A Regional Forecasting Tool to Estimate the Horizontal Mismatch Between VET Supply and Labour Market Demand 2022 - 2030

Albizu Echevarria, Mikel
mikel.albizu@orkestra.deusto.es, Orkestra–Basque Institute of Competitiveness, University of Deusto

Gamboa, Juan P.
juan.gamboa@orkestra.deusto.es, Orkestra–Basque Institute of Competitiveness, University of Deusto

Moso Díez, Mónica
moso.monica@gmail.com, Dualiza Foundation

Monaca-Soto, Antonio
amondacas@gmail.com, Dualiza Foundation

Abstract

Context: The demand for workers in the labour market is changing, and due to that, there is, therefore, a particular need to develop systems for forecasting labour demand. To this end, Cedefop has developed a tool that provides comprehensive estimates of labour market trends up to 2030 in all EU Member States. Importantly, this tool has two improvement areas. Firstly, its estimates are not directly linked to the system of skills provision, including initial Vocational Education and Training (IVET), and, secondly, the results are not at the regional level, which offers a particularly appropriate scenario for analysing the dynamics generated between human capital and development.
Approach: the main contribution of the article is the development of a new methodology, based on Cedefop's Spanish estimates, for estimating the degree of horizontal mismatch between the number of graduates with IVET studies by fields of knowledge per Spanish region and the number of job opportunities by economic sector (NACE code letter) between 2022 and 2030.
Findings: The horizontal mismatch in the construction sector is very pronounced. This is also the case for agriculture and fishing, and manufacturing. The services sector is balanced.
Conclusion: Technical occupations will continue to be relevant in the current and future labour market, although these occupations will likely undergo intrinsic changes. One of these changes should be directed towards the supply of the labour market with people trained in different fields of knowledge.

Keyword: horizontal mismatch, forecasting tool, IVET supply, regional development

1   Context

The demand for workers in the labour market is changing, as it can be evidenced with the vast amount of literature around this topic published during the last two decades. We are in a time of ambiguity and questioning as a result of the integration of different megatrends: digital, green and demographic (Naisbitt & Bisesi, 1983; Opik et al., 2018). There is, therefore, a particular need to develop systems for forecasting labour demand. Matching skills, supply and

demand is crucial for the development of education, economic development and inclusion policies in times of uncertainty.

To this end, Cedefop has developed a tool that provides comprehensive estimates of labour market trends up to 2030[1] in all EU Member States. This tool has two improvement areas. Firstly, its estimates are not directly linked to the system of skills provision, including Initial Vocational Education and Training (IVET). IVET is of particular interest because of its strategic importance for industrial development and employment (Lund & Karlsen, 2020; Spöttl & Windelband, 2021). This importance is greater in some countries (Germany, Denmark, Austria) with a high share of the labour force with post-secondary vocational education (OECD, 2010; Pusterla & Renold, 2022)

Similarly, it provides data at the national level, and as Alfred Marshall (1920) has explained, the concentration of economic activity, innovation and economic performance in certain places is mainly understood in terms of their local labour markets and localised processes of labour force development. In this respect, the regional level offers a particularly appropriate scenario for analysing the dynamics generated between human capital and development (Canal Dominguez, 2021) and to deliver an effective local policy (Sevinc et al., 2020). Other authors have also highlighted the relevance of technical profiles linked to IVET (ILO, 2012) as conducive to regional development (Retegi & Navarro, 2018; Teslenko et al., 2021; Toner & Woolley, 2016). Finally, within the same country, at the regional level, there may be significant differences between VET systems, both in terms of supply and demand for VET workers (Kleinert et al., 2018; Moso-Diez et al., 2022; Schuster & Margarian, 2021; Weßling et al., 2015).

For all the above reasons, the main contribution of the article is the development of a new methodology for estimating the degree of horizontal mismatch between the number of graduates with IVET studies by fields of knowledge per Spanish region between 2022 and 2030 and the number of job opportunities by economic sector (NACE code letter) in the same period of time associated to these IVET professional field. This type of mismatch, known as 'horizontal mismatch' (Robst, 2007), occurs when a worker's job is not related to his or her field of study. This type of mismatch is also known as 'field of study mismatch' and allows us to know whether VET fields of study are properly aligned with labour market demands at the regional level. Among other things, the proper matching of supply and demand in the labour market can increase the productivity of firms, because when individuals are well matched to their occupations, the knowledge and skills acquired through education are optimally used in the labour market (Somers et al., 2019).

This tool is built based on Cedefop estimates and the Spanish Labour Force Survey, two accessible sources that would allow it to be replicated and improved for the rest of the regions in all EU-27 countries.

2 Approach: Methodology, Methods, Research Instruments or Sources Used

The main contributions of the new methodology presented in this article are:
- To estimate the number of IVET-related job opportunities to be created from 2022 to 2030
- To link IVET-related job opportunities to the education system by calculating the horizontal mismatch for the same period
- To develop a forecasting tool that could be replicated into other regions within the EU-27

To this end, a forecasting tool has been developed, and it has 5 stages.

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[1]   In April 2023, Cedefop updated its estimates. They now range from 2022 to 2035.

2.1 Estimation of the net change of employment between 2022-2030 in the Spanish regions.

First, the Cedefop Skills Forecast model is used to calculate the Spanish sectoral inter-annual rate of change in employment from 2022-2030. These estimates are then applied to the 2021 Labour Force Survey (LFS) results for the Spanish regions by economic activity (NACE code letters).

2.2 Estimation of the global amount of job opportunities (expansion/contraction and replacement) at a regional level

Cedefop's estimates make it feasible to distinguish between the job opportunities created each year in a given labour market as a result of two main sources:

- On the one hand, by 2030, some economic sectors will employ more people globally (expanding), while others will employ fewer (contracting).
- In parallel, other job opportunities will be created by replacing existing workers who leave the labour market (due to retirement, disability, etc). Cedefop has calculated the total number of replacement job opportunities by economic sectors at the national level between 2018 and 2030. Due to that, we take the national average for the period by sector to adjust it to the regional level. In this regard, there are considerable regional differences in employment by age in Spain. In some regions, the working population is characterised by a high degree of ageing (e.g. Asturias, Basque Country, Castilla y León). To carry out this operation, Spanish social security data were used to calculate the percentage of people aged over 55 for each region and sector. On the basis of this calculation, the national average was corrected and adjusted to the regional level.

Finally, in this stage, the annual average replacement job opportunities by sector are added to the annual expansion/contraction opportunities. The final result can be considered as the total job opportunities.

3 Allocation of job opportunities to IVET

In order to estimate the employment opportunities attributable to VET, we have taken as a reference the evolution of the percentage of the employed population with intermediate and advanced VET studies in each sector (CNAE letter) from 2014 to 2021. On this basis, the evolution of the percentage of the employed population with VET studies in the employment of each sector from 2022 to 2030 has been estimated using the method of least squares. These percentages were then applied to the total employment opportunities for the same period to obtain the absolute and gross number of opportunities attributable to VET.

A positive adjustment factor has been applied to gross employment opportunities to take account of the potential impact of the exceptional event of the entry into effect of the ground-breaking Organic Law on the Organisation and Integration of Vocational Training. This law will lead to a transformation of the system, among other things through a greater allocation of resources, which will be reflected in an increase in the number of training places offered. This is expected to increase the number of IVET graduates who will eventually be effectively integrated into the labour market and, as a result, increase the weight of IVET in the working population.

The mechanism by which the VET Act is expected to affect the number of IVET graduates is based on the assumption that the Act will bring Spain closer to the EU-14 as a whole in terms of the percentage of VET graduates out of the total number of post-compulsory graduates (excluding Masters and PhDs). The EU-14 has been chosen as a reference, as it is made up of the most advanced countries in the EU in terms of education and is more comparable to Spain.

These countries have education systems with an occupational structure in which the weight of vocational training is higher.

The adjustment factor has been calculated as the average difference in percentage points between 2016 and 2020 between the number of graduates in IVET (ISCED 35, 45 and 554) and the number of graduates in post-compulsory education (up to university level: ISCED 3-6) aged 15-29 for the EU-14 as a whole and for Spain.

The average of the resulting five-year gap, calculated on the basis of Eurostat data, is 4.5 points. The Organic Law on VET is therefore expected to reduce this gap between Spain and the EU-14 from 2026 onwards, when its effects are expected to be noticed. Thus, a cumulative growth of 4.5 points has been applied to the percentage of employment opportunities for VET between 2026 and 2030. This positive average has been applied to all sectors using the cumulative rate of change.

4 Connection between each economic sector to the IVET fields of knowledge

In Spain, the VET system is divided among 26 different fields of knowledge as it can be seen in the (Table 1). The fields of knowledge, also known as professional branches, are the set of qualifications into which the Spanish National System for Qualifications and Vocational Education and Training are structured. The four main economic sectors (Table 1) can be linked to IVET fields of knowledge using a correspondence table elaborated by the Spanish Employment Public Service (known as SEPE in Spain).

Table 1
Sectoral linking of Spanish IVET fields of knowledge

Sector	VET fields of knowledge
Agriculture, fisheries, mining and energy	Agriculture
	Energy and Water
	Maritime and Fishing Industry
	Extraction Industry
Manufacturing	Electricity and Electronics
	Mechanical Manufacturing
	Food Industry
	Installation and Maintenance
	Wood, Furniture and Cork
	Chemistry
	Security and Environment
	Textiles, Clothing Industry and Leather
	Glass and Ceramics
Construction	Construction and Civil work
Services	Physical and Sports Activity
	Administration and Management
	Graphic Arts
	Arts and Crafts
	Trade and Marketing
	Hospitality and tourism
	Personal Image
	Image and Sound
	Information and Communication Technology
	Health
	Sociocultural and Community Services
	Transport and Vehicles Maintenance

5   Estimation of the IVET job opportunities by professional fields and the estimation of horizontal mismatch

The annual IVET job opportunities by main sector are crossed with the number of graduates that are effectively entering into the labour market linked in 2022 for each related field of knowledge (Table 1). At this point it is important to emphasise that not all IVET graduates enter the labour market after completing their studies. Some of them continue their studies at a higher level of VET or at university. For this reason, we have corrected this figure using data from the Spanish Survey on the Transition from Education to Work (known as ETEFIL). According to this, 63% of the annual IVET graduates enter the labour market.

Table 2
Methodological stages to calculate the regional horizontal mismatch

	Name of the Stage	Source(s)
1	Estimation of the net variation of employment between 2022-2030	-Cedefop Skills Forecast -Spanish LFS microdata
2	Estimation of the replacement opportunities between 2022-2030	-Cedefop Skills Forecast -Spanish LFS microdata -Social Security Data
3	Allocation of the job opportunities to IVET	-LFS
4	Connection between each economic sector to the IVET knowledge fields	-SEPE
5	Estimation of the IVET job opportunities by field of knowledge and horizontal mismatch	-LFS -ETEFIL

6   Findings

The results obtained for one of the Spanish regions, namely Andalusia, are shown below. This is because space limitations do not allow us to show the data for each of the 17 regions. In any case, the methodology applied and the data obtained would be similar for each of the Spanish regions.

Between 2022 and 2030, a total of 1,231,921 job opportunities will be created in Andalusia, 87% of which will be replacement opportunities. On the other hand, of the 20 sectors analysed (Table 3), 5 will suffer a total contraction in employment (NACE A, C, H, Q and S). However, these will generate job opportunities as a result of the large number of replacement opportunities that will arise in all sectors. On the contrary, the sectors in which proportionally the highest percentage of opportunities will be generated by expansion will be the NACE: P, J, K and F.

Table 3
Total and IVET job opportunities by sector (NACE letter)

ANDALUSIA (Job opportunities 22-30)	TOTAL Job Opportunities	EXPANSIÓN/CONTRACCION Job Opportunities	REPLACEMENT Job Opportunities	% EXP/CON	% REPL	IVET Job Opportunities	IVET /TOTAL Job opportunities
A: Agriculture, forestry and fishing	38.449	- 52.079	90.528	-135%	235%	7.366	19%
B: Mining and quarrying	460	- 928	1.388	-202%	302%	102	22%
C: Manufacturing	59.730	- 17.602	77.332	-29%	129%	21.602	36%
D: Electricity, gas, steam and air-conditioning supply	5.384	811	4.573	15%	85%	1.590	30%
E: Water supply, sewerage, waste management and remediation	8.751	1.509	7.242	17%	83%	2.490	28%
F: Construction	106.666	38.414	68.252	36%	64%	24.516	23%
G: Wholesale and retail trade, repair of motor vehicles and motorcycles	216.554	55.548	161.006	26%	74%	66.217	31%
H: Transportation and storage	46.368	- 1.597	47.965	-3%	103%	12.552	27%
I: Accommodation and food service activities	121.896	18.821	103.076	15%	85%	24.475	20%
J: Information and communication	25.499	9.857	15.642	39%	61%	7.484	29%
K: Financial and insurance activities	28.548	10.370	18.179	36%	64%	4.567	16%
L: Real estate activities	10.140	2.982	7.158	29%	71%	2.553	25%
M: Professional, scientific and technical activities	43.084	1.932	41.152	4%	96%	7.524	17%
N: Administrative and support service activities	80.887	26.700	54.187	33%	67%	18.725	23%
O: Public administration and defense, compulsory social security	132.351	21.829	110.522	16%	84%	28.978	22%
P: Education	111.204	45.561	65.643	41%	59%	10.472	9%
Q: Human health and social work activities	100.140	- 12.326	112.466	-12%	112%	34.153	34%
R: Arts, entertainment and recreation	24.260	3.213	21.047	13%	87%	6.237	26%
S: Other services	21.865	- 5.465	27.330	-25%	125%	16.167	74%
T: Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	49.684	12.262	37.422	25%	75%	5.527	11%
Total	1.231.921	159.811	1.072.110	13%	87%	303.299	25%

Of the total number of job opportunities offered to the entire working population of Andalusia, more than 300,000 will correspond to people with IVET studies, which would represent slightly less than 25% of the total number of opportunities. It can be seen that in some sectors the percentage of job opportunities for people with IVET studies is higher than in others. This is particularly the case in sectors NACE C, J and Q.

Table 4
Horizontal mismatch estimation by main sectors

ANDALUSIA	TOTAL IVET Job Opportunities	ANNUAL IVET Job Opportunities	TOTAL IVET GRADU-ATES	WORKING IVET GRADU-ATES	HORIZON-TAL MISS-MATCH	% IVET op-portunities/ IVET gradu-ates working
Agriculture, fish-eries, mining and energy	7.366	818	1.663	1.131	313	28%
Manufacturing	25.784	2.865	5.027	3.418	553	16%
Construction	24.516	2.724	328	223	-2.501	-1122%
Services	245.631	27.292	38.507	26.185	-1.107	-4%
Total	303.297	33.699	45.525	30.957	-2.742	-9%

Calculating the horizontal mismatch within the labour market (Table 4), it can be seen that in Andalusia the system graduates around 45,000 people per year. Of these, 31,000 end up actually working, as many IVET graduates continue their studies either within the VET system itself or in higher education. Of the total number of graduates, the system provides the labour market with an annual surplus of 28% in the agricultural sector and 16% in the manufacturing sector. On the other hand, the deficit of people trained for the service sector is 4%, while for the construction sector the annual deficit is enormous, reaching 1122%, i.e. for every 2,724 job opportunities per year, the system graduates 223 people who effectively enter the labour market.

7   Conclusions

Today, in view of the profound changes caused by the megatrends, (digitalisation, polari-sation of the labour market, hollowing out...), it seems very pertinent to translate Cedefop's calculations to the regional level and to link them to the training system to promote public policies related to education, among other things. As the literature has shown, an adequate match between the training system and labour market demand is essential to promote economic growth, innovation and social cohesion. In order to do this properly, it is necessary to carry out the analysis from a regional perspective, since in Spain, for example, training systems and the productive fabric differ considerably at regional level. This may be essential for any level of training, but it is even more relevant for VET, whose educational purpose, as Billett (2011) points out, is mainly focused on identifying the knowledge necessary for the effective perfor-mance of an occupation.

In this sense, the results for the region of Andalusia show that there is a horizontal mis-match of different magnitudes in all sectors. The sector that seems to be the most adjusted is the services sector, where the education system should provide the labour market with 4% more people per year with studies related to it. This sector is the most relevant in terms of employ-ment and, therefore, the one that will create the most job opportunities until 2030, so, in general, the level of mismatch does not seem particularly high. However, the remaining sectors, alt-hough employing a smaller number of workers, show higher levels of mismatch: the fields of knowledge that naturally feed the agricultural sector bring 28% more people into the labour market than they should ideally do, which may lead some of these people to end up in sectors that are unsuitable for the type of training they have received. In the case of the manufacturing sector, the same percentage would reach 16%. In the construction sector, the difference is very significant, reaching 1122%. This means that while there are 2,724 job openings per year, there are 223 people with sector-specific training entering in the sector. This, as in the agricultural sector, is likely to lead to a tendency to recruit people with other training and other low levels

of education, thus stimulating the low-skill traps that have always been closely linked to the construction sector in Spain. In any case, it is evident that in line with the arguments of Brown (2020) and Autor (2015), technical occupations will continue to be very relevant in the current and future labour market, although these occupations are likely to undergone intrinsic changes.

Likewise, it is necessary to highlight a number of limitations which, in our opinion, could improve the tool when applied to other territories. Firstly, it is based on large sectors. For example, in the case of the services sector, which has a considerable diversity of activities, more adjusted estimates could be developed to these subsectors. At the same time, the fields of knowledge selected and linked to economic activities correspond to an ideal scenario, i.e. not all people graduating in this field of knowledge are necessarily linked to the sector associated with their training. Nevertheless, we consider the tool to be very valuable because of its adaptability to other regions in which these improvements can be developed.

Finally, the tool has been designed to be replicated and refined by other scholars in other European regions. The two main statistical sources on which it is based are the LFS and the estimates developed by Cedefop, both of which are accessible at European level. Indeed, Cedefop's estimates were updated in April 2023 and now cover the period up to 2035. The scope of the application of these estimates is also broad, as they can be used to measure the level of horizontal mismatch but also, for instance, to guide reskilling strategies through continuing vocational training. To do this, it is necessary to combine this type of estimation with a more specific knowledge of the transformations undergone by the different occupations associated with VET. Another analytical derivation of the present tool of particular interest which has not been explored in depth is directly related to replacement opportunities. Currently, in view of the ageing of the population in many regions of Europe, it would be highly pertinent to develop analytical tools to establish the extent to which the skills supply system is capable of supplying people workforce to the labour market on an annual basis compared to those who need to be replaced.

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Biographical notes

Mikel Albizu Echevarria is a pre-doctoral researcher at Orkestra-Basque Institute of Competitiveness, fully involved in creation of the Spanish VET Observatory. His main research lines are related to job creation in local economies and the role of VET within it.

Dr Juan Pablo Gamboa-Navarro is researcher at Orkestra-Basque Institute of Competitiveness. He leads the research line on VET and the scientific development of the Spanish VET Observatory. Other fields of interest for him are employability and career development.

Dr Mónica Moso-Diez is the Head and Principal Investigator of the R&D Centre of a privat non-profit foundation (CaixaBank Dualiza), Spain. Main topics are related to VET system as an innovation ecosystem and sustainability, and VET indicators (Spanish VET Observatory).

Antonio Mondaca-Soto is a Senior Researcher in the R&D unit of a private non-profit foundation, Spain. His research interests focus on quantitative methodologies and statistical analysis on VET, highlighting the Spanish VET Observatory (www.observatoriofp.com).