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Determinants of overlapping mismatch in the Turkish labour market

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Abstract

Using a micro dataset from labour force survey of Turkey and employing a multinomial logistic regression, this paper examines the determinants of mere overeducation, mere field of study mismatch and full-mismatch (who are both overeducated and field of study mismatched simultaneously). The target group consists of full-time wage-based employees who graduated from higher education and are aged 20–65. The determinants of mismatch are analysed under four variable groups which are labour market context, demography, field of study and job-specific characteristics. In line with the earlier empirical evidence, we find that the unfavourable economic conditions at the time of entry into the labour market might affect the behavioural pattern of individuals while searching for a matching job. Moreover, the sharp increase in university graduates increased further the fierce competition for the limited jobs available in the labour market, and resulted in a high likelihood of mismatch especially for the recent graduates. In sum, the estimation results yield that any mismatch category is responsive to those determinants where fully-mismatched employees are more responsive. Hence, we propose that the policy implications should better focus on the full-mismatch category.

Keywords Field of study mismatch, Horizontal mismatch, Vertical mismatch, Overeducation, Overlapping mismatch, Labour market, Higher education, Turkey

JEL Classification Codes, J21, J23, J24

1 Introduction

Vertical mismatch and field of study mismatch (horizontal mismatch) are two common forms of mismatch between the education system and the labour market. Vertical mismatch happens when the acquired level of education differs from the level required for a job. Field of study mismatch occurs when the type or field of education is unrelated to the field required for doing the job well (Hartog 2000; McGuinnes 2006; Robst 2007; Nordin et al. 2010; Leuven and Oosterbeek 2011; Quintini 2011; Domadenik, Farcnik and Pastore 2013; Montt 2015; Shahidan and Ismail 2021).

This paper focuses on determinants of overlapping mismatch of vertical mismatch and field of study mismatch. We derive four categories of mismatch. These are mere overeducation (well-match by field of study but overeducated), mere field of study mismatch (vertically well-match but mismatch by field), full-mismatch (the ones who are both simultaneously overeducated and mismatched by field of study) and well-match (Verhaest et al. 2017; Montt 2017; Ege and Erdil 2023).

The empirical studies suggest that the increased supply of university graduates within many countries for the last decades caused a quantitative imbalance between the demand for and supply of labour force which, in turn, was the main driver for the field of study mismatch and/

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Table 1 Share of Employment by ISCO-08 Occupation Codes, Turkey, 2014–2018, %

	VTHS		HE	
	2014	2018	2014	2018
1-Managers	7.4	7.0	67.6	72.6
2-Professionals	5.2	4.5	91.6	92.4
3-Technicians&associate profes	25.2	22.1	44.6	51.8
4-Clerical support workers	18.5	16.9	41.7	46.3
5-Service and sales workers	13.0	14.2	13.4	16.9
6-Skilled agriculture, forestry	3.5	5.6	1.6	2.1
7-Craft &related trades	13.4	15.0	3.5	5.5
8-Plant&machine operators	12.2	14.3	3.2	3.9
9-Elementary occupations	7.5	9.1	2.1	2.8
Country Average	**12.0**	**12.6**	**26.1**	**29.5**

Bold values indicate the total share of employment for VTHS and HE, regardless of occupation codes

VTHS Vocational and Technical High Schools, *HE* Higher Education. Share of employment is presented for only the VTHS and HE. For example, for managers in 2018, 100–72.6–7.0 = 20.4% corresponds to the other levels of education.
Source: Own construction

or vertical mismatch (Wolbers 2003; Montt 2015; Verhaest et al. 2017; Sellami et al. 2018; Somers et al. 2019).

In line with those countries, Turkey has also been implementing an expansion policy in higher education since 2006. This policy action can be considered a rational step to increase the education level of the population, reduce interregional migration and foster the whole development process (Ministry of Development 2017). For example, the share of the population with higher education within the 25–34 age group in Turkey increased by 24.4 percentage points between 2000 and 2018, which is significantly more than the OECD average of 17.9 points (OECD 2020). For the other side of the effects of this expansion, we found two key preliminary findings which might be considered initial signals of a quantitative imbalance between the demand and supply sides. First, the number of university graduates potentially entering into the labour market increased sharply by 3.4 times from 322,000 in 2005 to 1,100,000 in 2020, which in turn increases further the fierce competition for the limited jobs available in the labour market. Second, as Table 1 indicates, (i) the share of employment of higher educated graduates in all occupation codes increases (on the average, it increases from 26.1% to 29.5%) and (ii) the share of employment of vocational and technical high schools decreases in occupation codes 1–4 but increases in occupation codes 5–9 (on the average, it increases from 12.0% to 12.6%, it seems that there is a shift of employment from higher levels of occupation codes to lower ones). ILO (2012) defines the association between the education level and ISCO-08 occupation codes in such a way that the education level of ISCO-08 occupation codes decreases as we move from occupation code 1 to code 9. Accordingly, these findings might imply that more university graduates start to work in jobs which require low level of education and that some high school graduates lose their jobs in occupation codes 1–4 and start to work in occupation codes 5–9.

Moreover, in parallel with the sharp expansion in higher education, the mismatch literature has been growing among the researchers and policy makers in Turkey for the recent years. However, there are only 15 studies that cover vertical mismatch and field of study mismatch on Turkey (Ege and Erdil 2023), and it appears that the mismatch literature is still very limited.

As a result, we contribute to the mismatch literature on Turkey in such a way that this paper is the first study that estimates and examines the determinants of overlapping mismatch for Turkey.

The remainder of the paper is structured as follows. The next section presents a brief theoretical framework. In section three, we describe the data and present how to measure mismatch and estimate determinants of overlapping mismatch. The fourth section provides and discusses the main findings. Finally, we present the conclusions.

2 Theoretical framework in brief

The labor market theories differ in explaining the mechanisms by which educated individuals are allocated to jobs. Hartog (2000) uses human capital, job-competition and assignment theories to frame vertical mismatch and the relationship with the wages. Montt (2015) states that this framework can be applied to field of study mismatch.

Human capital theory states that productivity is a function of the human capital level of an individual acquired through education, on-the-job training or experience, and that the workers are paid according to their marginal product (Becker 1964). In other words, employers make hiring decisions, and set wages based on the assumption that individuals who have more years of education are more productive. Hence, human capital theory is a supply-side theory and claims that with their investment in human capital, individuals are able to compete for the best job. On the other hand, job competition theory is a demand-side approach in which the wages are determined primarily by job characteristics but not individual productivity (Thurow 1975). Finally, the assignment theory is a mixture of human capital theory and job competition theory. Sattinger (1993) states that wage depend on characteristics of both the workers and the jobs. Similar to the job competition model, assignment

theory assumes that the jobs available in the economy are limited, and that remuneration is job-specific and independent of the human capital endowment of the individual. Similar to the human capital theory, assignment theory states that wages are bound to be influenced by the human capital level of individuals (Caroleo and Pastore 2015). Hence, for a particular job, certain workers will have more advantages (as a result of their general and job/field-specific skills acquired in formal training) than others, but these jobs may or may not be available to them, possibly pushing them to choose other jobs instead (Kim et al. 2016).

3 Data, methodology and limitations

3.1 Data

This study is based on micro dataset from TURKSTAT labour force survey of 2016. We focus on full-time wage-based employees who graduated from higher education and are aged between 20[1] and 65. Further, since the determinants of mismatch are examined under four mismatch category, the data sufficiency problem arose for at least one mismatch category. Accordingly, we made two additional data exclusion. First, we exclude non-governmental organization (NGO) from the employment sector and concentrate only on the government and private sectors. Second, to examine the effect of labour market conditions in the year of labour market entry, we focus on the survey variable called "starting year of current job" which covers the years from 1970 to 2016. The starting years in between 1970 and 1991 and 1992–2016 constitute 10% and 90%, respectively. Hence, we further reduce the data by excluding the "starting year of current job" which is less than 1992 to eliminate the data insufficiency problem. As a result, the total sample size consists of 24,457 employees.

3.2 Measuring mismatch

In order to estimate the determinants of overlapping mismatch, first, we measure field of study mismatch and vertical mismatch and then derive their overlapping mismatches.

3.2.1 Measuring field of study mismatch

We measure field of study mismatch by relying on the coding scheme (see Table 5 in the Appendix), a type of job analysis method. Coding scheme is a matrix which has two dimensions. The first dimension is field of study that is based on Fields of Education and Training-1999 (FOET-99) classification. The second dimension is occupations that are based on the International Standard Classification of Occupations (ISCO) codes. The coding scheme shows the occupation codes in which any employee who graduated from a particular field of study can work as well-match. Hence, an employee is mismatched if her field of study does not match the corresponding occupation codes.

3.2.2 Measuring vertical mismatch

Vertical mismatch is measured by employing the mean method, a type of realized-matches method. An employee is overeducated (undereducated) if her actual attained[2] year of education is above (below) one standard deviation from the mean years of education in her ISCO-08 occupation code at one-digit level.

3.2.3 Measuring overlapping mismatch

We derive four categories of mismatch following Verhaest et al. (2017) and Montt (2017). The first one is the mere vertical mismatch which includes the ones who are mismatched only vertically but not by field of study. The next category is the mere field of study mismatch which covers the employees who are mismatched only by field of study but not vertically. The third category is the full-mismatch. This group consists of both vertically and field of study mismatched employees at the same time. The last category is the well-matched employees who are not mismatched by any category. On the other side, the undereducated employees are grouped as well-match to simplify the analysis following Verhaest Verhaest et al. (2017). Hence, under overlapping mismatch context, vertical mismatch corresponds to overeducation only.

3.3 Data limitation

We have two types of data limitation while measuring field of study mismatch. First, we were able to use 2016 data at the latest because the education dimension of the coding scheme (matrix) is based on FOET-99 classification which was used in labour force surveys between 2009 and 2016. For the second limitation, the original coding scheme uses three-digit ISCO-08 occupation codes. However, three-digit codes are not available in TURKSTAT labour force surveys. Therefore, following Ege and Erdil (2023), our coding scheme is developed (see Table 5 in the Appendix) by aggregating three-digit

[1] In Turkey, the official completion age of high school is 18, and higher education consists of two year associate degree and four to six years of bachelor's degree education. Hence, we assume that a high school graduate attends an associate degree at the age of 18 and completes it at the age of 20.

[2] The attained level of education is transformed into years of education as follows: 19 years for 5–6 years of higher education, master's degree, doctorate degree; 16 years for 2–4 years of higher education; 12 years for high school level; 8 years for lower secondary education or 8 years of primary education; 5 years for primary education level (5 years); zero for those who did not complete any completion.

codes into two-digit ones which is based on Montt's (2015) coding strategy.

3.4 Estimation and model specification

We estimate the determinants of mismatch by employing a multinomial logistic regression. The model specification is as follows:

$Y_i = \beta_0 + \beta_1 Xi + \beta_2 Yi + \beta_3 Zi + \beta_4 Wi + U$ where.

The dependent variable, Y_i is the mismatch category which has four categories. These are mere overeducated, mere field of study mismatch, full (joint) mismatch where full-match is the reference category. The independent variables X, Y, Z and W are the vectors of labour market conditions, field of study, demography and job-specific characteristics, respectively. Table 2 presents the distribution of data with respect to key variables.

4 Results and discussion

Table 3 displays the beta coefficients of the multinomial logistic regression. The estimation results are presented under four variable groups.

4.1 Labour market context

We find that the likelihood of mere overeducation and full mismatch increases as the unemployment rate increases. The effect on mere field of study mismatch is found to be insignificant. For the effect of growth rate of GDP per capita, we find that the full-mismatch decreases as the growth rate increases. The effects on mere overeducation and mere field of study mismatch are found to be statistically insignificant.

The estimation results regarding labour market conditions corroborate the earlier empirical evidence and are similar to those in Wolbers (2003) and Hensen, de Vries and Cörvers (2009) who both found that a high unemployment rate in the year of labour market entry increases the likelihood of field of study mismatch. Moreover, McGuinnes et al. (2017) found that likelihood of overeducation decreases as GDP per capita increases. Furthermore, Croce and Ghignoni (2012) examined the effect of business cycle (economic recession/expansion) in the year of labour market entry, and found that countries that are in the economic recession have a higher likelihood of overeducation. Later, Verhaest et al. (2017) found similar correlation between the business cycle and mismatch not only for overeducation but also for overlapping mismatch. Additionally, Rehman et al. (2021) stated that the mismatch between the education system and the labour market reduces the achievable level of growth through various mechanisms, and growth is expected to have a strong and inverse relationship with educational mismatch.

4.2 Demographic characteristics

In contrast to majority of earlier empirical evidence, we find that females are less likely to be mismatched by any category than males. This finding can be explained by the fact that the employment/population ratio for women in Turkey is 26.3 as of 2020 and is far below the OECD average of 47.9 (OECD 2023). Moreover, we find that 20–29 age-group is less likely to be merely overeducated. Considering the fact that our target group is only the higher education, when compared to 20–29 age-group, it is reasonable that the elder employees might have already completed their graduate study that results in overeducation. For the mere field of study mismatch, those younger employees (20–29 age group) are found to be less likely to be mismatched than the elder ones. This finding is in parallel with Wolbers (2003) and Montt (2015) who stated that the career moves of the elder employees depend more on their past experience than their formal education. However, when it comes to fully mismatch (joint mismatch by overeducation and field of study mismatch), we find that those younger employees (20–29 age-group) are more likely to be fully-mismatched.

These results can be explained by combining Table 1 (presented earlier in the Introduction section), Table 3 and Table 4 (which presents the distribution of overlapping mismatch by occupation codes[3]). It is clear that more than 70.0% of the employees in occupation codes 2–4 are fully well-matched implying that there is better fit in terms of both level and type of education. However, the occupation codes 5–9 are all mismatched by any category with high level of full-mismatch. For those occupation codes, we can infer that some of the higher-educated graduates cannot find appropriate jobs that match their field and education level, and start to work in the high school level positions or even displace the current high school level employees from their jobs. Similarly, some of the graduates from high school level move to lower-level occupations.

4.3 Field of study

Following Verhaest et al. (2017) who used the engineering field as the reference category, we hypothesize that graduates from the STEM field would have the lowest likelihood in any mismatch category. However, we find almost a totally different picture. For the fully-mismatched employees, there are only two fields of study (namely "humanities, languages, arts" and "agriculture, veterinary") which have higher incidence of mismatch than STEM. Three fields of study have a lower likelihood of full mismatch than STEM. For mere overeducation,

[3] ILO (2012) defines the association between the education level and ISCO-08 occupation codes in a way that the education level of ISCO-08 occupation codes decreases as we move from occupation code 1 to code 9.

Table 2 Distribution of Data Used in Model Specification

	Full Match	Mere Over-educated	Mere Field of Study Mismatch	Full Mismatch	Total
Total	**14,239**	**4111**	**3197**	**2910**	**24,457**
Gender					
Male	7729	2725	2208	2367	15,029
Female	6510	1386	989	543	9428
Age group					
20–29 age	4601	1284	946	1040	7871
30–44 age	8149	2351	1829	1627	13,956
45–65 age	1489	476	422	243	2630
Marital status					
Married	9452	2683	2225	1862	16,222
Single	4400	1306	889	976	7571
Divorced	387	122	83	72	664
Field of study					
STEM	2473	1132	1401	699	5705
Teacher training and education	2837	237	651	304	4029
Humanities, languages, arts	975	152	384	260	1771
Social Sci., business, law	6128	1233	303	1383	9047
Agriculture, veterinary	377	135	201	133	846
Health and welfare	1047	598	106	80	1831
Services	402	624	151	51	1228
Sector of employment					
Government	7792	2052	1359	1305	12,508
Private	6447	2059	1838	1605	11,949
Firm Size					
Less than 10	2199	680	494	628	4001
11–19 employee	1202	217	249	139	1807
20–49 employee	3940	793	738	517	5988
50 +	6898	2421	1716	1626	12,661
Permanency of job					
Permanent job	13,893	4011	3123	2.773	23,800
Temporary job	346	100	74	137	657
Social Security System					
Yes registered	14,109	4004	3161	2787	24,061
Not registered	130	107	36	123	396

Bold values indicate the composition of overlapping mismatch status for our target group

For the continuous variables: The unemployment rate ranges from 6.5% to 12.5% with a mean of 9.4%. The growth rate of GDP per capita ranges from -7.1% to 9.7% with a mean of 3.5%.

three fields of study have lower incidence than STEM. Similarly, for mere field of study mismatch, four fields of study have lower incidence than STEM.

These opposing findings can be explained in terms of two perspectives. First, graduates of STEM education (engineering, mathematics etc.) might show a greater probability of voluntary field of study mismatch and work in finance, banking, insurance, information technology or in managerial positions in sectors other than their own field of study. The second perspective is that the estimation results might change depending on whether the country is developed or not. Having a high likelihood of mismatch in STEM implies that Turkey, a developing country, might have low technological and innovation capacity and not able to sufficiently absorb the oversupply of graduates from STEM. The following figures support our findings. Turkey increased annual quotas of STEM education in the university entrance examination and provided some key relevant government subsidies to support the employment of such graduates in R&D activities in order to achieve the national level R&D-related goals. Accordingly, for the supply side, the number of graduates from STEM higher education increased by 17.3%

Table 3 Estimation results from multinomial logistic regression, beta coefficients

	Mere Over-education	Mere field of study mismatch	Full mismatch
Constant	− 0.936*	− 0.002	− 1.276*
Labour market context			
Unemployment rate	0.026***	− 0.011	0.061*
Growth rate of GDP per capita	− 0.03	− 0.009	− 0.012*
Demographic characteristics			
Female (Ref:Male)	− 0.448*	− 0.488*	− 1.261*
Age 30–44 (Ref:20–29)	0.212*	0.122**	− 0.106*
Age 45–65 (Ref:20–29)	0.173**	0.269*	− 0.475*
Single (Ref:Married)	0.136*	− 0.138**	0.006
Divorced (Ref:Married)	0.236**	0.071	0.0376*
Field of Study (Ref: STEM Education)			
Teacher training and education	− 1.438*	− 0.438*	− 0.452*
Humanities, Languages, Arts	− 0.924*	− 0.022	0.292*
Social Sci., Business, Law	− 0.0763*	− 2.354*	− 0.083
Agriculture, Veterinary	− 0.140	0.179***	0.516*
Health and Welfare	0.464*	− 1.290*	− 0.715*
Services	1.246*	− 0.275*	− 0.773*
Job-Specific Characteristics			
Government (Ref:Private sector)	− 0.158*	− 0.704*	− 0.226*
Firm size Less than 10 (Ref:50 +)	− 0.109**	− 0.219*	− 0.089
Firm size 11–19 (Ref:50 +)	− 0.443*	− 0.209*	− 0.727*
Firm size 20–49 (Ref:50 +)	− 0.324*	− 0.385*	− 0.551*
Temporary job (Ref: Permanent)	0.042	0.057	0.590*
No social security (Ref:Yes)	0.928*	− 0.04	1.365*

* p < 0.01. ** p < 0.05. *** p < 0.1 N = 24457. Estimation by multinomial logistic regression. The figures represent beta coefficients. Dependent variable is mismatch category of mere overeducation, mere field of study mismatch, full- mismatch (mismatch by both field of study and overeducation) where full-match is the reference category. The Pseudo R-Square values: Cox and Snell: 0.201; Nagelkarke: 0.225; McFadden: 0.099. Source: Own calculation

Table 4 Overlapping Mismatch by Occupations, Higher Education, Turkey, 2016, %

	Full Match	Mere OE	Mere FoS MM	Full MM
1-Managers	40.5	8.0	44.7	6.8
2-Professionals	76.2	17.0	5.9	0.9
3-Technicians&associate profess	79.4	3.1	16.8	0.7
4-Clerical support workers	70.6	2.3	25.8	1.4
5-Service and sales workers	0.0	40.3	0.0	59.7
6-Skilled agriculture, forestry	n/a	n/a	n/a	n/a
7-Craft &related trades	0.0	61.8	0.0	38.2
8-Plant&machine operators	0.0	49.2	0.0	50.8
9-Elementary occupations	0.0	24.0	0.0	76.0

OE Overeducation, *FoSMM* Field of Study Mismatch;Full MM: Mismatched by both field of study and overeducation at the same time; n/a: Sample size below 30. Source: Own construction

between 2012 and 2016 (OECD 2020). Moreover, human resources in science and technology as a share of the active population in the age group 25–64 for Turkey increased from 23.1% in 2012 to 27.5% in 2016. However, the same ratio for EU-28 is 46.0% in 2016 which implies that Turkey is far below the EU-28 average (European Commission 2021). On the employment side, total employees engaged in R&D activities in Turkey constituted only 0.44% of total employment while the same ratio was 1.21% in EU-28. Hence, on the one side, while human resources in science and technology are required to be increased when compared to the EU-28 average, on the other side, it is clear that this low share of currently available human resources in Turkey is also not fully utilized. (Voyvoda and Yeldan 2015).

4.4 Job-Specific characteristics

Finally, we focus on job-specific characteristics. First, in contrast to majority of earlier evidence, we find that the likelihood of any mismatch category increases as the firm size increases. Then, our results yield that the wage-based employees working in public sector are less likely to be field of study mismatch than the ones working in private sector. There might be two reasons. As Somers et al. (2019) stated, the first one is the fact that public sector is almost the only employer for the graduates from teacher training and health science whose likelihood of mismatch are among the lowest ones. The second reason is that the government institutions usually recruit new graduates by an entrance examination, and therefore give more importance to education background than the experience. Since the required skills and the fields of study are well-defined in the vacancy positions, the likelihood of mismatch is kept at lower levels. Next, the regression results indicate that wage-based employees who work in temporary jobs are more likely to be fully mismatched than the ones who work in permanent jobs. Moreover, we find that the employees who are not registered to social security system are more likely to be fully-mismatched and overeducated as expected.

5 Conclusions

Turkey has been facing a significant expansion in higher education since 2006. On the one side, there are positive effects of this expansion on the development process and education level of the population. On the other side, after we carried out a quick analysis on the preliminary consequences of this expansion, we found two key findings which might be considered initial signals of a quantitative imbalance between the demand for and supply of graduates from higher education. These consequences have given rise to concern about how well the level and type of education is matched to the jobs. Therefore, first, we measure both the field of study mismatch and vertical mismatch, and then derive four mismatch categories depending on their overlapping mismatches. These are mere vertical mismatch (well-match by field of study but overeducated), mere field of study mismatch (vertically well-match but mismatch by field), full-mismatch (the ones who are both overeducated and mismatched by field of study) and well-match. Hence, we estimate the determinants of these overlapping mismatches (where well-match is the reference category) by running a multinomial logistic regression for the first time in Turkey to provide the policymakers and researchers with novel evidence and insight.

The estimation results are presented under four variable groups which are labour market context, field of study, demographic and job-specific characteristics. The results yield that any mismatch category is responsive to those determinants and the findings are in parallel with the assignment theory.

Because of two reasons, we propose that the policy implications should better focus on the fully-mismatched employees who are both simultaneously mismatched by field of study and overeducation. First, in some cases, field of study mismatch itself cannot be problematic because individuals, as a personal choice, can willingly work in a job unrelated to their fields of study as long as their wages and working conditions are satisfactory in which employers are benefiting from their high level of skills. This voluntary mismatch can be considered a minor problem from the individual and collective point of view, to the extent that there is no waste of resources. Second, the fact that a university graduate works in a job which requires lower level of education represents a problem to the extent that investment in human capital does not provide the expected benefits. Hence, the main problem is to focus on involuntary field of study mismatch which is closely associated with the vertical mismatch. In other words, if the economy does not create sufficient job positions in response to the sharp expansion in higher education, then the individuals might be forced to work in jobs which are outside their field of study by downgrading their education level (Wolbers 2003; Montt 2015; Verhaest et al. 2017).

Accordingly, we find that the employees who are both overeducated and field of study mismatched (full mismatch) are more likely to be mismatched (i) when the unemployment rate is high at the time of entry into the labour market, (ii) as the growth rate of GDP per capita decreases, (iii) when they are younger (aged between 20 and 29). In line with the earlier empirical evidence, we can infer that the unfavourable economic conditions at the time of entry into the labour market might affect the behavioural pattern of individuals while searching for a matching job. Moreover, the sharp increase in university graduates increased further the fierce competition for the limited jobs available in the labour market, and resulted in a high probability of mismatch especially for the recent graduates.

The Turkish government has already carried out key institutional and legislative arrangements to cope with the expansion of higher education and its effects on the labour market. We expect that the perspective of and evidence from this paper will further contribute to the achievements already realized by the Turkish government and will open up several avenues for policy discussions and future research. In sum, when the conclusions are taken into account, we propose that balancing the supply of graduates and improving the effectiveness of the labour market mechanism would be at the centre of policy designs.

Appendix

See Table 5

Table 5 Coding scheme-coding of ISCO-08 occupation codes to fields-of-study

Occupation Codes FOET-99 One-Digit Classification	Based on ISCO-08, 3-digit Codes (Montt 2015)	Our Coding Scheme Based on Montt (2015) but Aggregated into 2- Digit Codes
Teacher training and education science	231–235, 342, 531	23, 34, 53
Humanities, languages and arts	216, 231–233, 262–265, 341, 343	21,23,26,34
Social sciences, business and law	112, 121, 122, 131–134, 141–143, 231–233, 241–243, 226, 261–264,331–335, 325, 341, 411–413, 421, 422, 431, 432, 441, 521–524, 952	11–14, 23, 24, 22, 26, 33, 32, 34, 41, 42, 43, 44, 52, 95
Science, mathematics and computing	211–213, 226, 231–233, 251–252, 311, 313,314, 321, 331, 351–352	21, 22, 23, 25, 31, 32, 33, 35
Engineering, manufacturing and construction	214–216, 231, 232, 251–252, 311–313, 315, 335, 351–352, 515, 711–713, 721–723, 731–732, 741, 742, 751–754, 811–818, 821, 831–835, 931–933	21, 23, 25, 31, 33, 35, 51, 71, 72, 73, 74, 75, 81, 82, 83, 93
Agriculture and veterinary	213, 225, 231–232, 314, 321, 324–325, 611–613, 621–622, 631–634, 751, 754, 834, 921	21,22,23,31,32, 61, 62, 63, 75, 83, 92
Health and welfare	213, 221–227, 231, 234, 263, 321–325, 341, 516, 531, 532, 541,	21,22,23,26,32,34, 51, 53, 54
Services	134, 243, 325, 334, 335, 341, 343, 411–413, 421–422, 431–432, 441, 511–516, 521–524, 531, 532, 541, 831–835, 911–912, 941, 951, 952	13,24,32,33,34,41, 42, 43, 44, 51, 52, 53, 54, 83, 91, 94, 95

Three-digit ISCO-08 codes are not available in TURKSTAT labour force surveys. Therefore, following Ege and Erdil (2023), the coding scheme is developed by aggregating three-digit codes into two- digit ones which is based on Montt's (2015) coding strategy. Source: Own construction based on Montt (2015)

Abbreviations

FOET-99 Fields of Education and Training-1999
ISCO-08 International Standard Classification of Occupations-2008
TURKSTAT Turkish Statistical Institute

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All authors contributed equally to all sections and steps of the study.

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Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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