, the optimal approach for facilitating interactions between schools, employers, and other stakeholders remains ambiguous in the literature. Hence, this article proposes various techniques to encourage the engagement of employers and other stakeholders, particularly in the process of skill anticipation, and thereby identifying supply-demand mismatches. This contribution enriches the existing body of knowledge.

3. Professional Education in Portugal

In the first two decades of the XXI century both OECD and EU have identified a set of challenges to be addressed by VET systems. In particular, the EU has identified the high levels of youth unemployment in many Member States, and “an evident mismatch of skills supply and demand that hinders economic growth and job creation” (European Commission, 2016). Additionally, it has been agreed that workers in Europe should be given opportunities to develop high-quality skills, throughout their lives, in order to be able to play an active role in the labour market, while driving innovation and growth. For these purposes, general recommendations were given as a framework for VET programs to become more varied and able to sustain the development of skills of different target audiences, according to their age groups and qualifications. The flexibilization of educational pathways has been a way of ensuring that more students finish compulsory education and that they do so with the possibility of entering directly into the labour market with appropriate qualifications.

In Portugal, special attention has been given to measures aiming at reducing academic dropout, through VET programs, increasing the attractiveness of professional programs, increasing the number and diversity of such programs and their relevance to the labour market. In particular,

more space was given, in the curricula, to workplace training, reinforcing links with local employers and VET providers.⁵ In line with European policies, VET in Portugal has been developing, in recent years, in order to provide alternatives for students to complete compulsory education, giving them, at specific levels of education, double (academic and professional) certification. It has been one of the mechanisms developed by governments to increase the professional and academic qualifications of young people entering the labour market and, through permeability with the other educational routes of secondary education, allow access to further education at post-secondary and tertiary levels (CEDEFOP, 2018b).

Several initiatives are ongoing in order to develop and adjust the VET offer to the needs and priorities of the different socio-economic sectors and ensure the relevance of such offers. NCQ was developed as a single reference tool for the harmonization of ETA and occupations, within the National Qualifications System. Regional studies, like the one in which the present work is based on, are being developed to align the relevance of qualifications and the regional profiles of demand by the labour market. At the same time, the VET providers are involved in the alignment of their quality assurance mechanisms with the European Quality Assurance Reference Framework for VET in an initiative to promote the development and quality improvement in VET.

Approximately 30 years after the establishment of VET as an alternative route of upper secondary education (VET level 4 programs)⁶ in the Portuguese educational system, the proportion of Portuguese students enrolling in VET is still, on average, lower than that of those enrolling in regular secondary education and also lower than the EU average (CEDEFOP, 2020). An investment is underway to increase the relevance, number, diversity and quality of the programs available, through the cooperation between the different stakeholders: Ministries of Education and Labour, Solidarity and Social Security, National Agency for Qualification and Vocational Education, regional and local authorities—Intermunicipal Communities, Municipalities, schools and local employers.

Professional Courses (PC) are currently the major form of level 4 education for young people. The percentage of Portuguese students enrolled in VET in secondary education (mostly PC) was, globally, around 36.5%, in 2020, significantly below the goal of 50% stipulated by the Government.

4. Leiria region

The Leiria region (NUT III) is situated within the Central region (NUT II) of Portugal and comprises 10 municipalities. To better comprehend the context, the authors conducted a regional diagnosis. A key finding is that the ratio of young people to the total population in the Leiria region is lower than the national average and has displayed a declining trend over the past six years, which raises significant concerns regarding the future labour supply.

In contrast, a highly favourable economic dynamic was observed between 2013 and 2018, characterized by an increase in turnover per firm, attributable to both enhanced labour productivity and a rise in the number of employees (Lopes et al., 2019). Furthermore, the number of companies has also grown, which, in conjunction with the aforementioned factors, indicates a clear positive trend for the regional labour market. The region's enterprise density surpasses the national average, and nearly 40% of the Gross Value Added is generated by the manufacturing industry. This sector, along with trade and construction, accounts for over 70% of the region's Gross Domestic Product, significantly exceeding the national average of approximately 50%.

Since 2013, the employment rate in Leiria has been on an upward trajectory, and its proportion of the total population is considerably higher than the country's average. Employment is heavily concentrated in manufacturing, particularly in the production of metallic, mineral, and plastic products. Finally, the region's unemployment rate (3.5% of the total population aged 15 or older, in 2018) is proportionally lower than the national average and has been decreasing since 2013. Despite this, it is noteworthy that unemployment among individuals with secondary education is

higher than overall unemployment, which may suggest a misalignment between the supply and demand of skills within this educational level.

5. Materials and Methods

The methodology used in this study is illustrated in [Figure 1](#). First, we started by following SANQ (System for Anticipating Qualification Needs) approach, which is a mandatory methodology designed by the National Agency for Qualification and Vocational Education with the aim of identifying the skills' needs of regional labour market. This methodology is composed by two parts: the first corresponds to the analysis of recent dynamics of the labour market and the second consists in the prospective analysis of the demand evolution for qualifications.

[Figure 1](#) description: Framework of the combination between different methodologies used to obtain the redefinition of VET courses in the Region.

In the prospective analysis, a combination of different methodological approaches and instruments is used in order to achieve reliable and meaningful results. This was made by developing, on the one hand, a quantitative approach through the application of surveys to employers and to analyse the employment offers by sector; and on the other hand, using qualitative methods, including expert interviews, focus groups and the analyse of stakeholders' documents (e.g. regional and sectoral strategical plans).

Next, we translated the data into indicators and other outputs, and presented this information to a diverse group of stakeholders composed by decision-makers, experts, representatives of education and training institutions and private and public sector employers with the objective of enriching our analysis. Then, by using the deep knowledge about the region's demand of skills collected through this methodology, we proposed priority levels for the ETA.

At the same time, data on professional courses offered by VET providers in Leiria region was gathered from official sources (Ministry of Education's website). The number of students in the 1st year of these courses in each of the academic years from 2014/15 to 2016/17 was compiled and the corresponding ETA identified. This data allows us to identify the areas, which are expected to have more/less graduates in the next few years.

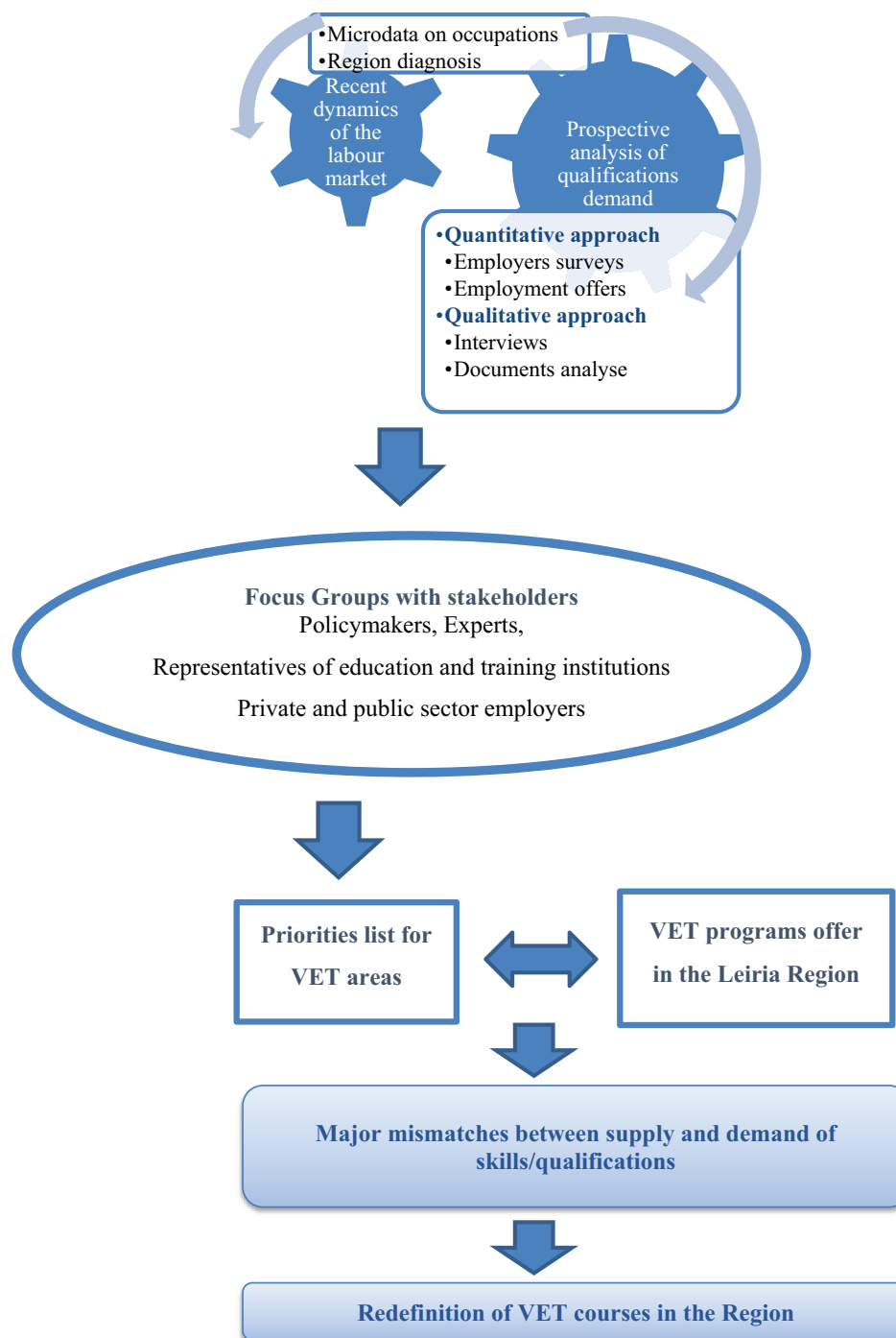
Next, the priorities list for ETA was compared with the concrete VET courses offer in the region and the major mismatches between supply and demand of skills were identified. Finally, the conclusions of our study were used for the definition of the supply network for professional education courses in the region for the next academic years.

5.1. Recent dynamics of employment

The analysis of employment by occupations (considering the Portuguese Classification of Occupations, PCO) in the Leiria region was carried out using data from the *Quadros de Pessoal*. This Portuguese database was provided by the Strategical and Planning Office of the Ministry of Labour, Portugal, and contains worker-level information including age, schooling level and job occupation. Thus, several indicators were built in order to analyse the current status of occupations in the region:

- occupation relevance—coefficient of the number of workers in each occupation and total number of workers;
- occupation relevance for workers with upper-secondary education and age between 20 and 24;
- evolution (between 2014 and 2017) of the number of workers in each occupation and their contribution to the employment growth in the region;
- relation between the occupation relevance at Leiria region and the relevance of the same occupation in the Centro region.

Figure 1. Methodology.



Then, for each indicator, a ranking was created, attributing to each occupation a value from 1 to 4, depending on whether its value was in the first to fourth quartile, respectively.

5.2. Employers Surveys

In order to evaluate the demand for graduates with a VET diploma (level 4), an online survey was provided to a list of employers in the region, between February and April of 2019. The survey was supported by the most influential local organizations, namely the Leiria Intermunicipal community and the largest Business Association in Leiria (NERLEI).

In the first part of the survey, the authors intended to characterize the companies in terms of county location, industry, number of employees, turnover, among others. In a second part, employers were asked to identify, by education and training area, the number of employees with a level 4 VET diploma they expect to hire for the next two years. Some additional information was also demanded, such as the reasons behind the new hires (expansion or diversification of activity, replacement of employees) and the identification of possible recruitment difficulties.

5.3. Employment Offers

Currently, online platforms represent the largest source of information regarding job vacancies. More and more companies are using these tools as a way to increase the reach of their offers aimed to cover a larger number of candidates. Despite the increasing use of social networks, namely professional ones, such as *LinkedIn*, in the placement of job vacancies, their expressiveness, in relation to other specific platforms, was considered insufficient. Thus, in this study, four online platforms were used, as they have been identified as the main sources related to job vacancies.

The search, using the tools/filters available on each of the online platforms, was conducted from 15 April to 11 May 2019. During this period, daily searches were made on the four platforms, and a job database was created with the job vacancies matching the following criteria:

- workplace in the Leiria region;
- jobs that fit an intermediate professional level.

After controlling for duplicated cases (vacancies that are advertised on more than one platform), a total of 682 vacancies that met the criteria listed above were considered for analysis.

5.4. Interviews and Focus Group

The interview is an interaction process in which the interviewer has the purpose of obtaining information from the interviewee, through the approach of a set of topics around a problem (Haguet, 1995). According to Minayo et al. (2002), the interview allows to obtain affirmations through a direct speech, revealing values and norms regarding a certain group. As such, the applied interview was a semi-structured one that granted the interviewees the possibility of giving free and spontaneous responses that gave an in-depth view on the different actors' perspectives on the present and future demand of VET, as well as its perceived main shortcomings and advantages in the region.

Face-to-face and asynchronous interviews were conducted with the municipal officials of 8 of the 10 Municipalities and the largest Leiria business association, NERLEI (with more than a thousand members). The interviews took place between February and March 2019, having been recorded.

Seven fundamental themes, that were part of the SANQ methodology, were considered in the interviews:

- challenges facing the municipality's economic and social development;

- strategic bets of the municipality in the scope of business/sectorial development in the short and medium term;
- vision on the local and regional labour market and its main dynamics, potential and constraints;
- economic and business dynamics and projects/investments with an impact on employment and skills demand;
- perception/view on the existing VET supply and its relevance;
- perception about intermediate qualification needs/technicians;
- emerging activities/ranks, new jobs, “new” key skills and necessary training.

These topics aimed to understand the interviewee’s views on the county economic situation, challenges and future plans that may influence the labour market and whether the existing supply of VET courses fulfils that dynamic. Most of the questions were constructed in order to have a broader view of the skills and training that are required and not having the interviewees too much focus on existing VET courses. The recorded interviews were transcribed, and a contextual analysis was carried out on expressions and transversal themes existing in each one. The key qualifications named at least once in each interview and the main ideas for the future were identified.

Additionally, two focus groups and an asynchronous business dynamic with companies were carried out. These focus groups involved several stakeholders and were carried out by using the same seven themes identified above.

6. Results

This section starts presenting the main results of the methodology applied to identifying the qualifications demand of the regional labour market. Next, a proposal for VET priorities for the Leiria region is built on those qualifications’ needs. Finally, qualifications mismatches are identified by comparing VET priorities in the demand perspective with the actual supply of VET courses.

6.1. Recent dynamics of employment

Among the 122 occupations considered at the Portuguese Classification Occupations (at 3 digits level), 14 of them stand out as they include more than 50% of the workers in the region (Figure 2). The occupations highlighted in Figure 2 correspond to those that have a higher weight within employees with secondary-level education. The two arrows pointing to the right identify occupations that stand out for having a much higher weight in Leiria than in the Centre region and, finally, the five arrows pointing up correspond to the occupations whose growth had the highest contribution to the employment growth in the region.

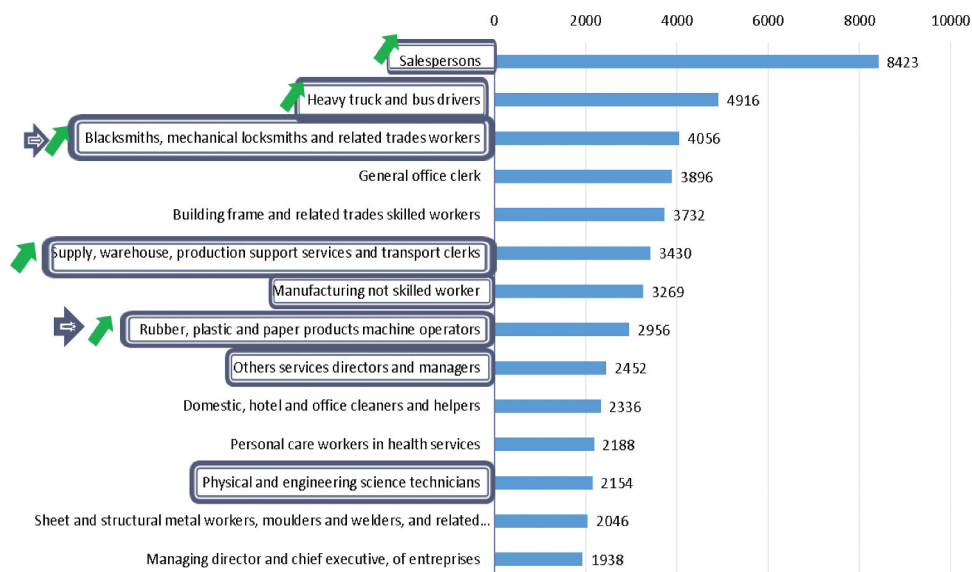
Figure 2 description: Top 14 occupations considering the number of workers, with salespersons being the occupation with the highest number.

Accordingly, five occupations stand out as being relevant for the majority of the indicators considered: Salespersons; Blacksmiths, mechanical locksmiths and related trades workers; Rubber, plastic and paper products machine operators; Supply, warehouse, production support services and transport clerks; and Heavy truck and bus drivers.

6.2. Employers survey

The surveys from 305 organizations/companies in the Leiria region, covering all its 10 counties, were validated and included in the results analysis. The organizations presented in the sample employ almost 14,000 workers (more than 10% of the employment in the region) and are a reliable description of the Leiria companies’ population. In fact, the sample is similar to the population in terms of territorial distribution (higher percentage of companies in the counties with higher number of companies and employment) and sectorial distribution and by covering different dimensions in terms of number of employees and turnover.

Figure 2. Top 14 occupations in Leiria Region.



As would be expected considering the structural business of the region and of the Country (characterized by micro and small-sized companies), most of the companies observed are small-sized companies, with 45% having less than 10 workers. The majority of companies (75%) is also concentrated in a single county. Moreover, the analysis of results shows a significant heterogeneity between counties either in the observed number of workers, as in the turnover per company.

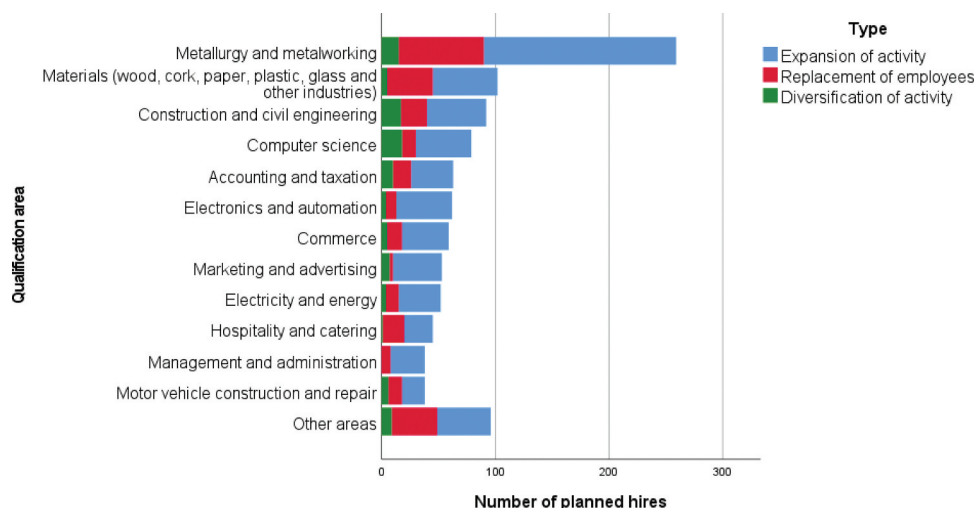
The majority of companies (80%) have their activity concentrated in a single sector. The most represented sectors are the manufacturing industry (41.0%), construction (16.4%), other service activities (14.1%), wholesale and retail trade and repair of motor vehicles and motorcycles (12.1%) and consultancy, scientific, technical and similar activities (11.8%), a distribution that also constitutes a good reflection of the reality of the region.

On the survey, the employers had showed an intention to recruit 1,266 workers with a level 4 VET diploma over the next two years. This is a very important result and a significant number especially considering that the number of graduates of level 4 VET in 2018 was of 826.⁷ Figure 3 shows the number of hires' intentions for the next two years in each of the ETA of level 4 professional courses currently offered in the region. Recruitment was further divided according to its objective, namely whether it corresponds to an activity expansion, the replacement of employees or the activity diversification.

Figure 3 description: Number of planned hires by Education and Training Area, with metallurgy and metalworking presenting a much higher number of planned hires than the remain areas. This is planned mainly with the aim of expanding the activity.

From the 1,266 hire intentions, 1,038 are in the ETA already offered in the region. The majority of the intentions, 656 (63.2%), are in order to expand their activity over the next two years, 281 (27.1%) to replace employees and 101 (9.7%) to diversify the activity. The ETA of metallurgy and metalworking stands out with 259 hires (25.0% of the recruitment intentions), followed by the materials area with 102 hires (9.8%), construction and civil engineering with 92 hires (8.9%) and computer science with 79 new contracts (7.6%). Other relevant areas are commerce, marketing and advertising, accounting and taxation, management and administration, electricity and energy,

Figure 3. Number of planned hires by ETA.



electronics and automation, construction and repair of motor vehicles, and hotels and restaurants. Moreover, through open questions in the survey, companies expressed their intention to hire more 228 workers in ETA that are not provided in the region, such as waste management, production, bricklayers and servants, driver (freight transport), locksmiths, assistant geriatrics and health assistant, with at least 10 hiring intentions each.

6.3. Employment Offers

The analysis of job vacancies on online platforms showed some asymmetries between Leiria counties. In fact, offers are concentrated in three counties of the region with the other seven counties together representing only 7.8% of the main online platforms' offers.

With regard to the activity sectors, those that offered the majority of job vacancies in the period studied were manufacturing industry, with 25.2% of orders, trade and sales (22.3%), construction (16.5%) and hotel/restaurant sector (14.5%). The occupations in focus, responsible for 48.8% of all job vacancies, are Commercial; Heavy-duty driver; Waiter; Salesman; Cook; Other unskilled workers in the manufacturing industry; Bricklayer; Store assistant; Counter worker; Production assistant; Maintenance technician; Metalworker and Family helper.

6.4. Interviews and Focus Groups

ETA highlighted in the interviews and the focus groups were: Programming and computer technicians; Mechatronics; Electronics and automation; Tourism technicians; Forest management; Geriatrics; Hospitality technicians; Metalworking and metal mechanics; Polymer technicians and transformation of plastic materials; Nature sports coaches; Environmental management and sustainability; Industrial maintenance; Industrial management; Measurement and budgeting technician/civil construction and Design and data analysts. All information technologies related areas were prevalent in the answers and worries expressed by stakeholders.

From the interviews and focus groups analysis, it was also possible to identify other main ideas. All respondents considered that VET has an important role in the regional companies. However, regarding the existing offer, there were some concerns that begin with the excess of qualifications areas and inadequacy of the NCQ considering that it is complex and out of place with reality. Another concern is that VET courses might not always consider the current and future demand needs, but rather the accommodation of the schools' necessities, creating a decompensated

portfolio of courses. Studies that promote the involvement of the employers in the design of the VET courses are therefore recognized to be of main importance.

Moreover, an additional concern is that the priority areas in the labour market perspective are not always in demand by future students. In fact, this phenomenon has an echo in professional education, which is often considered as a “poor” alternative to traditional education and even, often, subject to “ghettoization” within some educational institutions. To combat this phenomenon, VET should be promoted as a qualifying alternative, through direct and indirect communication with students and parents. Changing the names and syllabus of some courses may also play a role in increasing demand.

The lack of labour supply, aging (which aggravates the lack of labour), immigration and its management, the skills needed for digital transformation and the social sustainability of the regions were referred to in a transversal way as some of the main challenges to be faced, in the medium term, by companies in the region.

Through the analysis of the interviews, it was also possible to determine a transversal alert for the need to articulate VET network within the region. According to several interviewees, not all counties will have to offer all courses, and there may be territorial specialization.

6.5. Skills’ needs and training and education priorities

In Table 1, we present the identification of priorities among the ETA. All the 29 ETA that are currently provided in the region were considered. Of the remaining possible areas, those that are very important in the employers’ perspective, were also considered. For each of these areas, it was attributed a relevance level ranging from 1 to 10 (with 10 being the most relevant level).

The relevance level associated with the recent dynamic of employment was obtained by considering the four indicators presented above. First, the professions on the Leiria region were ranked based on the quantile levels of these indicators. Next, a link between professions and ETA was made allowing each area to have a rank for each indicator. Then, for each area, an average of the four rankings was determined, which was finally translated into a value between 1 and 10.

The results obtained by the survey and the employment offers enable to rank the priorities among ETA through the identification of hiring needs as well as of the areas where it is currently difficult to hire. In terms of interviews and focus group, we analysed the number of times each training field was referred by each interviewee. We then constructed a ranking for each one of the fields.

On the top of the priorities are the ETA of Metallurgy and metalworking and of Materials.

6.6. VET Professional Courses in Leiria region

Between 2014/15 and 2018/19 there were 17 public secondary schools and 8 private professional schools as VET providers in Leiria region. The offer of professional courses encompassed 29 ETA, among the 37 possible, inscribed in the NCQ.

The 29 ETA provided in the region are presented in Figure 4 by descending order of the number of students enrolled in the 1st year of these course in each academic year of 2014/15 to 2016/17. Hotels and restaurants were the ETA with a higher number of students enrolled in the 1st year. It was also one of the ETA in which more classes were approved for schools to offer in the following two academic years. This ETA was followed by Computer science; Audio-visual and media production; Tourism and leisure; Electronics and automation; and Metallurgy and metalworking. These 6 ETA brought together 58% of the students enrolled in the 1st year of professional courses in the Leiria region in 2014/15 and, respectively, 61% and 62% in the following two academic years (Lopes et al., 2019).

Table 1. ETA level of relevance

Education and Training Areas	Recent dynamic of employment	Survey and Employment Offers	Interview/Focus Groups	Demand relevance
Performing arts	1	1	1	1
Audio-visual and media production	4	3	5	4
Design	6	5	6	6
Philosophy, history and similar sciences	1	1	1	1
Trade	8	8	7	8
Management and administration	4	6	7	6
Finance, banking and insurance	2	2	2	2
Accounting and taxation	5	7	6	6
Marketing and advertising	7	7	8	7
Law	3	3	2	3
Computer Science	6	7	10	8
Metallurgy and Metalworking	8	9	10	9
Electricity and energy	7	7	7	7
Electronics and automation	8	7	10	8
Chemical processes technology	8	8	8	8
Motor vehicles construction and repair	9	8	8	8
Textile, clothing, footwear and leather industries	4	4	3	4
Materials (wood, cork, paper, plastic, glass and others)	8	7	9	9

(Continued)

Table 1. (Continued)

Education and Training Areas	Recent dynamic of employment	Survey and Employment Offers	Interview/Focus Groups	Demand relevance
Construction	7	8	9	8
Dental studies	4	2	3	3
Health services (other)	6	4	6	6
Child care and youth services	4	2	6	5
Social work and counselling	4	4	8	6
Hotel, restaurants and catering	7	7	8	7
Tourism and leisure	5	4	7	6
Sports	5	4	5	5
Beauty services	6	3	2	4
Protection of persons and property	3	3	2	3
Occupational health and safety	7	3	4	5
Food science and technology	8	7	7	7
Mining and extraction	8	8	8	8
Transport services	8	8	9	8

Figure 4. Number of students in the 1st year of the VET courses in Leiria Region.

Source: <https://www.dgeec.mec.pt/>

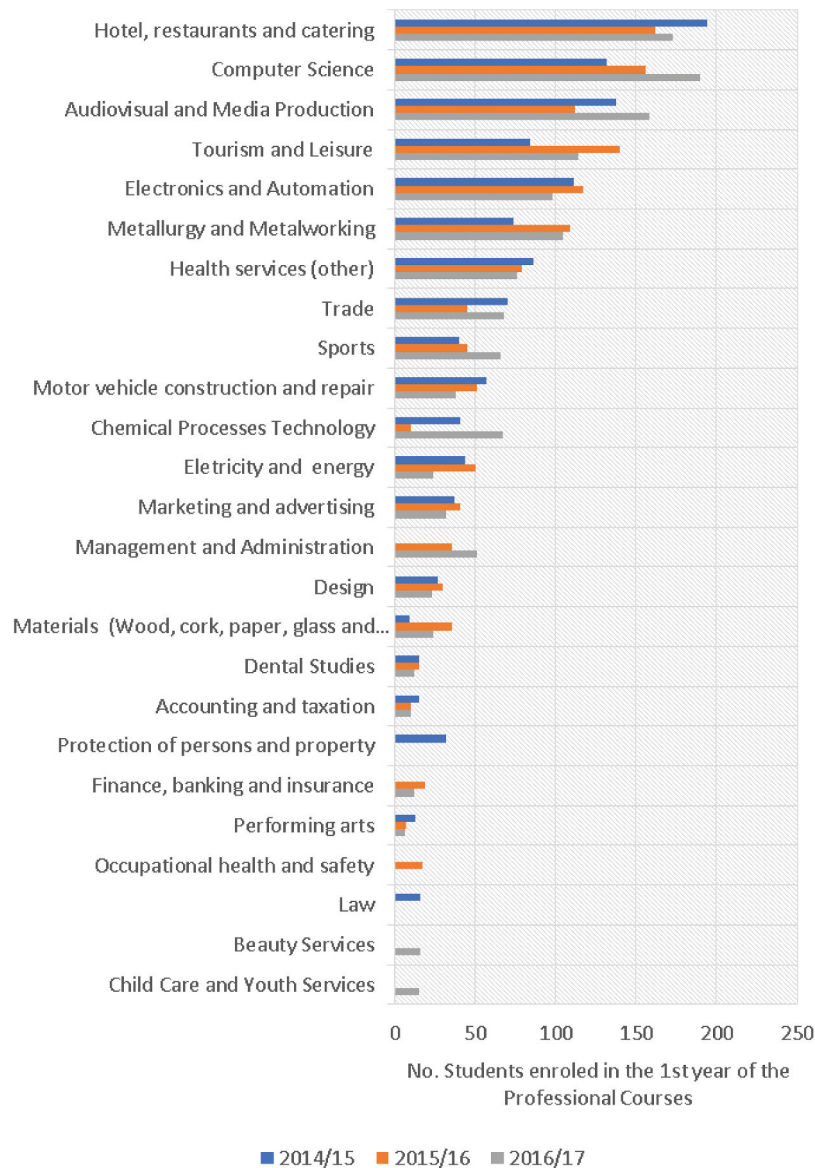


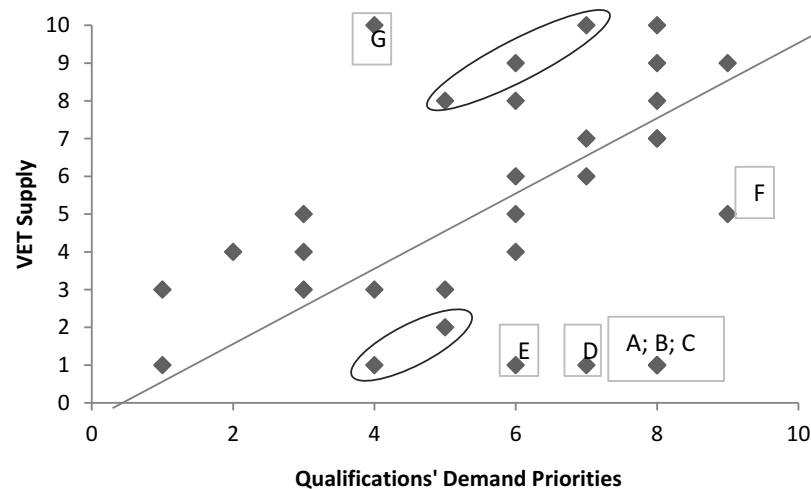
Figure 4 description: Number of students in the 1st year of the VET courses in Leiria Region. Courses with more students enrolled are in the areas of Hotel, restaurants and catering; Computer science and Audiovisual and media production.

6.7. Qualifications Mismatches

In this section, the qualification priorities resulting from the prediction on the demand (Table 1) are compared with the importance of each ETA in the VET supply of the region measured by a 10 points scale of relevance. The attribution of the scale for the VET supply was associated to intervals of the total number of students enrolled in the 1st year of the courses across three academic years, obtained by applying decile computation.

In Figure 5, demand relevance of each ETA is considered in the x axis and supply relevance in the y axis, with the bisector corresponding to a good match between demand and supply. ETA located above the bisector corresponds to a field with supply surplus and ETA below the bisector indicates

Figure 5. Demand and Supply of Qualifications – Mismatches.



that labour market demands in that field is higher than supply. The methodology used here is similar to the one used in Çidem et al. (2021). These authors calculated a match ratio (equals to skills demand over supply) where the unit value gives the same information than our bisector, a good match between supply and demand. Besides, a match ratio lower than unit corresponds to our “above the bisector” (supply surplus), and a match ratio greater than unit to “below the bisector” (demand surplus). However, besides the similarities, Figure 5 has the additional advantage of assessing the absolute importance of supply and demand of each ETA for the region, which is not taken into account in the match ratio. In fact, ETA that are bisector-coincident but closer to the origin corresponds to a reduced demand and supply, whereas those also bisector-coincident located furthest from the origin are very important for the region either in terms of demand and supply (in both cases the match ratio will be one).

Demand (x axis) and Supply (y axis) of Qualifications with courses closer to the bisector presenting a good match between demand and supply. One ETA is significantly above the bisector identifying a supply excess but 6 ETA are significantly below corresponding to a demand excess.

Of the 32 ETAs represented in Figure 5 (and in Table 1), 20 show a good adjustment between the supply and demand for qualifications. Among the 12 remain areas (corresponding to almost 39% of the total students enrolled), 8 reveals recent and future qualification need higher than the numbers of expected graduates in these ETA in the near future. The major mismatches are observed in Construction; Mining and extraction; Transport services; Social work and counselling; and Food science and technology (A, B, C, D and E, respectively, in Figure 5). In fact, these areas, although considered important for the region, are not provided by the education system of the Leiria region.

Additionally, a significant mismatch is also observed in case of the Materials area which is one of the two most important qualification areas in a demand perspective. This ETA is provided in the region, but its number of classes and students is clearly insufficient comparing to the region needs. For example, the 305 organizations that fulfil the survey (representing 10% of the region employment), shows an intention of recruiting more than 100 graduates in the Materials area for the next two years, whereas only 60 students had enrolled in this course in the two academic years. Textile, clothing, footwear and leather industries and child care and youth services also need a reinforcement in the courses offer, but in a smaller level.

With a significant number of students enrolled in courses of Audio-visual and media production (G in Figure 5); Hotel, restaurants and catering; Tourism and leisure and Sports, the supply of these qualifications (although important for the region) seems to be significantly higher than the region needs. This justifies a serious adjustment in this courses supply, especially in the case of Audio-visual and media production where the mismatch is more significant.

Çidem et al. (2021) concluded that the vocational fields with higher mismatches vary significantly between regions, which limits the comparison of our results, obtained for a particular Portuguese region, with the literature. This does not mean that our investigation is not applicable to other regions, but the application is more viable in terms of methodology than in terms of comparing results. Even though, it is possible to observe some similarities between our and Çidem et al. (2021) results: in both studies, audio-visual and media production have significant supply surplus and Materials, Mining and extraction and Food science and technology present higher market needs than the predicted graduates.

7. Discussion and Conclusions

The decline in the population of young individuals in Portugal, particularly in the Leiria region, raises a significant concern: the potential scarcity of future labour force, which could hinder the growth of companies and the region as a whole. Therefore, it is imperative to conduct a thorough analysis that identifies the present and future qualification needs, the mismatches between current qualification supply and demand, and proposes adjustments to the qualification system. Such an analysis is vital for regional development and constitutes the objective of our article. Indeed, stakeholders who participated in the study acknowledge the importance of VET in bolstering the regional economy and appreciate the disclosure of qualification areas deemed as priorities by employers. Furthermore, they regard this study as valuable information for schools to adjust VET supply and to inform students (and their parents) about the role of VET in enhancing employability and providing more appealing career paths.

To ascertain the professional qualification needs of the region, a survey was completed by employers, representing over 10% of regional employment. This sample constitutes a reliable depiction of the region's companies in terms of territorial distribution, sectorial distribution, number of employees, and turnover. The survey collected information on private sector recruitment intentions, enabling the identification of the most relevant ETA for the region's development. However, it is possible that some relevant areas may not be identified in the survey, particularly those associated with the public sector. To address this limitation, additional instruments were employed, such as analysing recent regional employment dynamics, job offers on online platforms, interviews with municipalities, and focus groups. By integrating these techniques, the main recruitment needs of both the private and public sectors can be identified, capturing all relevant ETA for the future of the Leiria labour market. Moreover, utilizing multiple quantitative and qualitative methodologies enables capitalizing on the strengths of each method, resulting in a more robust and reliable forecast of qualification needs.

A noteworthy finding of our research is that surveyed employers indicated their intention to recruit 1,266 workers with level 4 professional qualifications over the next two years. This figure is substantial, considering that in the Leiria region, 826 students were enrolled in these courses in 2018. This outcome underscores the significance of this type of education, the high employability of VET, and the necessity to reinforce these courses in the region.

The results obtained through various methodologies are generally consistent, indicating similar priorities. At the forefront of the region's needs are the areas of Metallurgy and Metalworking, and Materials. Metallurgy and Metalworking feature a high number of enrolled students in the region, signifying a suitable adjustment. In contrast, the number of students attending courses in the Materials field is lower than recruitment intentions, potentially warranting an increase in the number of classes for this ETA.

Other crucial ETA for fulfilling the region's qualification needs include Trade; Computer Science; Electronics and Automation; Chemical Processes Technology; Motor Vehicles Construction and Repair; Construction; Mining and Extraction; and Transport Services. For the first five ETA, supply is aligned with demand for each qualification. A high number of students in these classes may also reflect social recognition of the importance of these courses by students, their families, VET suppliers, and regulators. Conversely, Construction; Mining and Extraction; and Transport Services are not currently offered in the region, which, given their significance for regional development, justifies substantial investment in these ETA. Social Work and Counselling; Food Science and Technology; and Audio-Visual and Media Production also exhibit mismatches between demand and supply, with the former two necessitating reinforcement in supply and the latter requiring a reduction in the number of classes.

Several recommendations for educational policy have arisen from stakeholders' concerns regarding the VET process. Some of these suggestions emerged during the participatory process, which itself offers additional benefits. Firstly, substantial alterations to the NCQ framework, as well as the nomenclature and curricula of courses, are required to address the inadequacy and complexity of the VET offerings. Secondly, the Leiria Region Business Association (NERLEI) proposed establishing school factories or incorporating practical classes within companies. This approach would reduce the investment needed for equipment and technology by VET providers (which constitutes a constraint in specific ETA supply) and foster stronger connections with prospective employers. Thirdly, a well-defined strategy to enhance VET's appeal in Portugal and achieve parity within the educational system (50% VET students) is essential, necessitating the involvement of diverse stakeholders such as schools, the business community, municipalities, students, and their families.

Efforts to promote improved VET and its social recognition are already underway, as VET providers have recently been required to align with the European Quality Assurance Reference Framework. Additional initiatives that strengthen VET's public image as a means of obtaining secondary education certification while simultaneously enabling graduates to pursue further education have been implemented. However, further progress is still needed.

Companies should collaborate with educational institutions to conduct promotional activities, capturing students' interest by elucidating future qualification needs and outlining potential professional trajectories. Key arguments for such promotion include high demand for specific qualifications, professional opportunities, and the potential for student success. This promotion should primarily target the ETA of Materials; Social Work and Counselling; Food Science and Technology; Construction; Mining and Extraction; and Transport Services, with the latter three necessitating the development of corresponding courses. Lastly, the articulation and reinforcement of VET offerings in the identified areas are crucial, with the primary focus being on addressing the needs of the labour market.

The conclusions and policy recommendations presented herein should enhance the quality of VET supply, thereby contributing to reduced unemployment (particularly among younger individuals), mitigating demographic challenges, facilitating company expansion, and ultimately playing a pivotal role in regional development. Finally, our investigation contributes to skills mismatches literature by developing a framework for anticipating demand and supply, thereby measuring imbalances not based on those currently existing in the market but rather on predictions of those that may arise in the near future.

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Author details

Ana Sofia Lopes¹
E-mail: analopes@ipleiria.pt
ORCID ID: <http://orcid.org/0000-0003-0163-4833>
Isabel Rebelo²
Rui Santos^{3,4}
Rogério Costa²
Vitor Ferreira⁵

- ¹ CARME – Centre of Applied Research in Management and Economics, School of Technology and Management Polytechnic of Leiria, Leiria, Portugal.
- ² Mathematics and Natural Sciences, School of Education and Social Sciences Polytechnic of Leiria, Leiria, Portugal.
- ³ Mathematics, School of Technology and Management Polytechnic of Leiria, Leiria, Portugal.
- ⁴ CEAUL – Center of Statistics and Applications, University of Lisbon, Lisbon, Portugal.
- ⁵ CDRSP – Centre for Rapid and Sustainable Product Development, School of Technology and Management Polytechnic of Leiria, Leiria, Portugal.

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Notes

1. <https://www.cedefop.europa.eu/en/tools/skills-forecast>.
2. <https://www.cedefop.europa.eu/en/tools/matching-skills>.
3. <https://www.cedefop.europa.eu/en/themes/learning-anticipate-and-match-skills>.
4. Data from www.ine.pt (accessed 2022.02.18).
5. Private and public secondary and professional schools.
6. The National Qualification Framework is the 8-level reference tool for classifying the qualifications produced in the national educational system (Ordinance No.782/2009, of July 23 https://dre.pt/dre/detalhe/por-taria/782-2009-493227?_ts=1680739200034), which adopts the descriptors of the European Qualifications Framework by Recommendation of the Council (2017/C 189/03).
7. Data from <https://www.dgeec.mec.pt/> (accessed 2021.05.20).

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