ANALYZING THE INCIDENCE AND CAUSES OF FIELD OF STUDY MISMATCH IN TURKEY: EVIDENCE FROM TURKSTAT LABOR FORCE SURVEYS

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Approval of the Graduate School of Social Sciences

Prof. Dr. Yaşar Kondakçı
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Doctor of Philosophy.

Prof. Dr. M. Teoman Pamukçu
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Doctor of Philosophy.

Prof.Dr. Erkan Erdil
Supervisor

Examining Committee Members

Prof. Dr. M.Teoman Pamukçu	(METU, STPS)	
Prof. Dr. Erkan Erdil	(METU, ECON)	
Prof. Dr. İrem Dikmen Toker	(METU, CE)	
Assoc.Prof.Dr. Bahar Sağlam	(Hacettepe Uni., ECON)	
Assist.Prof. Dr. Ş.Pelin Akyol	(Bilkent Uni., ECON)	

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name : Ahmet Alper EGE

Signature :

ABSTRACT

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Ege, Ahmet Alper
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Supervisor: Prof. Dr. Erkan Erdil

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Field-of-study mismatch occurs when attained field-of-study is different from field-of-study required for doing the job well.

Using TURKSTAT labor force surveys, this thesis attempts to analyze incidence level and causes of field-of-study mismatch in Turkey. Mismatch is measured by using coding scheme. Its determinants are analyzed by estimating binary logistic regression model, with an emphasis on the effect of labor market conditions.

Analysis of incidences indicates that Turkey has high incidence of mismatch at an increasing trend between 2012 and 2016. The findings are remarkably much worse for some fields. For example, 92.5% of graduates from "arts" at vocational and technical high schools, and 71.2% of graduates from "computing" at higher education work in jobs that are unrelated to their fields-of-study.

Regression results for 2016 yields that likelihood of mismatch increases as "field specific employment rate" decreases, which indicates that mismatch does not result uniquely from workers' choice, but is highly responsive to labor market context. Moreover, overeducated employees are far more likely to be mismatched than vertically well-matched ones. These findings imply that when supply of graduates from a field is more than jobs available in that field, graduates are forced to accept jobs outside their fields and/or below their education level which causes them to be field-of-study mismatched and/or overeducated.

Balancing supply of graduates and improving effectiveness of labor market mechanism may be primary policy recommendations to be proposed by focusing on high priority fields which have the highest incidences with the worst labor market indicators.

Keywords: Field of study mismatch, horizontal mismatch, vertical mismatch, education mismatch, labor supply

ÖZ

TÜRKİYE'DE ÇALIŞAN BİREYLERİN EN SON BİTİRDİĞİ EĞİTİM-ÖĞRETİM ALANI İLE İSTİHDAM EDİLDİKLERİ MESLEK GRUBU ARASINDAKİ UYUMSUZLUK DÜZEYİNİN VE NEDENLERİNİN ANALİZİ: TÜİK HANE HALKI İŞ GÜCÜ ANKETLERİNDEN ELDE EDİLEN BULGULAR

Ege, Ahmet Alper
Doktora, Bilim ve Teknoloji Politikası Çalışmaları
Tez Yöneticisi: Prof. Dr. Erkan Erdil

Şubat 2020, 234 sayfa

Bu tez, TÜİK işgücü anketlerinden elde edilen mikro verileri kullanarak, çalışan bir bireyin bitirmiş olduğu en son eğitim-öğretim alanı ile istihdam edildiği meslek grubu arasındaki uyumsuzluğun düzeyini ve bunun nedenlerini analiz etmektedir. Uyumsuzluk, kodlama şeması kullanılarak ölçülmüştür. Uyumsuzluğun nedenleri ikili lojistik regresyon modeli tahmin edilerek analiz edilmiştir.

Uyumsuzluk düzeyi analizlerine göre Türkiye yüksek bir uyumsuzluk düzeyine sahiptir ve bu düzey 2012-2016 yılları arasında artmaktadır. Bazı eğitim-öğretim alanları için uyumsuzluk sorunu daha ciddi boyutlardadır. Örneğin, mesleki ve teknik liselerde "sanat" alanından mezun olanların % 92,5'i ve yükseköğretimdeki "bilgisayar" alanından mezun olanların % 71,2'si kendi alanlarıyla ilgili olmayan meslek gruplarında çalışmaktadır.

2016 yılı verileri kullanılarak elde edilen regresyon sonuçlarına göre, kişinin işe başladığı yıldaki eğitim-öğretim alanına özgü istihdam oranı azaldıkça uyumsuzluk ihtimali artmaktadır. Bu sonuç, uyumsuzluğun işgücü piyasası koşullarına yüksek derecede duyarlı olduğunu göstermektedir. Ayrıca, çalışılan meslek grubundaki ortalama eğitim seviyesinden bir miktar daha yüksek eğitim düzeyine sahip olan kişilerin uyumsuzluk ihtimalinin oldukça yüksek olduğu tespit edilmiştir. Bu bulgular, herhangi bir eğitim-öğretim alanından mezun kişi sayısının bu kişilere olan talepten fazla olması durumunda, mezunların bir kısmının kendi alanları dışındaki işlerde ve/veya sahip oldukları eğitim düzeyinden daha düşük eğitim seviyesi gerektiren işlerde çalışmak zorunda kaldıklarını göstermektedir.

Bu kapsamda, mezun arzının dengelenmesi ve işgücü piyasası mekanizmasının etkinliğinin artırılması gibi politika önerileri ön plana çıkmaktadır. Söz konusu politika tasarımlarında, uyumsuzluk düzeyi en yüksek ve iş gücü piyasası göstergeleri en kötü olan eğitim-öğretim alanlarına öncelik verilmesi gerektiği düşünülmektedir.

Anahtar kelimeler: Eğitimde yatay uyumsuzluk, eğitimde dikey uyumsuzluk, aşırı eğitimli, uyumsuzluğun nedenleri, iş gücü arzı

To

my dear son,

my wife and

all my family

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LIST OF ABBREVIATIONS

FOET-99	Fields of Education and Training 1999
ISCED-F-2013	The 2013 revision of the International Standard Classification of Education focused on the fields of education and training
ISCO-88	International Standard Classification of Occupations 1988
ISCO-08	International Standard Classification of Occupations 2008
OECD	Organization for Economic Cooperation and Development
OSYM	Student Selection and Placement Center of Turkey
STEM	Science, Technology, Engineering and Mathematics
TURKSTAT	Turkish Statistics Institute
YOK	Higher Education Council of Turkey

CHAPTER 1

INTRODUCTION

1.1.Background Information

The mismatch between the education system and the labor market has become a growing concern among policy makers because it has social and economic implications. At the individual level, it affects job satisfaction and wages. At the firm level, it reduces productivity and increases on-the-job search and turnover. At the macro level, it increases unemployment and reduces GDP growth via the loss in human capital and the reduction in productivity (Quintini, 2011b). In this context, the mismatch between the supply of and demand for labor force has long been studied by researchers. They focused on the extent to which workers are well-matched or mismatched to their jobs, and analyzed the causes and consequences of it.

In the literature there are mainly three types of mismatch. These relate to level of education, type of education and skills. Researchers use different terminology for each type. The mismatch regarding level of education occurs when the education level of an individual in any occupation is higher or lower than the required level for doing the job well. For this type of mismatch, the terms such as vertical mismatch, education mismatch and qualifications mismatch are used interchangeably. The mismatch regarding the type of education occurs when a worker trained in a particular field works in another. In other words, it is the mismatch between the attained field of study of the individual and field of study required for doing the job well. For this mismatch, the terminology such as field of study mismatch, horizontal mismatch or education-job mismatch is used. Skills mismatch is defined as the actual match between a worker's skill proficiency and the level of skills required by the worker's job (Montt, 2017). It is out of scope of this thesis.

The empirical literature on mismatch issue provided that the quantitative imbalance between the education system and the labor market can cause field of study mismatch and/or vertical mismatch. More specifically, the excess supply of skilled workers may force job seekers to accept jobs below their level of education and/or outside their field of study. Furthermore, it is found that field of study mismatch is responsive to the broader labor market context, it is not only an individual outcome or one that results uniquely from workers' choice (Wolbers 2003; Flisi et al 2014; Montt 2015; Verhaest et al 2017).

On the other side, the technological developments, changes in trade patterns and skill requirements have been continuously affecting the structure and composition of labor force. There has been a shift towards a more educated workforce within many countries. In some countries this expansion is very huge in which attainment levels have risen sharply, more than doubling the level of labor force entrants with a higher education level (OECD, 2007). Moreover, Acemoglu (2002) stated that the twentieth century has been characterized by skill-biased technical change because the rapid increase in the supply of skilled workers has induced the development of skill-complementary technologies. Hence, according to Acemoglu (2002), this is the technological change that benefits only those workers with higher skills in detriment of workers with lower skills who lose their jobs or see their wages diminished. Depending on some projections, the volume of global higher education is expected to reach 377 million students by 2030 (UNESCO, 2017). The expansion in higher education and the supply of graduates is expected to grow in the world. As a result, improving the alignment of education system with the labor market mechanisms will continue to be critical policy goal for many countries in the future.

Marin and Hayes (2017) states that a mismatch demonstrates a failing either in the labor market or in the education system. Government interventions can be based on market failures or system failures. In neoclassical theory, public policy is explained by resorting to allocative and distributive market failures. Public policy making is a static true-or-false decision. However, evolutionary economics which favors the systems approach states that the market failure approach in neoclassical theory does not capture the dynamic complexity of the systemic combinations (Lundvall, 2007). More specifically, they claim that innovation is understood as a complex evolutionary process distributed in a system of multiple socio-economic agents whose behavior and interactions are governed not only by market forces but to a greater extent by non-market institutions. The innovative performance of such a system depends crucially on its agents' interactions and the institutions governing them. Therefore, the rationale for government intervention goes beyond a market failure argument (Bleda and del Río, 2013). In other words, innovation is a social learning process that takes place in a context of networks and institutions. Hence, government intervention is legitimate and needed if the complex interactions that take place among the different organizations and institutions do not function effectively (Dodgson et al 2009).

In sum, to limit the negative effects of mismatch, it is important to identify the progress in the incidence of mismatch over time and analyze the main causes of it. After those analyses are conducted, by following the systems approach, a comprehensive policy set should be designed to eliminate the basic drivers of the mismatch problem. More specifically, from the perspective

of national innovation system, improvement of coordination, networking and systemic interactions among the key government actors, academia, NGOS and private sector will play critical role in improving the harmony between education system and labor market by reducing mismatch.

1.2. Problem Definition-The Claim and Logical Framework of Thesis

The logical framework of this thesis is presented by moving step by step from the starting point to the policy recommendations. This thesis is structured sequentially on the following steps as seen from the logical framework (Figure 1.1).

The first step is about the main concern or curiosity to study this thesis. Turkey has been facing a rapid and significant expansion in higher education since 2006. Hence the starting point or the main concern of this thesis is the fact that the rapid expansion in higher education in Turkey has given rise to concerns whether the economy can provide sufficient positions to accommodate those graduates.

The second step is about the empirical rationale in which this thesis is built on. Regarding the above starting point, the empirical rationale is searched. Two critical findings are found which support the main concern. The first one is that sharp increase in supply of graduates can cause an imbalance between the education system and the labor market. The second one is the fact that this imbalance can be a potential signal for field of study mismatch.

As a next step, a quick preliminary analysis is conducted for Turkey to determine further motivations to study this thesis. It is found that there are basically four factors which can be a signal for an imbalance between the supply side and demand side. These four factors can also be considered as preliminary consequences of expansion in higher education.

These four factors are as follows in brief. The detailed explanation is provided in chapter 3.

a. As of 2018, expansion in higher education has caused a sharp increase in annual supply of graduates since 2010. It increased more than two folds. There are annually more than 840 thousand graduates from universities who are potentially entering to labor market. Hence, this rapid expansion might cause a quantitative mismatch in Turkey if the corresponding number of additional employment was not created or any policy action is not taken to balance the supply of graduates.
b. Especially for 2017 and 2018, significant portion of quotas of university entrance examinations was left idle and not preferred by the applicants. Applicants present a

clear resistance to some fields which might be another implication of a mismatch, especially of a field of study mismatch.

c. For the last 10 years, more and more university students and university graduates re-apply to university entrance exams to change their field of study in order to increase their chance of employment because they are not satisfied with their last field of study. This finding indicates that those students and graduates track the signals coming from the labor market.

d. When OECD data is analyzed, as of 2016, Turkey has the worst position in terms of labor market indicators among 22 OECD countries. Moreover, when TURKSTAT 2016 data is examined, 11 fields of study (among 21 fields) have worse situation than country average with respect to employment rate, unemployment rate and inactivity rate at a time. Hence these findings might be the reflection of rapid expansion in higher education in Turkey. Those findings can be considered as strong evidence for a quantitative mismatch between demand for and supply of higher education graduates

Moreover, regarding the field of study mismatch on Turkey, there are only two empirical studies in the literature. Those very limited findings indicate that the field of study mismatch is a problematic area because of its higher incidence level. It requires a specific attention to study the incidence and causes of this type of mismatch.

Hence, the above preliminary consequences and the literature gap on Turkey can be considered as further motivations to study this thesis.

The fourth step of logical framework is about proposing the claim of thesis. By taking into account;

- the above empirical rationale from the literature,
- the preliminary consequences of expansion in higher education and
- the problematic findings from the very limited literature of field of study mismatch on Turkey,

the claim of this thesis is proposed as follows. This thesis claims that

> *Turkey has been facing a high incidence of field of study mismatch at an increasing trend over time mainly because of the rapid expansion in higher education. More specifically, this mismatch might be more problematic for some fields of study.*

As a result, the aim of this thesis is to analyze the incidence and causes of field of study mismatch with an emphasis on the effect of labor market conditions, and propose policy recommendations to eliminate the main drivers of it to some extent.

The Starting Point: The rapid expansion in higher education in Turkey has given rise to concerns whether the economy can provide sufficient positions to accommodate those graduates.

Empirical Rationale: Rapid and significant expansion in higher education can cause quantitative imbalance between the education system and the labor market. More specifically, the excess supply of graduates may force job seekers to accept jobs below their level of education and/or outside their field of study. Furthermore, it is found in the literature that field of study mismatch is responsive to the broader labor market context, it is not only an individual outcome or one that results uniquely from workers' choice *(Wolbers 2003; Flisi et al 2014; Montt 2015; Verhaest et al 2017).*

Preliminary Consequences of Expansion in Higher Education

Expansion in higher education has caused more than two folds increase in annual supply of graduates since 2010. It reached to more than 840 thousand.

The % of idle capacities of officially announced quotas of university entrance examination reached to more than 20 % in 2017 and 2018

Among the applicants who take university entrance exam; the share of university students increased from 13.2 % in 2006 to 20.3 % in 2018. The share for university graduates increased from 2.4 % to 8.%

In terms of labor market indicators, Turkey has the worst situation among OECD countries.

Within Turkey, 11 fields of study have worse performance than country average

The above factors can signal imbalance between the demand and supply sides

Main Motivations to Study This Thesis: Preliminary Consequences + Literature Gap on Turkey

The Above Preliminary Consequences

Literature Gap on Turkey Regarding Field of Study Mismatch: There are only two empirical studies on Turkey. They reveal that Turkey has higher incidence of field of study mismatch than OECD average.

The Claim of the Thesis: Turkey has been facing a high incidence of field of study mismatch at an increasing trend mainly because of the rapid expansion in higher eucation. More specifically, this mismatch might be more problematic for some fields of study.

Conduct analyses by FOET- 99 classification of field of study

First measure the incidence of field of study mismatch by employing Wolbers's (2003) and Montt's (2015) coding scheme, and then analyze the incidences on the basis of FOET-99 2-digit classificatin and with respect to individual and job-specific characteristics

Analyze the causes of field of study mismatch by employing binary logistic regression model, with an emphasis on the effect of labor market conditions.

Policy Implications

Based on the analyses and concluding remarks, propose policy recommendations to reduce the field of study mismatch and hence to improve harmony between education system and labor market.

Figure 1. 1 The Logical Framework of Thesis

In the fifth step, two analyses are conducted to achieve the claim and aim of thesis. The first one is to measure and analyze the incidence of field of study mismatch. The second one is to analyze the causes of mismatch with an emphasis on the effect of labor market conditions.

Finally, in accordance with the conclusions derived from those analyses, policy recommendations and policy tools are proposed to reduce the field of study mismatch to improve the harmony between the education system and labor market.

1.3. Research Questions

There are many questions to be answered regarding the basic findings of problem definition. However, by taking into account the main objective and scope of this thesis, the following research questions are proposed.

- Does the expansion in Turkish higher education system have any effects on the labor market indicators for the period between 2010 and 2016? More specifically, in terms of triple interaction among employment rate, unemployment rate and inactivity rate, which fields of study
    - are constantly in worse situation than that of country average?
    - have improved or worsened their performance?
- What is the incidence of field of study mismatch on the basis of each field of study in Turkey? Do these field specific incidences increase or decrease over time?
- What are the main significant determinants of field of study mismatch in Turkey?
- How can the policy makers eliminate those determinants to improve the harmony between the education system and the labor market?

1.4. Plan of Thesis

This thesis includes six chapters. Each chapter has its own methodology and specific data to conduct the required analysis. The summary of data sources, methodology, target group and other relevant information for the main chapters are presented in Table 1.1.

The first chapter is the introduction part where the background information is provided and the problem definition is made within a logical framework. The problem definition is inspired from expansion in higher education, idle capacities of university entrance exams, repeated applications to university entrance exam, labor market indicators, and empirical findings of mismatch literature for Turkey.

The second chapter deals with the conceptual and theoretical framework under two sections. For the first section, the definitions and measurement methods of different types of mismatches are summarized. The aim of this section is to establish the conceptual underpinning. The second section is about three interrelated labor market theories in explaining the field of study mismatch and vertical mismatch. These are human capital theory, job competition theory and assignment theory. Their general assumptions and approaches for the mismatch phenomenon are provided. For both sections, literature survey is used.

The third chapter includes the preliminary consequences of expansion in higher education. In other words, these are the main motivations to study this thesis. The target group of this analysis consists of the graduates from higher education only. The objective is to present some preliminary findings to pave the way for further analyses. There are four sections. First, the data and methodology is presented. Then, national and global expansion in higher education is provided. Thirdly, the preliminary consequences of expansion in higher education is presented under two headings. The first heading is about the increase in annual supply of graduates, idle capacities of university entrance examinations and the repeated applications to this exam. The other heading is about the effect of expansion on labor market indicators. The final section includes the concluding remarks.

The fourth chapter deals with the measurement and analysis of incidence of field of study mismatch and vertical mismatch. There are five sections. First, the previous empirical findings regarding field of study mismatch and vertical mismatch for Turkey are presented by conducting a literature survey. The second section provides the data and methodology of the chapter. Then, field of study mismatch is measured by using coding scheme[1] (a type of job analysis method) which was originally developed by Wolbers (2003) and updated by Montt (2015). The field of study mismatch is measured for wage-based employees who are graduated from (i) higher education, (ii) vocational and technical high schools and (iii) sum of them. The data source is TURKSTAT labor force surveys for the period between 2012 and 2016. The analysis of incidence of mismatch is conducted with respect to two dimensions over time between 2012 and 2016. The first one is on the basis of Fields of Education and Training 1999

[1] It is a matrix in which there are two dimensions. The first one is the FOET-99 classification for fields of study. The second one is ISCO codes for occupation groups. This matrix shows the occupations in which the graduates from a particular field of study can work as a well-match. If a graduate works in an occupation group which is outside this coding scheme, then she/he is treated as field of study mismatch. The definition of coding scheme, FOET and ISCO is provided in section 2.2.1.3 Job Analysis Method in chapter 2, in section 4.3. Measuring and Analyzing Incidence of Field of Study Mismatch in Turkey in chapter 4, and in Appendix A.

(FOET-99) 1-digit and 2-digit classifications where there are 8 and 21 fields of study respectively. The second dimension provides basic findings with respect to some individual and job-specific characteristics such as age-group, gender, type of work place, firm size, contract type, permanency of job and NUTS1 regions. The fourth section is about vertical mismatch. It is measured by employing the realized matches method, which is an objective method, on the basis of ISCO-08 occupation codes. The data source is TURKSTAT 2016 labor force survey, and consists of the sum of graduates from vocational and technical high schools and higher education who are working as wage-based employees. The final section provides the concluding remarks of the overall chapter.

The fifth chapter analyzes the causes of field of study mismatch by employing binary logistic regression model, with an emphasis on the effect of labor market conditions. The model depends on five variable groups. These are labor market conditions, demographic characteristics, education background, job-specific characteristics and work place related characteristics. There are 12 independent variables, all of which are categorical. The dependent variable is being field of study mismatch. The data covers 2016 TURKSTAT labor force survey. The regression model is run for the target group which is defined as "at the time of survey year of 2016, the graduates from sum of vocational and technical high schools and universities who have been working since 2009 as a wage-based employee". Moreover, a graphical analysis is carried out to figure out the interaction effects of some variables on having field of study mismatch on the basis of FOET-99 1-digit classification (8 fields of study). In other words, while the analysis of the causes of mismatch is conducted in general terms, the graphical analysis is carried out on the basis of each field of study. For this purpose, estimated marginal means[2] of field of study mismatch with regard to critical variables is used.

The final chapter concludes and proposes policy recommendations for policy makers to improve the harmony between the education system and the labor market. In this context, first the conclusions derived from analyses are summarized to present some solid evidence for policy makers and researchers. Then, in accordance with those conclusions and the scope of this thesis, four policy recommendations are proposed. Moreover, the policy tools to achieve those recommendations and the key activities to realize the policy tools are also proposed.

[2] The Estimated Marginal Means in **SPSS GLM** tells us the mean response for each factor, adjusted for any other variables in the model

Table 1. 1 Summary of Data Sources, Methodology and Target Group of Main Analysis Chapters							
Chapter	**Basic Headings**	**Data Source**	**Target Group**	**Methodology**	**Level of Analysis**	**Time**	**The Aim**
2	-Conceptual framework -Theoretical background	Literature survey on mismatch	Field of study mismatch, Vertical mismatch	Literature survey Literature survey	National and international National and international	No limit No limit	Provide conceptual and theoretical underpinning.
3	-Expansion in higher education - Labor market indicators	OECD, YOK, OSYM OECD, TURKSTAT	Graduates from higher education Graduates from higher education	Basic descriptive statistics Basic descriptive statistics	-Country average -Country average and field of study level (FOET-99 2- digit classification).	2006-2018 2010 and 2016	Summarize the expansion and its consequences to generate supportive empirical evidence for further analyses. These consequences can be considered as main motivations to study this thesis.
4	-Measuring and analyzing field of study mismatch -Measuring vertical mismatch	TURKSTAT Labor Force Surveys of 2012-2016 TURKSTAT Labor Force Surveys of 2016	Wage- based employees graduated from (i)higher education (ii)vocational and technical high schools, separately and (iii) sum of them Sum of (i) and (ii)	For measurement, coding scheme is used. For analysis, basic descriptive statistics is used. Realized matches, an objective method	-Country average -Field of study level (FOET-99 1 and 2 digit classification -With respect to individual and job-specific characteristics such as age-group, gender, firm size -Country average -On the basis of ISCO-08 1 digit occupation classification	2012-2016 2016 only	Measure and analyze the incidence of field of study mismatch by (i) each field of study, (ii) with respect to individual and job-specific characteristics and (iii) over time Measure and analyze vertical mismatch by occupation codes

Source: Own construction

Table 1.1. Summary of Data Sources, Methodology and Target Group of Main Analysis Chapters (cont'd)							
Chapter	**Basic Headings**	**Data Source**	**Target Group**	**Methodology**	**Level of Analysis**	**Time Dimension**	**The Aim**
5	-Analyzing causes of field of study mismatch	TURKSTAT Labor Force Survey of 2016	"at the time of survey year of 2016, the graduates from sum of vocational and technical high schools and higher education who have been working since 2009 as a wage-based employee"	Binary logistic regression model in SPSS	Individual level for each respondent in labor force survey. In total, there are 12 independent variables which are classified into 5 groups. They are all categorical representing labor market conditions, demographic characteristics, education background, job-specific characteristics and work place related characteristics. The dependent variable is being field of study mismatch.	2016 only	-Determine the main determinants of field of study mismatch
	-Graphical analysis	The same as above	The same as above	The Estimated Marginal Means in SPSS which gives the mean response for each factor, adjusted for any other variables in the model	On the basis of FOET-99 1-digit classification.	2016 only	-Figure out the interaction effects of some variables on being field of study mismatch on the basis of FOET-99 1-digit classification

1.5 Main Contribution of Thesis

This thesis is the first study in terms of the following issues.

- It is the first study in the whole literature to analyze causes of field of study mismatch by using unique independent variables such as field specific employment rate, field specific unemployment rate and NUTS1 regions.
- It is the first study which analyzes the cause of field of study mismatch for Turkey by using labor force surveys.
- It is the first study to measure and analyze incidence of field of study mismatch for Turkey
    - on the basis of FOET-99 1 and 2-digit classifications, not only country average
    - over time
    - for three specific target groups separately which are
        - ✓ graduates from higher education only
        - ✓ graduates from vocational and technical high schools
        - ✓ sum of them

Moreover, the findings from this thesis contributes to assignment theory. The findings are in parallel with Montt (2015) and Park (2018). In other words, this thesis contributes to the assumption that the mismatch issue is such an assignment or allocation problem where there are critical factors coming from both the demand and supply sides.

CHAPTER 2

CONCEPTUAL FRAMEWORK AND THEORETICAL BACKGROUND

This chapter presents the conceptual and theoretical framework. There are two sections. The first one is about the definitions and measurement methods of mismatches. It provides terminology for vertical mismatch, field of study mismatch and skills mismatch. Moreover, it includes the measurement methods of field of study mismatch and vertical mismatch. Measurement method for the skill mismatch is not provided because it is out of scope of thesis. The second section covers briefly the theoretical background on explaining the field of study mismatch and vertical mismatch.

2.1. Conceptual Framework

In the literature, the mismatch between education system and labor market has been a policy issue for a long time. There are mainly three types of mismatch in the literature. These are related to education level, type of education and skills. Under this three headings, researchers used different definitions for each of them.

For the education level, the terminology such as education mismatch, vertical mismatch, overeducated, undereducated, qualification mismatch, overqualified, underqualified are used. For the type of education, the terminology such as horizontal mismatch, field of study mismatch, education-occupation mismatch, type of schooling mismatch are used. For skills mismatch, overskilling and underskilling are used as a terminology. In fact, some of the above definitions has the same meaning. Some researchers preferred to use different terminology to claim the same meanings with slight differences.

2.1.1. Definitions

There are three types or groups of definitions in this section. The terminology of this thesis is presented at the end of the section.

2.1.1.1. Mismatch Regarding Level of Education: Education Mismatch, Qualification Mismatch, Vertical Mismatch

The education mismatch, qualification mismatch and vertical mismatch have similar definitions and are used interchangeably in different studies. The education mismatch is defined in a broad manner as the situation where the highest level of education held by a worker does not match the required level of education for her/his job. In other words, it is the mismatch between a worker's attained education level and the education level required by the worker's job (Hartog 2000; McGuinnes 2006; Leuven and Oosterbeek 2011; Mavromaras et al. 2013). These researchers preferred to use education mismatch as a terminology. However, Montt (2015) used qualification mismatch instead. Moreover, some researches such as Li et al (2018), Park (2018) and Sellami et al (2018) preferred to use vertical mismatch instead of education or qualification mismatch. As understood from the definitions, the main focus in this mismatch is on the years of schooling or level of education, not on the type or content of schooling.

Moreover, the terms overeducated, undereducated, overqualified and underqualified belong to this terminology. They are the types of this mismatch. If the education level of an individual in any occupation group is higher (lower) than the required one, then she/he is treated as over(under)educated or over(under)qualified. In other words, overeducation exists when a worker is employed in a job that requires a lower level of education than that possessed by the worker. A typical example of the overeducation would be a university graduate who works in a job that is considered to be a high school graduate job, in which case the worker is vertically mismatched, that is overeducated (Park, 2018). Overeducation has received significantly more attention than undereducation because of the concern that it might have been caused by the increased supply of university graduates over the past few decades in several countries (Flisi et al, 2014).

2.1.1.2. Mismatch Regarding Type of Education: Field of Study Mismatch, Horizontal Mismatch

Field of study mismatch and horizontal mismatch have similar meanings. They occur when a worker trained in a particular field works in another (Montt, 2017). In other words, as McGuinnes et al (2017) stated, it can be defined as the mismatch between the attained field of study of the individual and the field of study required for doing the job well. The focus is on the type of schooling or content of the education or the type of field of study, not on the level of education.

Field of study mismatch is distinct from vertical mismatch in that a worker may be matched to the job in terms of the quantity of schooling received (education match) but not by the type of schooling acquaried (Robst 2008; Quintini 2011a).

There are some different terminology used for this mismatch. It is usually defined as horizontal mismatch. For example, Beduwe and Giret (2011), Domadenik et al (2013), Verhaest et al (2017), Li et al (2018) and Park (2018) preferred to use horizontal mismatch. Wolbers (2003) used the term "job mismatch", Robst (2007a and 2007b) preferred to use type of schooling, Boudarbat and Chernoff (2009) used education-job mismatch, Nordin et al (2010) used field of education-occupation match, Quintini (2011b), Montt (2015), OECD (2016) and Sellami et al (2018) preferred to use field of study mismatch.

2.1.1.3. Skill Mismatch

Skill mismatch is defined as the actual match between a worker's skill proficiency and the level of skills required by the worker's job. If the skill proficiency of an individual is higher (lower) than the required skill level, then she/he is treated as over(under) skilled. In other words, overskilling describes the situation whereby the workers believe that they possess more skills than their current job requires, whereas, underskilling describes the situation whereby the worker believes that their current skills do not meet the demands of the job (McGuinnes et al, 2017).

Vertical mismatch or field of study mismatch should not necessarily coincide with skill mismatches. A match in terms of formal education is not a necessary or a sufficient condition for skill utilization. For instance, a graduate having the optimal field of study for a job may be underskilled at the start of the job if it is optimal to acquire part of the required skills through further informal learning.

In the earlier studies, the researchers who studied skill mismatch used educational attainment as a proxy for it. The reason why using skills to conceptualize and measure occupational mismatch has been overlooked until relatively recently was because of the impossibility of validly and reliably measuring skills. However, the release of surveys such as the International Adult Literacy Survey (IALS), the Adult Literacy and Life skills Survey (ALLS), and the recent Survey on Adult Skills (PIAAC) paved the way for an analysis of skill mismatch. In fact, these surveys, in addition to measuring traditional educational attainment variables, assess skills in domains such as literacy, numeracy, and problem solving in technology-rich environments (Flisi et al, 2014). Skills mismatch is out of scope of this thesis.

2.1.1.4. Terminology of Thesis

Since this thesis focuses on the incidence and causes of field of study mismatch, and on its association with vertical mismatch, the terms "field of study mismatch" and "vertical mismatch" are used. The horizontal mismatch or education mismatch or qualification mismatch will not be used. Moreover, there is not any terminology regarding skill mismatch because it is out of scope of this thesis.

2.1.2. The Measurement Methods

The measurement methods were originally developed in the vertical mismatch literature since the mismatch analysis starts with the overeducation. Then, the same methodologies were used for measuring field of study mismatch and skill mismatch (Sellami et al 2018). However, different terminology is used for the methodologies which are in fact similar in terms of the approaches used. Some researchers such as Sellami et al (2018) grouped these methods as worker self-assessment, job analysis and realized matches. McGuinnes et al (2017) and Li et al (2018) grouped them as subjective method, job evaluation method and empirical method. Flisi et al (2014) grouped those methods as objective and subjective methods only, in which objective method consists of job analysis and statistical realized matches.

In fact, the terminology used above is similar. The worker self-assessment method refers to subjective method, empirical method refers to the statistical realized matches, and the job analysis refers to job evaluation. Moreover, as understood from the above examples, the basic logic behind grouping the methodologies is whether it is objective or subjective. The objective method includes the realized matches and job analysis. The subjective method includes the worker self-assessment.

The terminology of this section is based on Sellami et al (2018)'s terminology of which are worker self-assessment method, realized matches method and job analysis method. Since the research focus is on the field of study mismatch and vertical mismatch, the measurement methods used to measure those mismatches are presented.

2.1.2.1. Worker Self-Assessment Method

The worker self-assessment method is a subjective method which is based on the responses given to the specific relevant survey questions. This methodology is applied to measure both the vertical mismatch and field of study mismatch. The survey questions are designed

accordingly. However, the wording of survey questions and the available options for responses sometimes slightly differ by researchers even while measuring the same mismatch.

There are two types of worker self-assessment methods. These are direct worker self-assessment and indirect worker self-assessment. There are several empirical studies which applied those two types when measuring vertical mismatch. However, for measuring the incidence level of field of study mismatch, there is not any empirical study in the literature which applied indirect worker self-assessment method. The direct worker self-assessment method is the only worker self-assessment method for measuring field of study mismatch (Sellami et al, 2018).

For measuring vertical mismatch, worker self-assessment method asks individuals the relevant questions in the surveys to measure the level of education required "to get" or "to do" the job, which is then compared to the highest level of education actually acquired by the worker in order to determine if they are matched or not (McGuinnes, 2017).

For the direct worker self-assessment method, it directly asks workers' opinion regarding whether their job matches or is related to their level of education In other words, it is like asking the respondents whether they feel over(under)educated or not. The respondents choose one of the available responses provided by the survey. For example, OECD (2016) asked the question "Thinking about whether this qualification is necessary for doing your job satisfactorily, which of the following statements would be most true?" to measure the vertical mismatch.

The available options to be selected are (i) This level is necessary, (ii) A lower level would be sufficient or (iii) A higher level would be needed. For example, if the respondent chooses the option (ii), then this respondent is considered as overeducated. If she/he chooses the third option, then she/he is taken as undereducated.

The second type which is indirect worker self-assessment asks workers about the education requirements of their current job (Flisi et al, 2014). For example, Galasi (2008) used the following question to determine the required level of education.

> If someone was applying nowadays for the job you do now, would they need any education or vocational schooling beyond compulsory education? If so, about how many years of education or vocational schooling beyond compulsory education would they need?

For measuring field of study mismatch, worker self-assessment method is used in a similar way but with different wording. According to Sellami et al (2018), most of the studies which focus on field of study mismatch used worker self-assessment method to measure this mismatch (see Robst, 2007a; Robst, 2007b; Kelly et al, 2010; Boudarbat and Chernoff, 2012;

Verhaest et al, 2017). As mentioned earlier, only the direct worker self-assessment method is used to measure field of study mismatch.

The worker self-assessment method measures field of study mismatch by asking the respondent to assess the degree to which their current job is related to the study field of their highest education (McGuinnes, 2017). In other words, the individual worker assesses whether he or she has the appropriate field of study to perform the job.

For example, Robst (2007a) relied on a survey question regarding the extent to which their work was related with the field of their highest degree. Respondents could answer that their work was 'closely related', 'somewhat related', or 'not related' to their highest degree field. The survey questions in many studies which used worker self-assessment method are almost similar to the above question. Some researchers considered the last response as a field of study mismatch, some considered the last two responses as a mismatch. Robst (2007a), however, defined mismatch depending on the last response and defined a third category as "partial mismatch" if the respondent chose the second option, which is "somewhat related" (Sellami et al, 2018).

Some other researchers such as Verhaest et al (2017) reversed the question and ask respondents whether their field of study was most appropriate for the job. Respondents are asked the question: "Which field of study is most appropriate for the job?"

The individuals could provide four different answers. These are (1) Strictly own field of education, (2) My own or a related field, (3) A completely different field of education, and (4) No particular field required.

2.1.2.2. Realized Matches Method

This is an objective measurement method which is based on the distribution of realized data. For measuring mismatch, the mode or mean of the data is used.

For measuring vertical mismatch, the realized matches method estimates the educational requirement of an occupation by assessing the mean or modal level of education within a given occupation. For example, when years of schooling is used for measurement, first the mean years of schooling of all employees in that occupation group is calculated. If the worker's acquired education level is above or below one or two standard deviation from the mean years of schooling, then he/she is treated as overeducated or undereducated. When the mode level of education is used, if his/her level of education is higher than the modal level of education in his occupation group, then he/she is considered as overeducated (Hartog 2000; McGuinnes

2006; Galasi 2008; Flisi et al, 2014; Mercan et al 2015; McGuinnes et al, 2017;Sellami et al, 2018; Li et al, 2018).

For measuring field of study mismatch, Sellami et al (2018) claims that the realized matches method has been used only once in the literature. It is the study by Nieto et al (2015) where they defined an individual as field of study mismatched if his/her field of study differs from the modal field of study within his/her occupation group.

2.1.2.3. Job Analysis Method

Job analysis method is an objective measurement method. It is based on the evaluation by job analysts who defined the required education (level and type) for jobs relying on occupation classification methods. In the overeducation literature, this approach is quite common, whereas it has been used less frequently for the measurement of field of study mismatch. However, as mentioned earlier, the number of studies including field of study mismatch has been increasing recently, and most of them prefer to use this method to measure the mismatch (Sellami et al, 2018).

For measuring field of study mismatch, the basic approach is to prepare a coding scheme (matrix) which fits the occupation groups with the field of studies. Coding scheme is a matrix which shows the occupation codes in which the graduates from a particular field can work as a well-match. In other words, it compares the education and training received by the worker and the type of job she/he performs. It requires precise categorizations of the jobs held by workers and the education (Montt, 2015). As understood, for making coding scheme, two dimensions are required. The first dimension is the occupation codes and the second dimension is the field of study.

For the occupation codes, most of the studies preferred to use International Standard Classification of Occupations (ISCO) codes. The ISCO codes have been updated depending on the technological or global developments. Since 2008, ISCO-08 code has been in use. Before that, ISCO-88 was used. Some researchers preferred to use some different occupation codes. For example, Nordin et al (2010) and Domadenik et al. (2013) relied on three-digit codes of the Standard Swedish Occupational Classification to determine the incidence of field of study mismatch.

The ISCO codes used in coding scheme are originally available in three digit codes. However, some countries do not use three digit ISCO codes in their relevant surveys but they use two digit codes instead. Turkey uses two-digit classification of ISCO codes in annual labor force surveys.

For the field of study dimension of coding scheme, Fields of Education and Training 1999 (FOET-99) classification was used. Originally there are 90 fields of study in detailed 3 digit classification. When it is aggregated, 25 narrowed fields of study are obtained in 2 digit classification. When 2 digit classification is aggregated, 9 fields of study in 1-digit broad classification is obtained (TURKSTAT, 2019). In coding scheme, FOET-99 1-digit classification is used. The first category which is "general programmes" is excluded from this coding scheme and hence the workers are asked to report one of 8 possible fields. These are: ii) teacher training and education science; iii) humanities, languages and arts; iv) social sciences, business and law; v) science, mathematics and computing; vi) engineering, manufacturing and construction; vii) agriculture and veterinary medicine; viii) health and welfare; and ix) services. In many surveys including TURKSTAT labor force surveys, 2-digit classification is used but with a new structured list consisting of 21 fields of study. FOET-99 was used between 2009 and 2016. However, since 2014 ISCED-F-2013 has been in use in labor force surveys.

Montt (2015) used three digit ISCO-08 codes for occupation groups and FOET-99 1-digit classification for field of study. For example, he determined that the graduates from humanities, languages and arts can work in ISCO 231-233, ISCO 216, ISCO 262-265, ISCO 341and ISCO 343 as well-match. If any graduate from humanities, arts and languages works in an occupation which is outside this coding scheme, then she/he is considered as field of study mismatch.

For measuring vertical mismatch, the logic behind the approach is the same as the approach used in measuring field of study mismatch. The job analysts define the required level of education for occupation groups. Moreover, it is also possible to identify over and undereducation by using ISCO by level of education in accordance with ISCED classification. For example, ISCO categorizes legislators, senior officials and managers as requiring a tertiary (ISCED 5-6) level of education. If any graduate who works as senior official or manager has an education level below ISCED 5-6, then he/she is considered as undereducated. This measure relies on the assumption that all jobs with the same titles require the same level of education and this is true in all countries using the same occupational classification (Quintini,2011a).

2.2. Theoretical Background for the Mismatch Phenomenon

In economics, there is a consensus that education is an essential ingredient of economic growth, personal welfare and social welfare. The educated employees play a key role in

innovation activities and that innovation leads to higher productivity (Junge, Severgnini and Sorensen, 2012).

The growth literature states that education, ensuring human capital accumulation, positively and significantly affects long-term economic growth. According to models of endogenous growth theory, the skill levels of the workforce are an important driver of economic development (Bartlett, 2013). Aghion et al (2009) claim that education investments have positive impact on growth. Bye and Faehn (2012) state that increasing the share of highly educated workers has significant absorptive capacity effects that contribute to higher growth and welfare.

The evolutionary economics mainly focuses on fostering education and innovation as a central means of welfare and growth. It includes the gradual improvements of all capital infrastructures including actors, human capital, institutions and relational capital through collaboration networks (Erdil, Meissner and Chataway, 2018). As knowledge-based economy is a relatively recent contribution of evolutionary economics school, intangible capital is now more significant than tangible capital. In this context, the creation and usage of knowledge and transformation of it into social and economic benefits become very important. Therefore, the higher education policies, the labor market policies and science, technology and innovation policies should be carefully integrated by also taking into account some other macro and sectorial policies.

In this context the process of linking education and skills to the right positions in the labor market becomes very critical. As Wolbers (2003) stated, in modern societies education is probably the most important characteristic in the allocation process on the labor market. However, the labor market theories differ in explaining the mechanisms by which educated individuals are allocated to jobs.

This difference is much clear when it comes to mismatch phenomenon. Hartog (2000) uses human capital, job-competition and assignment theories to frame overeducation and the relationship with the wages. Montt (2015) states that this framework can be applied to field of study mismatch.

In the literature, the theoretical background for mismatch phenomenon is based on the intense discussion made for overeducation literature. However, for the field of study mismatch, there is not any unique or specific theories applied. Some researchers such as Wolbers (2003) and Mont (2015) tried to discuss the main assumptions of those theories from the point of view of field of study mismatch.

In the following sub-sections the theoretical framework of three interrelated labor market theories will be presented. These are human capital theory, job competition theory and assignment theory. Their basic assumptions in general and approaches in particular for the mismatch phenomenon are provided.

2.2.1. Human Capital Theory

In a neoclassical framework, as McGuinnes (2006) states, the human capital theory assumes that productivity is an increasing function of the human capital level of an individual and that the workers are paid according to their marginal product. Human capital is accumulated by formal education, on-the-job training and experience.

According to this theory, employers value labor productivity by offering the highest wages to those individuals who have obtained the most human capital. Therefore, individuals behave rationally and invest in human capital to increase their productive capacity.

The productivity and earnings are exclusively linked to education and experience and thus are independent of the availability and/or quality of jobs to which a worker has been assigned in the economy. As a result human capital theory highlights the importance of individual characteristics in determining mismatch, and thus it is a supply side theory (McGuiness, 2006).

Some researchers like Dolton and Vignoles (2000) argue that human capital theory is not consistent with the observed facts when explaining overeducation. Since overeducation is associated to a mismatch situation, it has been considered an exception to the human capital theory. In a framework where skills are fully utilized and workers are paid according to their marginal products, overeducation seems to be an inconsistent phenomenon because it is related with underutilization and lower wages than marginal product (Eriş, 2013).

On the other side, Leuven and Oosterbeek (2011) note that more recent literature tends to restore the validity of the human capital theory in explaining overeducation. Caroleo and Pastore (2015) claim that, as a matter of fact, overeducation could be conceived as a signal of a lack of the work-related component rather than a waste of human capital. Overeducation is therefore a consequence of a lack of skills that could be acquired through work experience and this is typical of young people, despite their increasing educational level. Marsikova and Urbanek (2015), moreover note that overeducated workers are less likely to get training as they compensate their lack of specific skills by an excess of education. Also, overeducated workers might have shorter tenure since they keep looking for a better match, therefore firms are less likely to invest in their training.

Beduwe and Giret (2011) state that, from human capital theory perspective, the question of whether the field of one's initial education matches that of his/her job is irrelevant since the skills acquired while at school do not depend on the type of job occupied.

Montt (2015) states that from a human capital theory perspective, any mismatch, including field of study mismatch, is temporary and firms will adjust their demand and productive process to the available stock of human capital. Although temporary under human capital theory, mismatch can be prolonged and costly for individuals.

I think that education level of an individual is an important attribution that she/he might make use of when searching jobs or working in any job. To my opinion, different level of education or different types of education offer different human capital. If any mismatch occurs, it might last longer and be costly for both the firms and individuals. Moreover, the human capital theory considers only the supply side factors which would be seen as a deficiency in analyzing the demand and supply side factors of labor market dynamics.

2.2.2. Job Competition Theory

The job competition model was first mentioned by Thurow (1975). He suggests that wages are determined primarily by job characteristics and not by individual productivity. Employers seek to employ the best available candidates for their vacancies, at the lowest training costs. Moreover, he states that excess schooling is a consequence of the competition for jobs in presence of rigidity of the demand for highly educated labor that leads graduates to accumulate education, which is in some cases more than that requested to get a job, in order to reach the best position in the queue for the job.

Eriş (2013), Linsley (2005), McGuinnes (2006), Stasio and Werfhorst (2016), Montt (2015) and Park (2018) made some further explanations to make the issues clearer in terms of overeducation and field of study mismatch.

Eriş (2013) notes that the main assumption of this theory is that workers compete in the labor market for high wage jobs. There occurs two kinds of queues while workers are willing to find a job. These are job queue and labor queue. Job queue is created by the competition among the workers for jobs which are ranked by earnings. Labor queue exists as an outcome of the competition between firms for high productivity workers who are ranked by their potential training costs. Since formal education and training are complements to each other in terms of human capital, more educated workers are expected to create lower training costs. As a result, educational qualifications is one of the main criteria that employers use, at point of hire, to

infer the future trainability of applicants. In other words, as Stasio and Werfhorst (2016) claim, education is seen as a sorting machine that helps employers identify those individuals who have the potential to develop valuable skills in the future. Therefore highly educated individuals are at the fronts of the queue and recruited to jobs with higher wages.

Linsley (2005) restates that earnings and productivity are related to the job characteristics. Only the demand side factors have an impact on the earnings. The education level does not play a role in wage determination. He claims that as the educational attainment of workers increase, overeducation arises and this causes bumping down or even crowding out the lower-skilled workers of the labor market. After some time, lower skilled individuals become out of the labor market and high educated workers who are still at the queue are forced to accept those lower-skilled jobs, which in turns lower the returns to education. However, lower rate of earnings do not avoid individuals to invest in education, because they want to keep their advantageous positions in the labor queue. Within this framework, overeducation is more than a temporary phenomenon. It may persist and economic costs in the form of suboptimal investments in education, allocative efficiencies and increased income inequalities may be created.

As McGuinnes (2006) claims, when compared to human capital theory, the job competition model therefore provides a clear explanation for educational overinvestment. Individuals compete for job opportunities based on their relative training costs. However, in human capital theory this competition is based on the wages individuals are willing to accept given their human capital. The central element of the job competition theory is based around the observation that the majority of workplace skills are acquired through on-the-job training as opposed to formal education. Thus, the labor market is not a bidding market for selling existing skills but a training market where training slots must be allocated to different workers.

Montt (2015) clearly revisits the queuing issue and restates that workers line up in the hiring queue which is set according to their educational credentials and field of study, or other criteria relevant to employers for the purposes of sorting job-seekers for the available vacancies. For the field of study mismatch, he claims that it is a result of employers in a particular occupational group requiring more workers than available in the corresponding field, thus having to draw workers from further down the queue, reaching those that come from different fields. In job competition theory, field of study mismatch can also result from employers' perception of and approach to it, in which they do downplay field of study as a relevant signal in the hiring process. Importantly, by taking into consideration the general assumptions of job

competition theory, as workers' productivity depends on the characteristics of the job, he strongly claims that there should be no wage penalty associated with field of study mismatch.

Park (2018) states that this theory emphasizes institutional rigidities, where marginal products and consequently wages are associated with job characteristics, not individual characteristics. This approach is the extreme case, being purely demand-side driven.

As understood from the above discussions, this theory contributes to literature in explaining the mismatch phenomenon from a new perspective, that is the effect of demand side factors or job characteristics. It enriches the labor market mismatch discussions by adding job queue or worker queue mechanisms. However, since I think that mismatch is not a result of only the demand side factors, job-competition theory would be not sufficient for explaining the causes or effects of field of study mismatch.

2.2.3. Assignment Theory

Sattinger (1993) was the first one who attempted to search for a different model in which the human capital and job competition theories are integrated. He claims that this new model has characteristics from both theories. Like the job competition model, this model assumes that the jobs available in the economy are limited, which implies that remuneration is job specific and independent of the human capital endowment of the individual. Like the human capital theory, assignment theory assumes that with their investment in human capital, individuals are able to compete for the best job and wages are bound to be influenced by the human capital level of individuals (Caroleo and Pastore, 2015).

Moreover, Sattinger (1993) states that the productivity level and earnings in a job is determined by the degree of fit between required and acquired skills. The quality of a job match is important. If an employee works in a non-matching job, his acquired skills are under-utilized. This mismatch situation limits labor productivity, resulting in lower wages. The allocation of workers is optimal if every worker is matched to a job in which, in relative terms, she/he performs better than all other workers.

McGuinnes (2006) makes some further clarifications of the difference between this theory and the job competition theory. He states that assignment models differ significantly from the job competition interpretation in that they stress that choice of job or sector creates an intermediate step between an individual's characteristics and their earnings. Income maximization guides workers to choose particular jobs over others. Thus, higher wages for workers with some characteristics play an allocative role in the economy rather than simply being rewards for the

possession of particular characteristics. Workers found in a particular sector (or job) are not randomly distributed but they are there because of their choices made to maximize their income or utility. Thus, the central and crucial prediction arising from the assignment literature is that in order to adequately explain changes in the distribution of earnings, we must give some consideration to both individual and job characteristics.

Montt (2015) summarizes that while human capital theories predict that mismatches are temporary and firms adapt to labor supply, job-competition theories predict that there are no wage penalties associated with mismatch and workers adapt to labor demand. He adds that empirical evidence supports a third, intermediate model, which is assignment theory. In it, the productivity of a job and the allocation process depends on both demand and supply factors. The workers' income or utility maximization guides workers to choose particular jobs over others, but, in equal importance, jobs or groups of occupations available to workers and the mechanism that assigns workers to jobs need to be considered.

For the field of study mismatch, Montt (2015) claims that for a particular job, certain workers will have more advantages than others as a result of their general and job/field-specific skills acquired in formal training, but these jobs may or may not be available to them, possibly pushing them to choose other jobs or fields instead. Assignment theories predict that the likelihood of a field of study match will depend on both the skill demand in a particular occupational group and the supply of workers from the corresponding field.

Nordin et al. (2010) and Wolbers (2003) claim that a mismatched worker will not be able to use his/her field-specific skills on the job and their employers will not reward these skills. Field of study mismatched workers are thus expected to earn lower salaries when compared to their well-matched peers. Montt (2015) additionally state that this can be the case even after accounting for skill heterogeneity or overeducation.

Park (2018) states that there is an allocation problem in assigning heterogeneous workers to jobs that differ in their complexity and where frequency distributions on both the demand and supply sides are unlikely to match and educational mismatch may be a persistent problem.

In parallel with Montt (2015) and Park (2018), I believe that the mismatch issue is such an assignment or allocation problem where there are critical factors coming from both the demand and supply side.

2.2.4. Other Theories

In addition to above theories, there are also some other theories which are studied to some extent. In this section, only the main argument of these theories will be presented.

Career mobility theory was developed by Sicherman and Galor in 1990. The main argument is that a worker with given innate ability may prefer to start in a job below his ability level if this is compensated by a higher probability to be promoted.

Signaling theory was developed by Spence in 1973 where education is considered as a signal used by job-seekers and a screening device used by employers to transfer information about unobservable attributes, such as commitment, perseverance, and learning potential, which lower the cost of schooling and increase productivity.

Search theory describes an individual's problem in deciding when to accept a job offer. There are some factors which influence how long it will take the individual to find a job. In other words, these factors such as unemployment benefits, costs of looking for a job, and the current unemployment rate all affect the wage rate that an unemployed worker would be willing to accept. Search theory describes the optimal strategy for a worker looking for a job, and has been extended to describe how firms look for workers. Since the wage offer that a worker could get at different employers varies according to the relation between the worker's characteristics and the characteristics of the job, continued search by the worker can generate a higher wage. However, since search is costly, the worker at some point will decide to stop searching and accept a job that pays less than the maximum attainable wage (Sattinger, 2012). In a more clear way, the job search theory states that employees will continue to change jobs until an optimal match has been achieved. It is expected that field of study mismatched employees more frequently look for another job than those with a matching one (Wolbers, 2003).

Moreover, there is also another strand of literature called as search and matching model. A general matching function is used in this model to describe the aggregate characteristics of a labor market, including the Beveridge Curve relating vacancies to unemployment, the job finding rate, and the unemployment rate. Hence, the outcome of the job search process is described abstractly by this matching function that relates the number of matches formed between workers and employers to the number of unemployed workers and vacant positions. General equilibrium search models and search and matching models explain both sides of the labor market (Sattinger, 2012).

In the literature, the terms assignment and matching are often used interchangeably. Some researchers considered those theories as the same theory (Wolbers,2003). .However, Sattinger (2012) states that matching can be characterized as abstracting from the qualitative differences among workers and among jobs that are essential elements in assignment theory. The outcome of a worker-job match provides no information on characteristics of the worker or job that would be relevant to future matches for the worker or the job. Moreover, the rate of matching between unemployed workers and vacant jobs depends on the extent of mismatches generated by the search and meeting process. Under the assumption that the rate at which mismatches are generated is stable over time, the matching function abstracts from the qualitative features of workers and jobs that generate mismatches. As a result of this assumption, the matching function does not make explicit reference to characteristics of workers or requirements of jobs.

2.3. Summary of Definitions, Measurement Methods and Theoretical Background

Regarding definitions of mismatches: In the literature, there are mainly three types of mismatches. These are related to level of education, type of education and skills.

For the level of education, the main focus is on the years of educational attainment. The definitions used in the literature has a wide range of terminology. These are vertical mismatch, education mismatch, qualification mismatch, overeducation and undereducation. If the education level of an individual in any occupation group is higher (lower) than the required ones, then he/she is treated as overeducated (undereducated).

For the type of education, the main focus is on the field of study. In the empirical studies, anyone can observe the relevant terminology as field of study mismatch, horizontal mismatch, education-job mismatch, type of schooling mismatch. The main common content under those terminology is that it can be defined as the mismatch between the attained field of study of the individual and the field of study required for doing the job well.

For the skill mismatch, it is defined as the actual match between a worker's skill proficiency and the level of skills required by the worker's job. Overskilling describes the situation whereby the workers believe that they possess more skills than their current job requires, whereas, underskilling describes the situation whereby the worker believes that their current skills do not meet the demands of the job.

Terminology of Thesis: For the mismatch regarding the education level, the term vertical mismatch which includes overeducation and undereducation is used. For the mismatch

regarding type of education, the term "field of study mismatch" is used. Skills mismatch is out of scope of this thesis.

Regarding measurement methods: For each type of mismatch, there are mainly three types of measurement methods. These methods were originally developed in the vertical mismatch literature since the mismatch analysis starts with the overeducation. Then the same methodologies were used for measuring field of study mismatch and skills mismatch. These methodologies are worker self-assessment method, realized matches method and job analysis method. Worker self-assessment method is a subjective method which is based on the worker's responses given to the survey questions. Realized matches method is an objective method which uses distribution of realized data coming from surveys. Job analysis is another objective method which is based on the evaluation by job analysts for each occupation group.

Table 2.1 presents the definition and explanation of each measurement method for vertical mismatch and field of study mismatch.

Regarding theoretical background: As seen from the development of literature, it was started with an implicit assumption in the earlier literatures, that workers' human capital is efficiently utilized in the labor market and, relatedly, workers earn wages equal to their marginal products. However, the others question this implicit relationship and draws attention to potential labor market inefficiencies in matching occupations and workers according to the required and actual qualification levels (Mercan et al, 2014).

The studies involving field of study mismatch and other mismatches at the same time within a single study has started to increase recently because of the expansion in higher education and availability of international data. It is observed that the assignment theory which is a mixture of human capital theory and job competition theory becomes a frequent explanatory framework for the empirical studies. As Montt (2015) stated that field of study mismatch is responsive to the broader labor market context, it is not an individual outcome or one that results uniquely from workers' choice. I think that the most important factors for being field of study mismatch might be the labor market conditions and supply of graduates. Therefore, I am in line with the basic assumptions of assignment theory while analyzing the causes of field of study mismatch and its association with vertical mismatch.

Table 2. 1 Summary of Measurement Methods		
Type of Mismatch	**Approach Used**	**Explanation**
Vertical mismatch using the **modal level of education**	Realized matches method which is an objective measurement method based on realized data	The ISCED **level** of education of the individual is compared with the **modal level** of education of all the individuals in the ISCO occupation group within a country. Some researchers preferred to use ISCO 1-digit classification and some others use ISCO 2-digit classification. We define an individual as overeducated (undereducated) if his/her level of education is higher (lower) than the modal level of education in his/her occupation code.
Vertical mismatch using **years of education**		The ISCED **years** of education of the individual is compared with the **average years** of education of all the individuals in the ISCO occupation group within a country. Some researchers preferred to use ISCO 1-digit classification and some others use ISCO 2-digit classification. We define an individual as overeducated (undereducated) if the worker's acquired education level is above (below) one or two standard deviation from the mean years of schooling in his/her occupation code.
Vertical mismatch using **worker self-assessment method.**	Worker self-assessment method is a subjective method which is based on worker's opinion (responses) when asked in survey questions.	Worker self-assessment method asks individuals the relevant questions in the surveys to measure the level of education required "to get" or "to do" the job, which is then compared to the highest level of education actually acquired by the worker. There are two types. The first type is the direct worker self-assessment method. It directly asks workers' opinion regarding whether their job matches or is related to their level of education The respondents choose one of the available responses provided by the survey. For example, OECD (2016) asked the following question to measure the vertical mismatch. *Thinking about whether this qualification is necessary for doing your job satisfactorily, which of the following statements would be most true?* The available options to be selected are (i) This level is necessary, (ii) A lower level would be sufficient or (iii) A higher level would be needed. For example, if the respondent chooses the option (ii), then this respondent is considered as overeducated. If she/he chooses the third option, then she/he is taken as undereducated. The second type is indirect worker self-assessment which asks workers about the education requirements of their current job.
Vertical mismatch using job analysis method.	Job analysis is an objective method.	It is based on the evaluation by job analysts who defined the required education level for jobs relying on occupation classification methods. It is also possible to identify over and undereducation by using ISCO occupation codes by level of education in accordance with ISCED classification. For example, ISCO categorizes legislators, senior officials and managers as requiring a tertiary (ISCED 5-6) level of education. If any graduate who works as senior official or manager has an education level below ISCED 5-6, then he/she is considered as undereducated.
Field of Study Mismatch using **realized matches**	Realized matches method (modal field of study)	It is based on realized data. According to Sellami et al (2018), Nieto et al (2015) is the only study which uses this method for measuring field of study mismatch. An individual is defined as field of study mismatched if his/her field of study differs from the modal field of study within his/her occupation group.

Table 2.1. Summary of Measurement Methods (cont'd)		
Type of Mismatch	**Approach Used**	**Explanation**
Field of Study Mismatch using **worker self-assessment** method	Worker self-assessment method is a subjective method which is based on worker's opinion (responses) when asked in survey questions	The worker self-assessment method measures field study mismatch by asking the respondent to assess the degree to which their current job is related to the study field of their highest education. For example, Robst (2007a) relied on a survey question regarding the extent to which their work was related with the field of their highest degree. Respondents could answer that their work was 'closely related', 'somewhat related', or 'not related' to their highest degree field. Some researchers reversed the question and ask respondents whether their field of study was most appropriate for the job. Respondents are asked the following question: *'Which field of study is most appropriate for the job?*' The individuals could provide four different answers. These are (1) Strictly own field of education, (2) My own or related field, (3) A completely different field and (4) No particular field required.
Field of Study Mismatch using **job analysis** method. (Coding scheme)	Job analysis method (coding scheme).	The basic approach is to prepare a coding scheme. It is such a matrix which shows the occupation codes in which the graduates from a particular field can work as a well-match. In other words, it compares the education and training received by the worker and the type of job she/he performs. It is originally developed by Wolbers (2003) and updated by Montt (2015). For making coding scheme, two dimensions are required. The first dimension is the occupation codes and the second dimension is the field of study. For the occupation codes, most of the studies preferred to use International Standard Classification of Occupations (ISCO) codes. Some researchers preferred to use some different occupation codes. For the field of study dimension, Fields of Education and Training 1999 (FOET) classification was used. Montt (2015), who updated the coding scheme, used three digit ISCO-08 codes for occupation groups and FOET-99 classification for field of study. For example, he determined that the graduates from humanities, languages and arts can work in ISCO 231-233, ISCO 216, ISCO 262-265, ISCO 341and ISCO 343 as a well-match. If any graduate from humanities, arts and languages works in an occupation which is outside this coding scheme, then she/he is considered as field of study mismatch.

Source: Own construction based mainly on Flisi et al (2014). Moreover, the definitions, explanations and the relevant information are derived from the following studies: Sellami et al (2018), Montt (2015), Quintini (2011a-b), McGuinnes et al (2017), EU Commission (2016), Filiztekin (2011), Galasi (2008), Mercan et al (2014).

CHAPTER 3

EXPANSION IN HIGHER EDUCATION IN TURKEY AND ITS PRELIMINARY CONSEQUENCES

This chapter deals with the preliminary consequences of expansion in Turkish higher education system.

Wolbers (2003), Flisi et al (2014), Montt (2015) and Verhaest et al (2017) claimed that the increase in the supply of university graduates over the past few decades in several countries caused a quantitative mismatch between the supply of and demand for the graduates. This imbalance can cause worse labor market indicators. Moreover, the worsening labor market indicators, the quantitative imbalance between the education system and the labor market and some other factors can cause field of study mismatch and/or vertical mismatch.

Before starting to directly analyze the incidence levels and causes of field of study mismatch in the next chapters, the aim of this chapter is to present some preliminary findings from the analysis of expansion in higher education. In other words, the findings in this chapter will be an introductory contribution to the whole analysis by ensuring a more solid background for the thesis.

In this context, there are four sections. The first one is about the data and methodology of analysis. The second section includes global and national level expansion in higher education. The next section covers the analysis of preliminary consequences of expansion. The final section presents the concluding remarks.

3.1. Data and Methodology

In the whole chapter, a basic quantitative analysis is conducted simply by generating some graphs and tabular information by using the databases of OECD, YOK (Higher Education Council), OSYM (Student Selection and Placement Center of Turkey) and TURKSTAT.

All the analyses cover only the higher education graduates.

For the expansion in higher education, two findings are presented. These are OECD figures and national data. OECD figures are about the share of population with higher education attainment. The national data covers the relevant figures such as the increase in number of

universities, number of students, amount of annual quota of university entrance examination. The quantitative analysis of expansion covers the data from early 2000s to recent updated data. It starts with the data that belongs to early 2000s because the expansion in Turkish higher education system had been initiated in 2006. Therefore, data for early 2000s is used as a reference point for comparative analysis to capture the effects of expansion.

For the analysis of preliminary consequences of expansion in higher education, first the annual supply of graduates, amount of idle capacities of quotas of university entrance examination and the repeated applications to this exam are presented. Then, for the labor market indicators, a descriptive analysis is conducted on the basis of fields of study by using OECD database and national data. For cross-country analysis, OECD used the following classification of fields of study, which is originally based on ISCED-F-2013 classification.

- Education (Teacher Training and Education Science)
- Social Sciences, Journalism and Information
- Engineering, Manufacturing and Construction
- ICT
- STEM
- Arts and Humanities
- Business Administration and Law
- Health and Welfare
- Services
- Agriculture, Forestry, Fisheries and Veterinary
- Natural Sciences, Mathematics and Statistics

However, the data for (i) natural sciences, mathematics and statistics, (ii) ICTs, and (iii) agriculture, forestry, fisheries and veterinary are not provided in OECD database because they are below the publication limit in most of the countries. Moreover, the missing data is cleared. As a result, 22 countries, including Turkey are applicable for this analysis.

For the analysis of labor market indicators in Turkey, TURKSTAT Labor Force surveys of 2010 and 2016 are used to generate the field specific employment, unemployment and inactivity rates. Although TURKSTAT publishes the field specific labor market indicators, the FOET classification used in 2010 and 2016 are slightly different. Therefore, the indicators are calculated by the author on the basis of fields of study by using FOET-99 2-digit classification.

The field specific indicators have been available since 2009. However, data for 2010 is used as a reference year because 2009 data for labor market indicators were affected by 2008 global crisis. Using 2009 data might not generate rationale findings. Moreover, 2010 is a good indicator for the graduate year of universities which were started to be established in 2006.

3.2. Expansion in Higher Education

The expansion of higher education is presented first globally and then for Turkey by providing some relevant basic figures.

3.2.1. Global Expansion of Higher Education

There has been a shift towards a more educated and skilled workforce within several countries for the last 50 years. After the mass higher education was adopted worldwide in 1960's, the population of higher education has increased. When compared to 1970s, the number of higher education students increased from 32 million to 100 million in 2000 (OECD, 2007). As of 2016, there are 216 million students in higher education all over the world. In some countries this expansion is very huge in which attainment levels have risen sharply, more than doubling the level of labor force entrants with a higher education level. Depending on some projections, it is expected to reach 377 million students by 2030 (UNESCO, 2017). As a result, the supply of graduates from higher education will continue to grow in the world.

The above increase is also valid for OECD and EU region, which are closely related to Turkey. As a result of this expansion, as seen from Table 3.1, the share of population with higher education increased in OECD and EU countries between 2000 and 2017.

For the 25-64 age-group, the share of higher educated people in the overall population in OECD countries increased by 14.2 points from 22.3 % to 36.5 %. For the EU members, the increase is 13.4 points.

For the 25-34 age-group, the share of higher educated people in OECD countries increased by 18.1 points from 26.4 % to 44.5 %. For the EU members, the increase is 17.9 points.

From the figures on Table 3.1, it is very clear that most of the OECD and EU countries have faced a significant expansion for the recent years which caused a higher share of higher educated people among the 25-34 aged-population than that of 25-64 aged-population.

For Turkey, the above figures clearly reveal that although Turkey has increased the attainment level in higher education. The increase in the share of higher educated population within the 25-64 age-group is still lower than OECD and EU averages. This finding indicates that Turkey was late to expand the higher education because the overall stock of population has low level of educational attainment. On the other side, for the age-group of 25-34, the increase in the share of higher educated population of Turkey is higher than OECD and EU averages. This result reveals that Turkey has witnessed an enormous expansion in higher education recently.

In this context, this recent expansion in Turkish higher education system will be explained briefly in the next section.

Table 3. 1 Educational Attainment of Population, OECD, EU,Turkey, 2000-2017, %

(25-64 Age-Group)

	Below Upper Secondary Education			Upper Secondary Education			Tertiary Education		
	2000	2017	Change (2017-2000)	2000	2017	Change (2017-2000)	2000	2017	Change (2017-2000)
Turkey	76.7	60.7	-16	14.9	19.3	4.4	8.3	20	11.7
OECD Average	33	21.1	-11.9	43.8	42.8	-1	22.3	36.5	14.2
EU 23 Members in OECD	34.4	19.3	-15.1	46.1	46.3	0.2	20.9	34.3	13.4

(25-34 Age-Group)

	Below Upper Secondary Education			Upper Secondary Education			Tertiary Education		
	2000	2017	Change (2017-2000)	2000	2017	Change (2017-2000)	2000	2017	Change (2017-2000)
Turkey	72.3	44.5	-27.8	18.9	23.9	5	8.9	31.6	22.7
OECD Average	24.4	15.2	-9.2	50.2	40.8	-9.4	26.4	44.5	18.1
EU 23 Members in OECD	22.5	14	-8.5	53.1	43.6	-9.5	24.4	42.3	17.9

Source: Own construction based on OECD Stat (Education Database)

3.2.2. Expansion in Turkish Higher Education

Turkish government initiated an expansion policy and action plan of higher education in 2006. The most important reason behind this policy was the higher social demand for higher education because of its individual and social benefits, which is in parallel with the global trends. Moreover, the aims of the expansion plan were to increase the education level of population, to improve R&D and innovation capacity and capability of Turkey, to improve the skills of work force, to reduce the inter-regional migration, to facilitate local and regional development which in turn will all contribute to development of Turkey (State Planning Organization 2006; Ministry of Development 2013).

Turkey took two main steps to expand the higher education in 2006. The first one was to increase the number of universities. The second one was to increase the quota of university entrance examinations. In addition to these two major steps, some minor steps such as "not paying tuition-fees" for the state universities, increasing the amount of government scholarship/fellowship, increasing the capacity and improving the quality of state dormitories were also taken. Moreover, after the secondary education was made as mandatory in 2012, more students started to graduate from secondary education with a higher demand for higher education (Gur et al, 2017).

Table 3. 2 Expansion in Turkish Higher Education System, 2005-2018

		2005-2006	2012-2013	2015-2016	2017-2018	2018-2019	Increase from 2005 to 2018 (as folds)
Number of Universities	State Universities	53	103	109	112	129	2.4
	Foundation Universities	26	77	83	73	77	3.0
	Total	79	180	192	185	206	2.6
Capacity (Quota) of University Entrance Examination	Officially Announced, Formal Education Only	402.155	721.925	823.729	910.671	839.490	2.1
Number of Students (Open and Distance Education Included)	2-3 Year Higher Education (MYO-associate degree)	441.014	755.789	2.285.406	2.768.757	2.829.430	6.4
	Bachelor's Degree	1.714.090	3.890.800	3.900.601	4.241.841	4.420.699	2.6
	Master's Degree	111.814	217.588	417.084	454.673	394.174	3.5
	Doctorate	32.503	59.763	86.094	95.100	96.199	3.0
	Total	2.299.421	4.923.940	6.689.185	7.560.371	7.740.502	3.4
Distribution of Total Students	Open and Distance Education %	34.7	45.8	46.8	48.6	51.2	16.5
	Formal Education %	65.3	54.2	53.2	51.4	48.8	-16.5
	Total (in Numbers)	2.299.421	4.923.940	6.689.185	7.560.371	7.740.502	3.4

Source: Own construction based on OSYM and YOK Database.

As seen from Table 3.2, when compared to 2005, as of 2018;

- The number of universities increased by 2.6 folds and reached to 206. In this context, there is now at least one state university in each province of Turkey.

- The quota (capacity) of university entrance examinations increased by 2.1 folds from 402 thousand to 839 thousand.

As a result of those steps, the number of total students (including open and distance education) increased by 3.4 times, from 2.3 million students to 7.4 million students.

3.3. Preliminary Consequences of Expansion in Higher Education

The preliminary consequences of expansion in higher education is analyzed under two sub-sections. The first one is about the increase in annual supply of graduates, idle quota and the repeated applications to university entrance exam. The second one is in terms of three labor market indicators.

3.3.1. Annual Supply of Graduates, Idle Quota and Repeated Applications to University Entrance Exam

The effects of expansion is analyzed on the basis of three main findings in the next paragraphs. The first one is the substantial increase in annual supply of graduates within only 12 years. The second one is about the idle capacities of university entrance examinations in which some portion of the quotas was left idle and not preferred by the students. The third one is about repeated entrance to university exams where the distribution of applicants who apply to university exam has started to change since 2010.

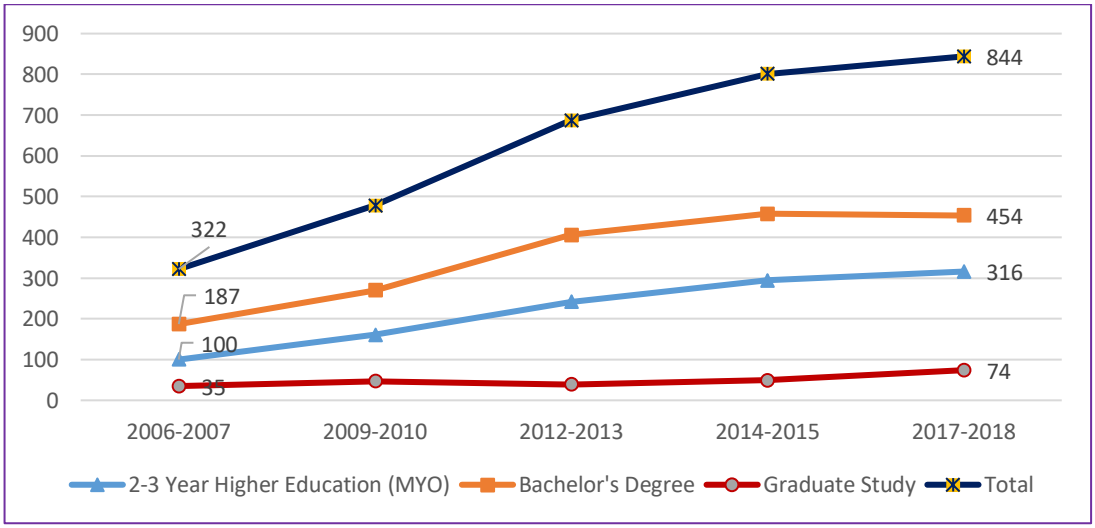

Figure 3. 1 Supply of Graduates from Higher Education in Turkey, 2006-2017
Source: Own construction based on YOK Database

Regarding the supply of graduates, one of the significant result of the expansion in higher education is that there are, annually, more than 840 thousand graduates from universities who are potentially entering to labor market.

As seen from Figure 3.1, the number of annual graduates increased from 322 thousand in 2007 to 844 thousand in 2018. The increase in number of graduates become sharper just after 2010, which corresponds to the graduation year of the state universities which were founded in 2006 and 2007.

Regarding the idle capacities of university entrance examination, as seen from Figure 3.2, the percentage of idle capacity after additional placement was around 8-10% of initial quota between 2006 and 2016. However, for the last two years the percentage of idle capacity was first increased to 35.% in 2017 and then decreased to 21.1% in 2018, which is still significantly very high and needs urgent policy actions.

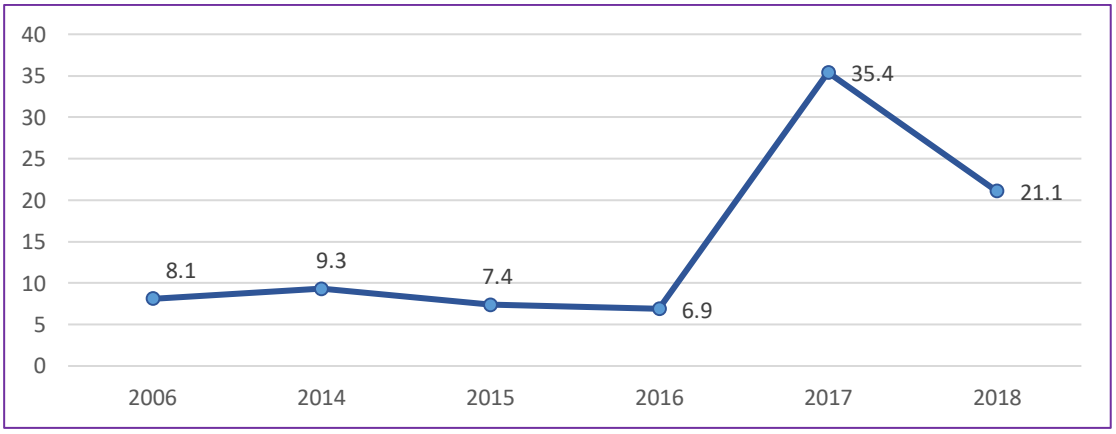

Figure 3. 2 Idle Capacity of University Entrance Examinations, 2006-2018, Formal Education Only, %
Source: Own construction based on YOK Database

Regarding the distribution of applicants, as it is known, there are four groups of applicants in university entrance exams. These are:

a. The ones who are currently attending to the last grade/year of high schools
b. Applicants who were not succeeded to place at any university or were placed but not registered
c. The ones who are currently student at any university
d. The applicants who are university graduates

As seen from Figure 3.3, there are two critical findings. The first one is that the share of university graduates in applicants increased from 2.4 % in 2006 to 8 % in 2018. This portion is very high especially for the last three years. Likewise, the share of applicants who are currently student at any university is also at an increasing trend, which is increased from 13.2 % in 2006 to 20.3 % in 2018.

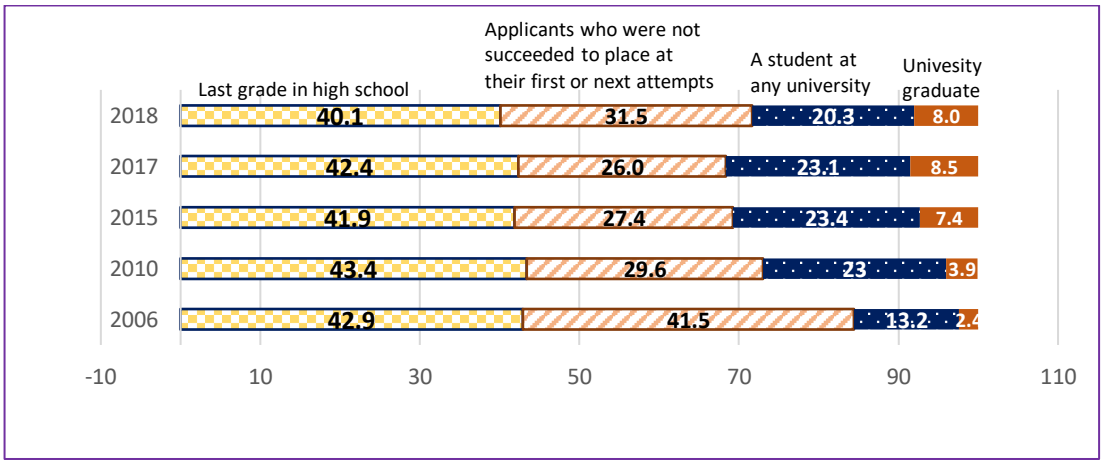

Figure 3. 3 Distribution of Total Number of Applicants to University Entrance Examination by The Education Status, 2006-2018
Source: Own construction based on YOK Database

These findings indicate that more and more university graduates and university students are not satisfied with their last field of study. Hence they are trying to change their fields of study to increase their chance of employment.

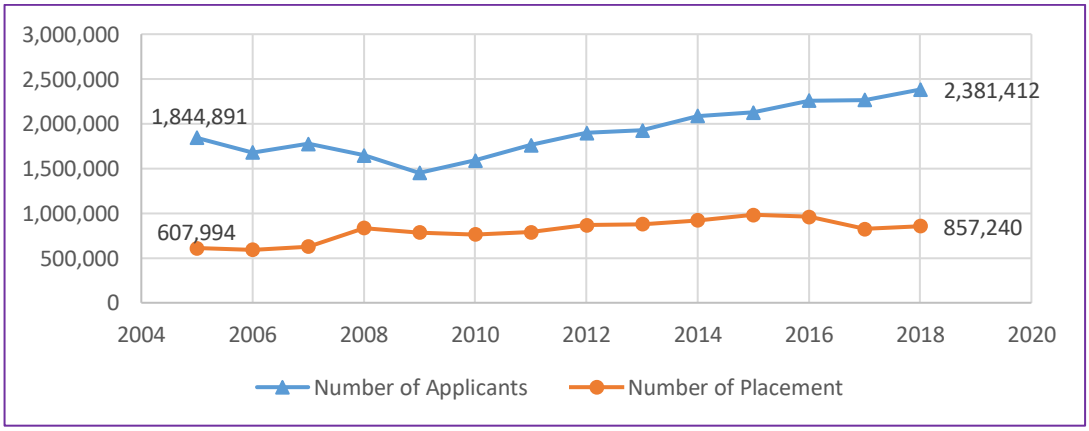

Figure 3. 4 Number of Applicants and Placement to University Entrance Exam
Source: Own construction based on YOK Database.

As a result of those three findings, as seen from Figure 3.4, the number of applicants who apply to university exam did not fall below the 1.5 million level for the last 15 years. The problem is that the gap between the number of applicants and number of placements has been increasing since 2009, with the highest gap for the last two years.

In sum, the expansion in higher education was a rationale step by the government. There has been a significant progress in terms of physical infrastructure and human resources. The national targets set for the expansion in higher education have been achieved in terms of enrollment ratios. This will increase the education level of whole population in Turkey. However, Turkey has to balance two challenging issues. The first one is keeping the quantitative expansion in balance with the quality of education. The second challenge is sustaining the harmonization between the education system and the labor market.

Regarding those challenges of expansion and its reflections, some institutional arrangements are also carried out within YOK. Some critical actions to take control of the supply side are taken. Within YOK, the Advisory Board for Quota Planning was formed officially and has already started to decrease the quotas of some education programs which are less preferred by the candidates. Moreover, to improve the role of universities in development process, the process of mission differentiation of universities was started. Some of the newly established state universities were selected as regional pioneers of mission differentiation, and some prestigious universities were selected as research universities. Furthermore, the Quality Council has been officially established under YOK to improve quality of education. However, by taking into account the aim and scope of this thesis, after analyzing in detail the labor market indicators and the field of study mismatch for each field of study on the basis of FOET-99 2-digit classification, the necessary and urgent policy measures might be taken to improve the balance between the supply and demand sides.

3.3.2. Labor Market Indicators

There are some indicators or signals in the labor markets which contribute to determine the mismatch between supply of and demand for labor force. The labor market signals that are often used are wages, employment trends according to education and occupation, unemployment rates classified according to education, qualification and occupations, costs of various education programs, education institutions, number of people registered in education programs and various courses, job-to-job movements, turnover ratio and job advertisements in newspapers and magazines (Adams et al, 1992).

In this section, employment rate, unemployment rate and inactivity rate are used as signals for an imbalance between the education system and labor market indicators.

In this context, in the first sub-section, the cross-country indicators in OECD countries are presented. Then, in the second sub-section, the same indicators will be analyzed briefly for Turkey on the basis of FOET-99 2-digit classification between 2010 and 2016 by using TURKSTAT labor force surveys.

3.3.2.1. Field Specific Labor Market Indicators in OECD Countries

In this section, the labor market indicators of Turkey are compared with those of OECD average.

Table 3. 3 Labor Market Indicators of Graduates From Higher Education by Field of Study, OECD Average and Turkey, 2016 or Latest Data Available

Country	Education	Arts and humanities	Social sciences, journalism and information	Business, administration and law	Engineering, manufacturing & construction	Health and welfare	Services	STEM	Country Average
Field Specific Employment Rates									
Turkey	71.1	66.5	68.1	72.9	78.4	78.3	71.0	76.8	75.0
OECD - Average	83.9	79.5	82.9	85.5	87.0	87.5	83.5	86.4	84.5
Field Specific Unemployment Rates									
Turkey	6.7	12.7	10.2	10.8	8.7	4.7	8.6	9.4	9.4
OECD - Average	3.9	7.6	5.8	5.3	5.0	2.9	5.3	5.3	4.5
Field Specific Inactivity Rates									
Turkey	23.8	23.9	24.3	18.3	14.1	17.8	22.3	15.4	17.2
OECD - Average	12.7	14.0	11.7	9.7	8.5	9.9	12.7	8.9	11.6

Source: Own construction based on OECD Stat Data.
Note:The classification of fields is based on OECD. The data for (i)natural sciences, mathematics and statistics, (ii) ICTs, (iii) Agriculture, forestry, fisheries and veterinary are below the publication limit in most of the countries. Hence, they are not included in OECD average. Moreover, the missing data are also deleted. The corresponding detailed figures for 22 OECD countries are presented in tabular form in Appendix B

When Table 3.3 is examined, it is very clear that Turkey has worse indicators than OECD 22-country average. Moreover, when the detailed data is examined for 22 OECD countries in Appendix B, Turkey has the worst cases in many of the fields of study. Unfortunately, for some other fields, Turkey has the second or the third worst cases.

This finding forces us to conduct a more detailed analysis for Turkey. The next section provides this analysis in all fields of study by using national TURKSTAT labor force surveys.

3.3.2.2. Field Specific Labor Market Indicators in Turkey

Table 3.4 provides three labor market indicators on the basis of each field of study for 2010 and 2016. Those rates are calculated by the author by using labor force survey data. They are not taken directly from TURKSTAT published statistics because the FOET classifications are different in 2010 and 2016.

The fields which are worse than country average is shaded for each indicator in each year. For any field, if three indicators are all worse than the corresponding country average in a year, then a "+" sign is put for this field, which means that this field might be a potential problematic field or high priority field. If a field is worse than the corresponding country average in terms of three indicators at a time for both 2010 and 2016, then this field has the highest priority while designing policies. In this context, as seen from Table 3.4;

- For higher education graduates, there are 10 fields which are in need of urgent policy actions. Those fields are grouped as "the highest priority" (3 fields of study) and "the high priority" (7 fields of study) as defined below.
- There are 3 fields which are the highest priority fields. Their employment rate, unemployment rate and inactivity rate are worse than corresponding country averages in both 2010 and 2016. In other words, they were worse than country averages in terms of 3 indicators in 2010 and have still the same position in 2016. They are:
    - 2-Arts 18-Social services
    - 19-Personal services
- After the highest priority fields are determined, the second set consists of 7 fields which are worse than the country average in terms of three indicators in 2016. In other words, they did not have worse position than country average in terms of 3 indicators in 2010 but they are now worse than the country average in 2016. Those are the fields of study which are getting worse. They are defined as high priority fields which also need further analysis. They are:
    - 3-Humanities 4-Social and behavioral science
    - 5-Journalism and information 10-Mathematics and statistics
    - 11-Computing 13-Manufacturing and processing
    - 20-Transport services and environmental protection

Table 3. 4 Labor Market Indicators of Graduates From Higher Education by Field of Study in Turkey, 2010 and 2016.

		2010			2016			Fields Which Are Worse Than Country Average in Terms of 3 Indicators at a Time		The Highest Priority Fields Which Need Further Analysis*	High Priority Fields Which Need Further Analysis**
Field Code	**FOET-99 2 Digit Classif.**	**Employment Rate**	**Unemployment Rate**	**Inactivity Rate**	**Employment Rate**	**Unemployment Rate**	**Inactivity Rate**	**2010**	**2016**		
	Country Average	**69.4**	**10.6**	**22.3**	**69.3**	**10.9**	**22.2**				
1	Teacher training and education science	64.8	8.1	29.5	67.3	7.5	27.3				
2	Arts	62.4	17.3	24.5	61.1	18.6	25.0	+	+	+	
3	Humanities	72.4	7.1	22.1	65.4	11.2	26.3		+		+
4	Social and behavioural science	69.2	9.5	23.6	64.8	12.8	25.8		+		+
5	Journalism and information	68.2	12.8	21.8	56.1	20.5	29.5		+		+
6	Business and administration	67.2	14.9	21.0	68.7	13.0	21.1				
7	Law	76.4	1.9	22.1	75.3	5.8	20.1				
8	Life Science	68.9	14.0	19.9	70.7	13.0	18.7				
9	Physical Science	65.8	12.5	24.8	70.1	11.6	20.7	+			
10	Mathematics and Statistics	68.2	8.1	25.8	66.2	12.7	24.3		+		+
11	Computing	61.3	22.9	20.4	64.9	16.7	22.2		+		+
12	Engineering and Engineering Trade	76.3	10.5	14.7	78.1	9.3	13.9				

Source: Own construction based on TURKSTAT Labor Force Surveys, 2010 and 2016.
Note: The relevant rates are calculated by the author, not taken from TURKSTAT published statistics because the FOET classification are different in 2010 and 2016. The shaded figures are the ones which are worse than the country average for each indicator in each year.
*indicates the fields which have worse position in terms of 3 indicators at a time both in 2010 and 2016.
** indicates the fields which have worse position in terms of 3 indicators at a time only in 2016, after the highest priority ones are determined

Table 3.4 Labor Market Indicators of Graduates From Higher Education by Field of Study in Turkey, 2010 and 2016. (Cont'd)

		2010			2016			The Fields Which Are Worse Than Country Average in Terms of 3 Indicators at the Same Time		The Highest Priority Fields Which Need Further Analysis*	High Priority Fields Which Need Further Analysis**
Field Code	FOET-99 2 Digit Classification	Employment Rate	Unemployment Rate	Inactivity Rate	Employment Rate	Unemployment Rate	Inactivity Rate	2010	2016		
	Country Average	**69.4**	**10.6**	**22.3**	**69.3**	**10.9**	**22.2**				
13	Manufacturing and processing	63.4	19.0	21.7	63.6	16.6	23.7		+		+
14	Architecture and building	67.9	12.1	22.8	71.4	11.3	19.5	+			
15	Agriculture, forestry and fishery	67.1	12.0	23.7	70.8	11.5	20.0	+			
16	Veterinary	86.8	4.2	9.5	85.1	5.0	10.4				
17	Health	84.5	2.1	13.6	77.3	6.1	17.7				
18	Social Services	55.6	11.8	37.0	51.8	21.0	34.5	+	+	+	
19	Personal Services	61.7	15.5	27.0	66.3	13.6	23.3	+	+	+	
20	Transport services and environmental protection	71.0	10.2	21.0	55.9	22.4	28.0		+		+
21	Security services	81.1	1.6	17.6	75.4	3.8	21.6				

Source: Own construction based on TURKSTAT Labor Force Surveys, 2010 and 2016.
Note: The relevant rates are calculated by the author, not taken from TURKSTAT published statistics because the FOET classification are different in 2010 and 2016. The shaded figures are the ones which are worse than the country average for each indicator in each year.
*indicates the fields which have worse position in terms of 3 indicators at a time both in 2010 and 2016.
** indicates the fields which have worse position in terms of 3 indicators at a time only in 2016, after the highest priority ones are determined

3.4. Concluding Remarks

In this chapter, the preliminary consequences of expansion in higher education is presented. It covered only the higher education graduates. The basic findings reveal that Turkey has been facing an expansion in higher education since 2006 by increasing the number of universities and quotas of entrance examinations. As a result, this expansion has caused the following preliminary consequences.

- The number of graduates who are potentially entering into the labor market increased sharply from 322 thousand in 2006 to 844 thousand in 2018.
- More than 20 % of initially announced quotas was left idle and not preferred by the students especially for the last two years.
- Among the applicants of university entrance exam, the share of university students increased from 13.2 % in 2006 to 20.3 % in 2018. Likewise the share for university graduates increased from 2.4 % to 8.%.

Moreover, it is found that;

- Turkey has lower employment rate, higher unemployment rate and higher inactivity rate than that of OECD average. More specifically, in some fields of study, Turkey has the worst cases among all 22 OECD countries.
- Within Turkey, there are 3 fields which have the highest priority because they were worse than the country average in terms of three indicators in both 2010 and 2016.

As a result, it can be claimed in this thesis that, as claimed in previous empirical literature by Wolbers (2003), Flisi et al (2014), Montt (2015 and Verhaest et al (2017);

- The sharp increase in supply of graduates might be a significant signal for an imbalance between the supply and demand sides.
- There is a clear resistance to some fields of study by the applicants.
- The quantitative imbalance between the supply and demand sides can worsen the labor market indicators especially for some fields.

Moreover, Montt (2015) claimed that field of study mismatch is not an individual outcome or one that results uniquely from workers' choice, but it is responsive to the broader labor market context. As a result, the above findings can be considered as critical signals for field of study mismatch. Hence, improving the harmony between the education system and labor market by balancing the supply of graduates and improving the effectiveness of labor market mechanism is thought to be critical policy implications.

CHAPTER 4

MEASURING AND ANALYZING INCIDENCE OF FIELD OF STUDY MISMATCH IN TURKEY

This chapter deals with the measurement and analysis of incidence of field of study mismatch and vertical mismatch.

There are five sections. First, the previous empirical findings regarding field of study mismatch and vertical mismatch for Turkey are presented by conducting a literature survey. The second section provides the data and methodology of the chapter. Then, field of study mismatch is measured by employing job analysis method. For this purpose, the coding scheme[3] which was originally developed by Wolbers (2003) and updated by Montt (2015) is used. The field of study mismatch is measured for wage-based employees who are graduated from (i) higher education, (ii) vocational and technical high schools and (iii) sum of them. The data source is TURKSTAT labor force surveys for the period between 2012 and 2016. The analysis of incidence of mismatch is conducted with respect to two dimensions. The first one covers the change in incidence of field of study mismatch over time on the basis of FOET-99 1-digit and 2-digit classifications where there are 8 and 21 fields of study respectively. The second dimension provides basic findings with respect to some individual and job-specific characteristics such as age-group, gender, type of work place, firm size, contract type, permanency of job and NUTS1 regions. The fourth section is about vertical mismatch. It is measured by employing the realized matches method, which is an objective method, on the basis of ISCO-08 occupation codes. The data source is TURKSTAT 2016 labor force survey, and consists of the sum of graduates from vocational and technical high schools and higher education who are working as wage-based employees. The final section provides the concluding remarks of the overall chapter.

[3] It is a matrix in which there are two dimensions. The first one is the FOET-99 classification for fields of study. The second one is ISCO codes for occupation groups. This matrix shows the occupations in which the graduates from a particular field of study can work as a well-match. If a graduate works in an occupation group which is outside this coding scheme, then she/he is treated as field of study mismatch. The definition of coding scheme, FOET and ISCO is provided in section 2.2.1.3 Job Analysis Method in chapter 2 and section 4.3. Measuring and Analyzing Incidence of Field of Study Mismatch in Turkey in chapter 4.

4.1. Previous Empirical Studies on Turkey

There is a dearth of literature on field of study mismatch. Sellami et al. (2018) listed only 21 researchers who studied field of study mismatch. In addition to those researchers, Quintini (2011b), Montt (2015), OECD (2016) and Montt (2017) are the other leading studies. Most of those studies used worker self-assessment method to measure this mismatch. However, the recent literature preferred to use coding scheme which is a type of job analysis method. Some of them used national data sources and some other made cross country analysis. As a result, they found different incidence level of field of study mismatch.

In this limited literature, to the best of my knowledge there are only six studies which include Turkey. Some of those studies focus only on Turkey by using national data, and some of them included Turkey while conducting cross-country analysis. These six studies are Galasi (2008), Filiztekin (2011), Barlett (2013) Mercan et al (2015), Quintini (2011b) and OECD (2016). Vertical mismatch is measured and analyzed in all of them. However, only two of them studied incidence of field of study mismatch. These are Quintini (2011b) and OECD (2016). They studied both the incidence of field of study mismatch and vertical mismatch at the same time. Galasi (2008), Filiztekin (2011) and Mercan et al (2015) analyzed only the vertical mismatch. Barlett (2013), on the other side, by employing a different measurement method for vertical mismatch, conducted a cross-country analysis for only five countries including Turkey.

For those six studies, first, the basic findings of vertical mismatch are provided briefly. Then the empirical findings for field of study mismatch and its association with vertical mismatch are presented.

4.1.1. Empirical Findings Including Vertical Mismatch

Galasi (2008), using European Social Survey data of 252 workers in Turkey, applied a subjective measurement method of worker self-assessment method. He studied overeducation in European countries. This study also included some observations for Turkey by using 2005 European Social Survey. His dataset was consisting of only a small sample of workers, which was 252 individuals for Turkey.

For Turkey, he reported that the share of Turkish workers who think that they are overeducated was 27.4% which is lower than the European average of 32,9%. Moreover, on average, the incidence of the undereducated was 59,1 % with important cross-country differences ranging from 12,9 % to 82%, whereas the figure for Turkey was found to be 70,8%.

Filiztekin (2011) is the first paper that examined the vertical mismatch issue specifically for Turkey. He applied an objective method, which is realized matches method. By using realized data from the 1994 and 2002 Household Budget and Expenditure Surveys, he measured the incidence of vertical mismatch in Turkey, and analyzed its possible causes and consequences. His dataset consisted of 16.375 individuals. He focused only on the country averages and did not differentiate his study among the fields of study or occupations

He used the measurement methods of both the mean and mode of education level for comparison sake. The mode of education level method generated higher values when compared to the method of average years of schooling. In 1994, 20,3% of workers were found to be overeducated and 16.5% were undereducated by using the modal method. The findings for overeducation and undereducation in 2002 were 24.6 % and 14.7 %, respectively. The incidences are much smaller, 13.4% and 9.9%, respectively, when mean method is used. The findings for overeducation and undereducation in 2002 were 15.1 % and 9.6 %, respectively.In this method, as a threshold value for required education level, one standard deviation from the average years is used.

Barlett (2013), on the other side, by employing a different measurement method for mismatch, conducted a cross-country analysis for only five countries including Turkey. He used each country's 2005-2010 labor force surveys and defined mismatch by comparing the share of unemployed people with a given ISCED education level to the share of employed people with the same level of education.

Mercan et al (2015) studied the vertical mismatch for Turkey. They applied an objective method by employing realized data from the 2009 Household Labor Force Survey covering a total of 145,934 individuals, reported the results for 27 sectors and explained the differences among these sectors. Their measurement was based on the mean level of schooling with one standard deviation threshold.

They are the first researchers who investigated the existence of undereducation and overeducation problems within 27 sectors in the Turkish labor market. The sectorial occupation category was formed on the basis of ISCO-88 occupation codes.

Table 4.1 provides the main findings for incidences of overeducation and undereducation for each occupation group. When the findings are analyzed;

- The overeducation levels range from zero to 36.58% and the undereducation level ranges from 0.65% to 39.97%. In short, for some different occupations the mismatch levels are more than 30%. According to Mercan et al (2015) these results indicate the

presence of inefficiencies in the job searching and matching processes in the Turkish labor market.

Table 4. 1 Summary of a Previous Study Including Incidence of Overeducation and Undereducation for 27 Occupation Groups, Turkey, 2009

Occupation Group	Overeducated %	Undereducated %
Physical and engineering science associate professionals	36.58	21.42
Other associate professionals	35.61	22,01
Stationary plant and related operators	35.56	3,36
Customer services clerks	32.67	23.51
Metal, machinery, and related trade workers	31.53	1,97
Office clerks	29.99	18.86
Machine operators and assemblers	23.96	5,28
Drivers and mobile plant operators	22.13	1,37
Laborers in mining, construction, manufacturing, and transport	21.32	9,32
Precision, handicraft, craft printing, related trade workers	20.98	7,29
Extraction and building trade workers	19.0	6,27
Teaching associate professionals	18.,32	6,57
Sales and services elementary occupations	15.21	11,24
Other craft and related trade workers	15.13	9,05
Managers of small enterprises	13.63	2,63
Subsistence agricultural and fishery workers	12,87	39.97
Personal and protective services workers	10,85	3,75
Agricultural, fishery, and related laborers	7,80	25.92
Market-oriented skilled agricultural and fishery workers	7,49	24.59
Models, salespersons, and demonstrators	0,00	32.75
Life science and health professionals	0,00	0,65
Teaching professionals	0,00	0,86
Physical, mathematical, and engineering science professionals	0,00	1,48
Life science and health associate professionals	0,00	6,37
Corporate managers	0,00	8,46
Other professionals	0,00	19,02
Legislators and senior officials	0,00	33.1

Source: Own construction based on Mercan et al (2015)

- For some occupation groups, both the undereducation and overeducation levels are interestingly jointly very high. (i.e. physical and engineering science associate professionals, other associate professionals). Mercan et al (2015) claimed that the most probable reason for these mismatches mainly arises from the definition of "associate." They stated that employment in a so-called associate position may demand either an impressive educational background or basic education with good

craftsmanship skills in similar sectors. Thus, the concept of "associate" is open to debate in the Turkish economy, where job definitions and classification requirements are quite insufficient.

- For some white collar occupations, there is high level of undereducation, which is not expected. For example, legislators and senior officials has very high level of undereducation. It is expected that education levels for this group should be more homogenous. According to Mercan et al (2015) this result is probably due to its cultural background that gives utmost importance to family ties and personal relations. However, it might also be because of the misunderstanding of scope of this occupation's definition.
- There is not any vertical mismatch, over or undereducation in the life science and health professionals group, the teaching professionals group, the physical, mathematical, and engineering science professionals group, the life science and health associate professionals group, and the corporate managers group. In these occupations, both the undereducation and overeducation levels are very low or zero. These sectorial job categories are well regulated by laws and strictly controlled by the authorities. Moreover, these findings might be related to the specialization of their education programs where their skills are difficult to be transferred to other fields or occupations.
- For some blue collar occupations, the overeducation exists highly. Mercan et al (2015) claimed that this situation stems mainly from the number of newly graduated students who have failed to find appropriate white-collar positions and reluctantly accept blue-collar jobs that do no match their education level.
- The zero overeducation level in "other professionals" group seems to be questionable since its undereducation level is 19.02%. The authors claimed that this finding most likely stems from the unclear definition of the "other professionals" group, which contains professions that are not described in depth.

The authors recommended that sectors in which high levels of undereducation persist should be under strict regulation to provide a sufficient level of educational attainment within these job groups; and in the case of overeducation, both the public and private sector should take part in developing simple, but efficient job-person matching systems.

Quintini (2011b) measured incidence of vertical mismatch, by employing an objective method, which is the mode of education level to define the measure of required education and is

calculated separately for each country. In her study, both the employees and self-employed workers are included.

She found that, in 2005, on average across OECD countries for which data are available, 25.3% of workers were overeducated and 22.2% were undereducated.

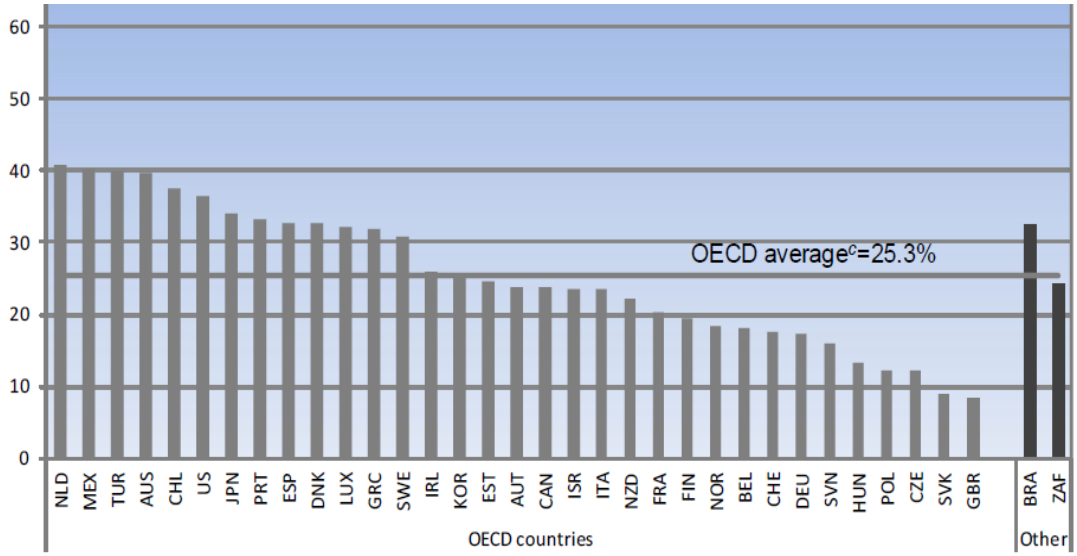

Figure 4. 1 Incidence of Overeducation, OECD Countries, 2005
Source: Quintini (2011b)

When Figure 4.1 is examined, it is seen that across OECD countries, Australia, Turkey, Mexico and the Netherlands have the highest incidence of overeducation. According to Quintini (2011b), this is largely due to the fact that post-secondary non-tertiary graduates in occupations that require upper secondary qualifications contribute significantly to the incidence of overeducation. United Kingdom and a number of Central and Eastern European countries have the lowest incidences. It is also noteworthy that Austria, Germany and Switzerland which have a long tradition of vocational training experience have below-average incidences of overeducation.

OECD (2016), measured vertical mismatch by employing a subjective method, which is workers' self-assessment reports for required level of education. PIAAC data of 2012 and 2015 for two rounds were used for the measurement and analysis. It was reported that, on average, 22% of workers are overeducated while about 13% are undereducated.

As seen from the Figure 4.2, the prevalence of vertical mismatch varies significantly across countries. The share of overeducated workers ranges from less than 15% in Italy, Jakarta (Indonesia), Slovenia and Turkey, to around 33% in France, Israel, Japan and New Zealand.

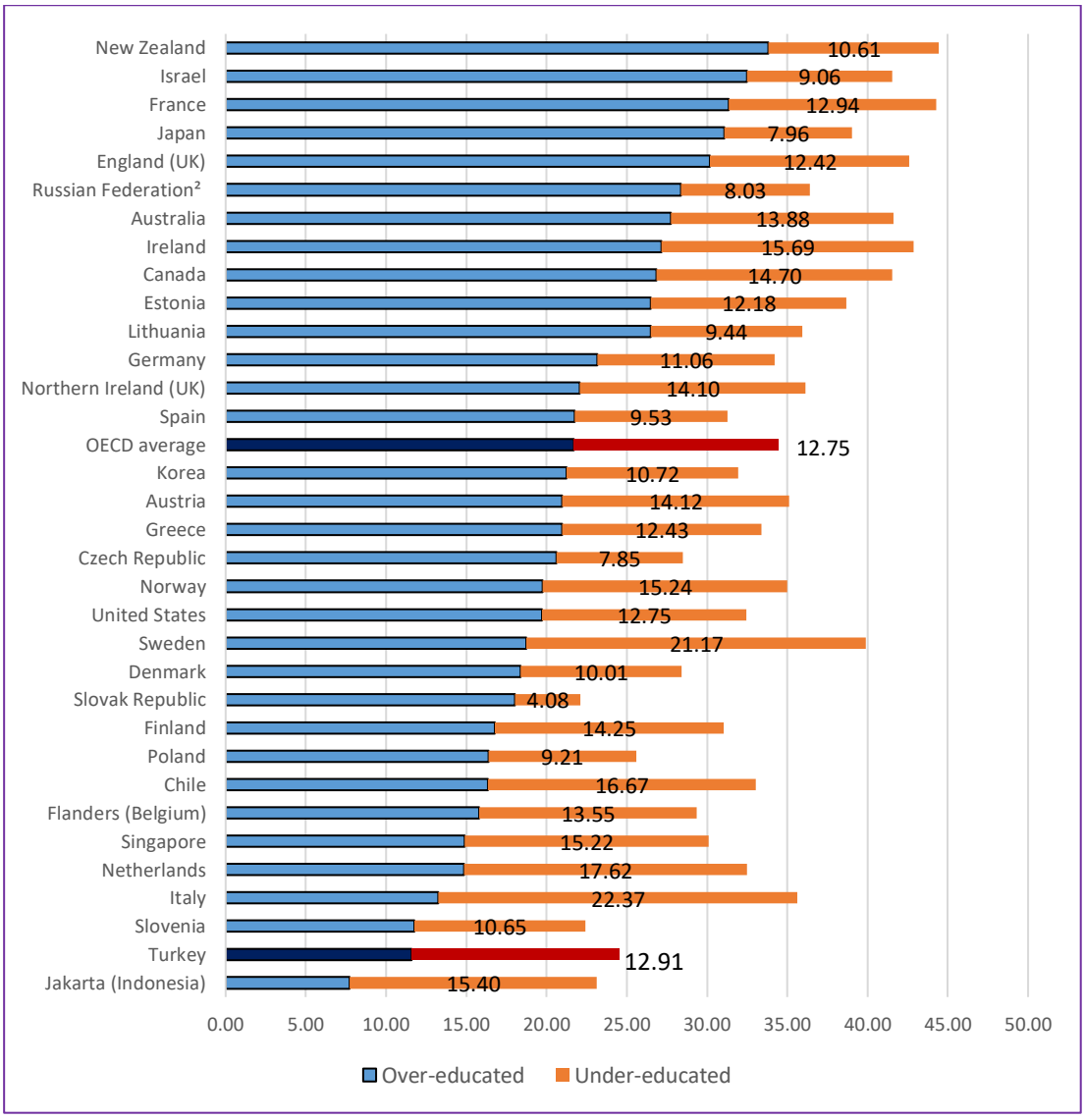

Figure 4. 2 Incidence of Overeducation and Undereducation, OECD PIAAC Countries
Source: Own Construction Based on OECD (2016)

The prevalence of undereducation is the lowest in the Czech Republic, Japan and the Slovak Republic. It varies between less than 10% in Lithuania and Israel to more than 15% in Chile, Italy, the Netherlands and Sweden. According to OECD (2016) this might reflect the rapid growth in educational attainment and the fact that workers today need higher qualifications to enter jobs that were previously accessible to workers with lower qualifications. The prevalence

of overeducation may also be the result of economic cycles: under favorable labor market conditions or full employment, employers seeking employees may recruit less-qualified workers to meet the demand at a given wage rate.

4.1.2. Empirical Findings Including Field of Study Mismatch

There are only two studies regarding field of study mismatch. These are Quintini (2011b) and OECD (2016). Quintini (2011b) measured field of study mismatch by using Wolber's (2003) coding scheme. She, then measured the overlapping mismatch, i.e. the share of workers who are also overeducated.

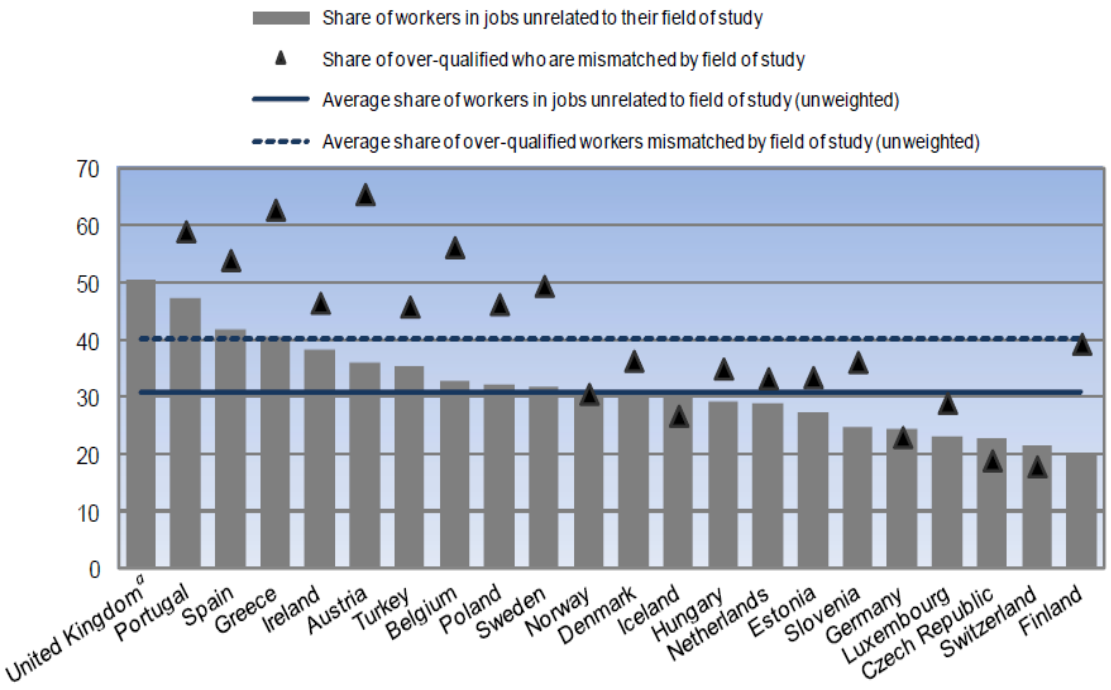

Figure 4. 3 Incidence of Field of Study Mismatch and Its Overlapping Mismatch by Vertical Mismatch, OECD Countries,2005
Source: Quintini (2011b)

As seen from Figure 4.3, on the average, across 22 OECD countries, 31% of workers hold jobs in areas that are unrelated to their field of study and among those mismatched workers 40% of them are overeducated. However, these values vary significantly across countries. United Kingdom, which is known as having a rather general education programme and the southern countries such as Spain, Greece and Portugal have the highest level of incidences of field of study mismatch. On the other side, the countries which have strict vocational education systems have lower level of incidences of field of study mismatch. For Turkey, almost 37 %

of workers are mismatched by field of study, which is more than the average level. More than 45% of those mismatched workers are also overeducated, which is also above the average level of 40%.

OECD (2016) followed the coding scheme which is updated by Montt (2015) to measure field of study mismatch in a cross-country context by using PIAAC data.

As shown in Figure 4.4, on average across OECD countries, 40% of workers are mismatched by field of study. Field of study mismatch is largest in Chile, England (United Kingdom), Italy, Jakarta (Indonesia), Korea and New Zealand, with values around 50%. By contrast, the least prevalence of mismatch is found in Austria, Finland, Germany and Slovenia, where fewer than 30% is mismatched by field of study. In these countries, the likelihood of mismatch is restricted to some extent by their strictly structured vocational and technical education system. For Turkey, the field of study mismatch is 43,7%, that is more than OECD average.

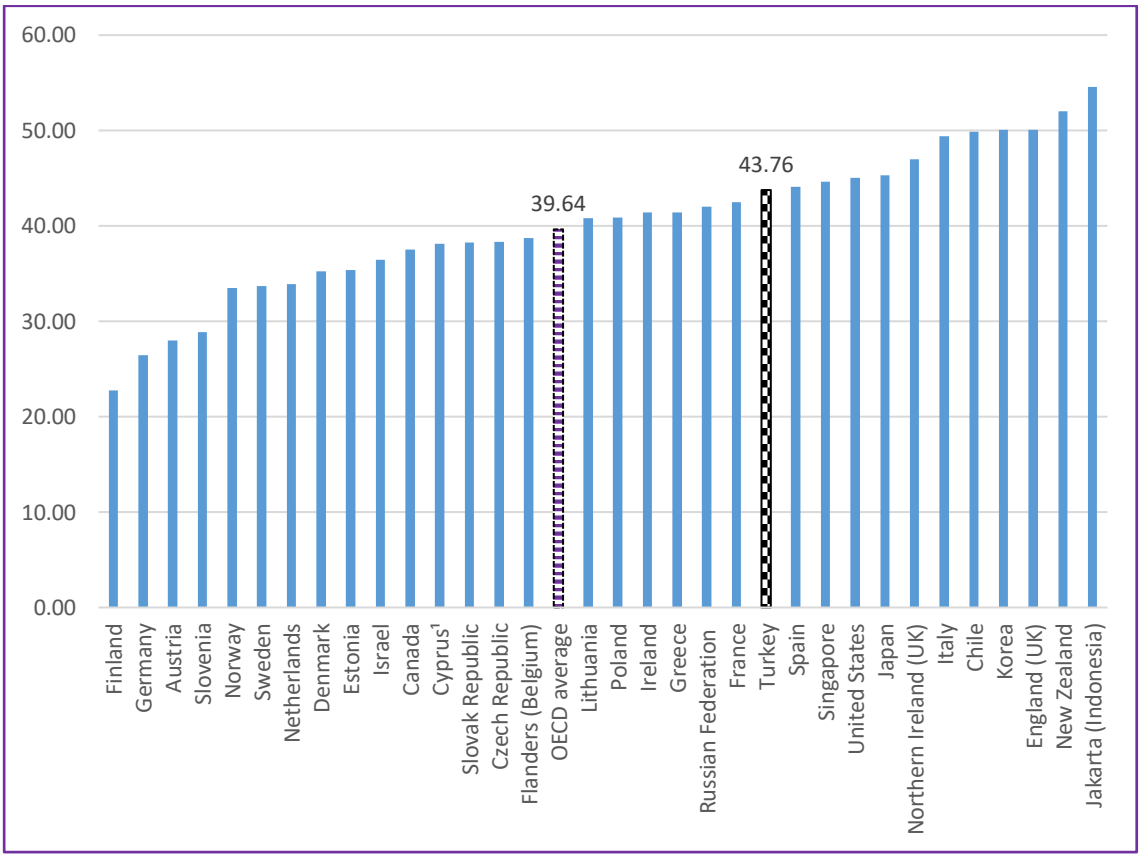

Figure 4. 4 Incidence of Field of Study Mismatch-OECD Countries, PIAAC Data 2012 and 2015
Source: Own Construction Based on OECD (2016)

Regarding overlapping mismatches, overeducation tends to be associated with field of study mismatch in Chile, England (United Kingdom), Israel, Italy, Korea, Singapore and Turkey (Figure 4.5). In these countries, more than 50% of overeducated workers are also mismatched by field of study.

According to OECD (2016), this raises questions about the capacity of workers to find jobs in their field and to transfer their skills to other sectors. In Finland, Germany and Austria, less than one third of overeducated workers are also mismatched by field of study. In these countries, the education system is strictly structured on the basis of vocational education which limits the level of field of study mismatch.

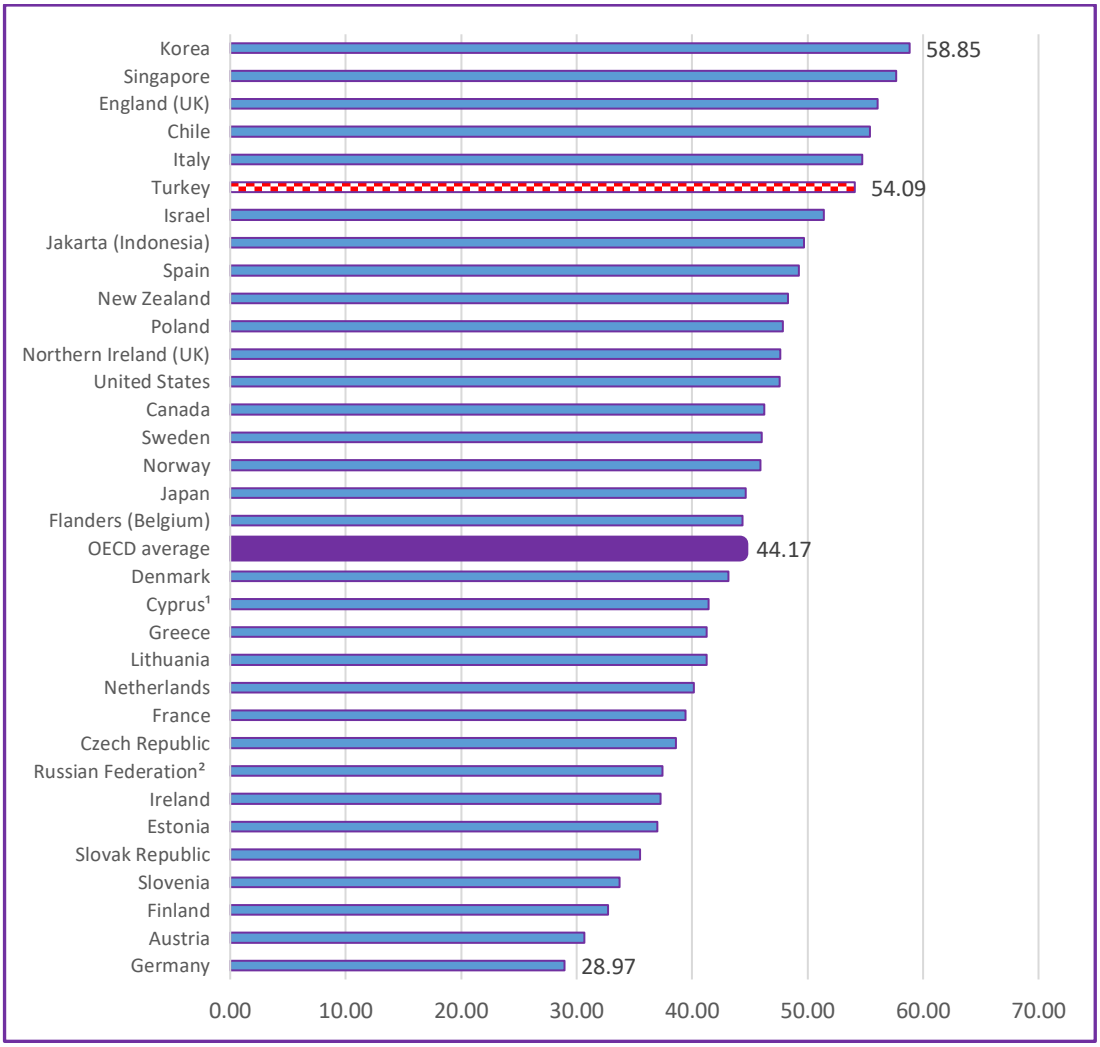

Figure 4. 5 Decomposition of Overeducated Workers by Field of Study Mismatch, OECD PIAAC Countries, 2012 and 2015
Source: Own construction based on OECD (2016)

When Figure 4.5 and 4.6 are compared, it is found that while on the average, almost one half of overeducated workers are also mismatched by field of study, only one fourth of field of study mismatched workers are also overeducated. This might trigger the discussion that overeducation is one of the significant determinant of field of study mismatch or vice versa.

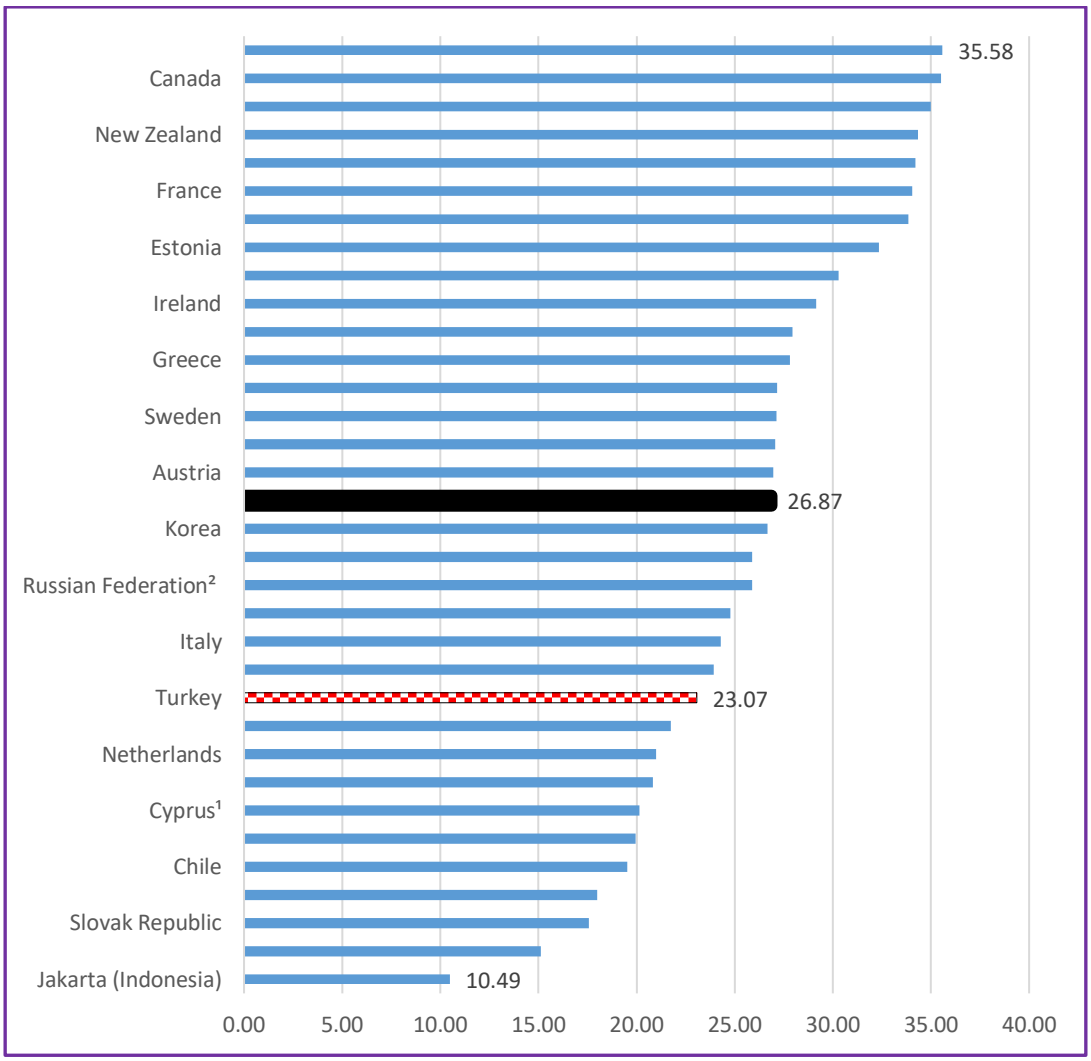

Figure 4. 6 Decomposition of Field of Study Mismatched Workers by Overeducation, OECD PIAAC Countries, 2012 and 2015
Source: Own construction based on OECD (2016)

OECD (2016) analyzed the field of study mismatch only for country average, not on the basis of each field of study. If it is analyzed on the basis of each field of study, we will see that some categories will be above the country average and some others will be under it since Montt (2015) has already showed that situation. Montt (2015) presented the incidences for each of eight fields by using 2012 data of PIAAC survey. Turkey did not take place in his study. I

strongly support his explanation for higher incidences that the most effective factor would be the high saturation levels of some fields of study in labor market. In other words, for some fields of study, if the ratio of unemployed graduates from a field of study to total number of graduates from that field is high, then it is more likely to be mismatched by that field of study. To provide some further insights, his findings are presented in Figure 4.7.

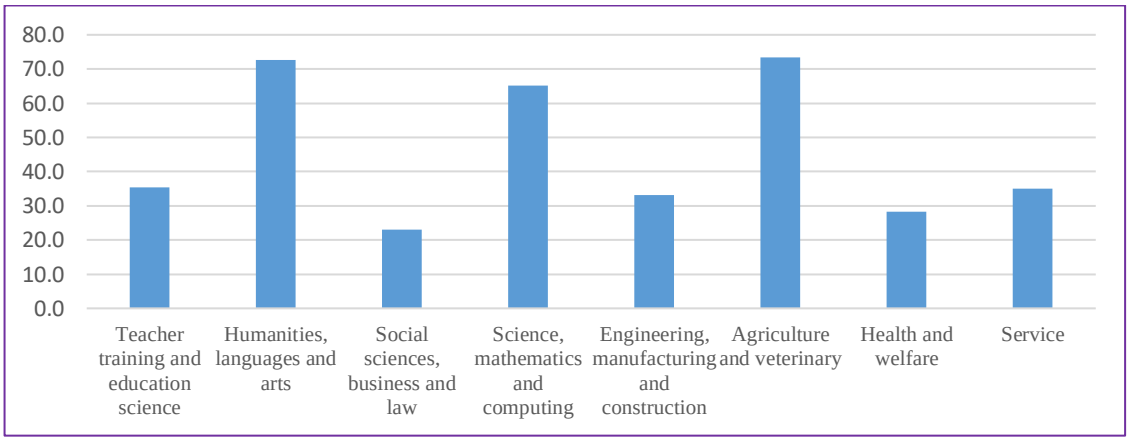

Figure 4. 7 Incidence of Field of Study Mismatch by Field of Study, OECD Average of PIAAC 2012 Survey Countries (FOET-99 1-Digit Classification)
Source: Own Construction based on Montt (2015)

4.1.3. Summary of the Empirical Findings on Turkey

In this section, the basic findings of the previous studies that include Turkey was presented. There are very few studies which include Turkey. There are six studies which include Turkey. Vertical mismatch is measured and analyzed in all of them. However, only two of them cover field of study mismatch of Turkey. These are Quintini (2011b) and OECD (2016). They analyzed the incidence of vertical mismatch, field of study mismatch and their overlapping mismatches at an international perspective to make cross-country comparisons. The interesting point is that Turkish researchers did not study field of study mismatch.

Quintini (2011b) found that Turkey has an incidence of 37.0%. The finding for Turkey in OECD (2016) is 43,7%. Both are above OECD averages. They indicate that the incidence of field of study mismatch is high at an increasing trend. Another problematic point is that the share of field of study mismatched workers among the overeducated workers is very high. It is 54,4%, which is above the group average.

The progress of mismatch can be analyzed over time by comparing two different studies which used the same measurement method at two different times.

Regarding the vertical mismatch, Table 4.2 provides the comparison of findings by Galasi (2008) and OECD (2016) both of which used the subjective measurement method of worker's self-assessment but from different data bases.

Table 4. 2 Comparison of Incidences of Vertical Mismatch for Two Different Studies Using the Same Measurement Method of Self-Assessment Reports, Turkey and Some OECD Countries

	Overeducation %		**Undereducation %**	
	Galasi (2008)	OECD (2016)	Galasi (2008)	OECD (2016)
Turkey	**27,9**	**11,5**	**70,8**	**12,9**
Finland	52,6	16,7	39	14,2
Greece	77,1	20,9	18,2	12,4
Germany	19,5	23,1	71	11
France	26,6	31,3	65,3	12,9
Austria	46,7	20,9	34,5	14,1
Spain	50,2	21,7	44,3	9,5
Netherlands	14,7	14,5	82	17,6

Source: Own construction based on Galasi (2008) and OECD (2016)
Note: Galasi (2008)) used the data from 2005 European Social Survey; OECD (2016) used the data from 2012 and 2015 PIAAC surveys. Both employed the worker self-assessment method for measuring mismatch..

As seen from Table 4.2, the overeducation decreased over time except for Germany and France. For Turkey, overeducation also decreased. However, the decrease is very sharp for Greece, Finland, Austria and Spain. The general decrease over time might be because of two reasons. The first one is the underestimation of overeducation in any of those studies. In the self-assessment reports, as McGuinnes (2006) stated, the respondents are more likely to give biased responses which produce underestimation of overeducation. The level of underestimation can be affected by the bias which is associated with the overall country level economic situation or level of unemployment ratios at the time of survey. The second reason might be the change in job requirements depending on the technological developments over time. As OECD (2016) stated before, workers today need higher qualifications to enter jobs that were previously accessible to workers with lower qualifications. Moreover, the supply of graduates from higher education has been increasing worldwide, which can cause a shift of worker composition from lower education level to higher level in the existing occupation groups.

Regarding the field of study mismatch, Table 4.3 presents the comparison of findings by Quintini (2011b) and OECD (2016) both of which used the same measurement method of coding-scheme but from different data sets at different times.

Table 4. 3 Comparison of Incidences of Field of Study Mismatch for Two Different Studies Using the Same Measurement Method of "Coding Scheme", Turkey and Some OECD Countries

	Field of Study Mismatch %		Overlapping Mismatch: % of Overeducated Among Field of Study Mismatched	
	Quintini (2011b)	OECD (2016)	Quintini (2011b)	OECD (2016)
Spain	41	44	52	34
Greece	40	41	61	28
Austria	36	28	64	27
Turkey	**37**	**44**	**45**	**23**
Germany	21	26	20	27
Finland	20	22	39	25

Source: Own construction based on Quintini (2011b) and OECD (2016)
Note: Quintini (2011b) used the data from 2005 European Survey of Working Conditions; OECD (2016) used the data from 2012 and 2015 PIAAC surveys. Quintini (2011b) employed Wolbers (2003) coding scheme for measurement of field of study mismatch.OECD (2016) employed Montt's(2015) updated coding scheme.

As seen from Table 4.3, it is very clear that there is an increase over time except for Austria. Moreover, the countries such as Germany and Finland whose education system is strictly structured on vocational education, not on a general programme have lower incidence levels. The increase might stem from either the unbalanced expansion of higher education or unfavorable labor market conditions. For example, the saturation level for some fields might be very high which cause graduates to search jobs in other fields.

When the share of overeducated workers among the field of study mismatched workers is examined, it is clear that there are remarkable decreases (except for Germany) for all countries over time. The degree of this decrease looks like unusual. The most effective reason may be the type of methodology used to measure the vertical mismatch. As mentioned before, Quintini (2011b) used the mode method and OECD (2016) used self-assessment report for measuring vertical mismatch. Moreover, by mathematically saying, the increasing incidence levels for field of study mismatch and decreasing incidence level of overeducation makes the share of overeducated among field of study mismatched workers smaller over time as expected.

The key findings for Turkey from the previous empirical studies are summarized in Table 4.4.

Table 4. 4 The Incidence Levels of Turkey from Different Studies: Vertical Mismatch, Field of Study Mismatch and Overlapping Mismatches

Name of the Study	Data Source	Measurement Method	Data Year	Incidence Levels %				
				Over-education	Under-education	Field of Study Mismatch	% of Field of Study Mismatch Workers Among Over-educated Ones	% of Over-educated Workers Among Field of Study Mismatch Ones
1- Quintini (2011b)	European Survey of Working Conditions	Mode of Years of Education for Vertical Mismatch Coding Scheme for Field of Study Mismatch	2005	OECD Avg: 25,3 Turkey: 40,0	OECD Avg: 22,2 Turkey: 4,0	OECD Avg: 31,0 Turkey: 37,0		OECD Avg: 40,0 Turkey:45,0
2- OECD (2016)	PIAAC Survey	Self-assessment Reports for Vertical Mismatch Coding Scheme for Field of Study Mismatch	2012 and 2015	OECD Avg:21,7 Turkey: 11,5	OECD Avg: 12,7 Turkey: 12,9	OECD Avg: 39,6 Turkey: 43,7	OECD Avg: 44,1 Turkey: 54,1	OECD Avg: 26,8 Turkey: 23,1
3- Galasi (2008)	European Social Survey	Subjective worker self-assessment method	2005	27,4	70,8			
4- Filiztekin (2011)	TURKSTAT Hosehold and Expenditure Survey	Mean of Years of Education	1994	13,4	9,9			
			2002	15,1	9,6			
		Mode of Years of Education	1994	20,3	16,5			
			2002	24,6	14,7			
5- Mercan et al (2015)	Turkey TURKSTAT Labor Force Survey	Mean of Years of Education	2009	0 to 36,5 for different occupations	0,65 to 39,9 for different occupations			

Source: Own Construction Based on the Aforementioned Studies
Note: Barlet (2013) is not included in the table because he employed a different measurement method which is not comparable

4.2. Data and Methodology for Measuring Field of Study Mismatch

The following subsections present the data and how the field of study is measured.

4.2.1. Measuring Field of Study Mismatch in Turkey

Field of study mismatch is measured by employing job analysis method. In this context, the coding scheme which was developed by Wolbers (2003), and updated by Montt (2015) is used.

The basic approach is to use a coding scheme. It is a matrix which shows the occupation codes in which the graduates from a particular field can work as a well-match. The well-match matrix is prepared by job-analysts and it shows the well-matched occupations according to fields of study. In other words, it compares the education and training received by the worker and the type of job she/he performs. It requires precise categorizations of the jobs held by workers and the education (Montt, 2015). Hence, for making coding scheme, two dimensions are required. The first dimension is the field of study and the second dimension is the occupation codes.

For the field of study dimension, FOET-99 classification is used which is valid for only the fields of study which are based on occupational groups. It is only available for the vocational and technical high schools and higher education because these type of schooling prepares individuals directly for the occupations. Therefore, FOET-99 classification covers only these two levels of education, not the general high schools or lower secondary or primary schools.
There are 9 categories of field of study in FOET-99 1-digit classification. However, the first category of education which is "general programmes" is excluded from this coding scheme because it is not based on any occupation.
For the occupation codes, International Standard Classification of Occupations (ISCO) codes is used. The ISCO codes have been updated depending on the technological or global developments. ISCO-08 code has been in use since 2008. Before that, ISCO-88 was used.

Wolbers (2003) and Montt (2015) used three digit ISCO codes and FOET-99 1-digit classification in their coding schemes for measuring field of study. For example, Montt (2015) determined that the graduates from humanities, languages and arts can work in ISCO 231-233, ISCO 216, ISCO 262-265, ISCO 341 and ISCO 343 occupation codes. If any graduate from humanities, arts and languages works in an occupation which is outside this coding scheme, then she/he is considered as field of study mismatch (Appendix A).

In this thesis, three digit ISCO-08 codes are not used because the ISCO-08 data is available in two digits in TURKSTAT labor force surveys. Therefore, this thesis develops its own coding scheme by aggregating three digit codes into two digit ones. However, aggregating three digit

occupation codes into two digit codes will generate more well-matched cases which in turn generates lower incidence of field of study mismatch when compared to the results of OECD (2016). Hence, this is one of the most significant limitations in measuring field of study mismatch when using TURKSTAT data. In other words, this thesis claims that the incidence of field of study mismatch would be much higher if three-digit occupation codes were available in labor force surveys.

As a demonstration, the incidence of field of study mismatch is calculated as follows. If, for example, there are 42.494 individuals in our target sample (Table 4.5) and 12.890 of them are found to be mismatched by field of study, then the incidence of mismatch is calculated as dividing mismatched ones by the sample size, which is ((12.890/42.494)*100) = 30.3 %.

4.2.2. Limitations on Data

As mentioned above, for measuring field of study mismatch, there are two dimensions in designing coding scheme. The first dimension is the field of study and the second dimension is the occupation codes. After reviewing the availability and structure of labor force survey data, annual data coverage for measuring field of study mismatch is as follows.

For field of study, the FOET-99 classification was started to be used in Turkey in 2009. However, later in 2013, International Standard Classification of Education (ISCED) fields of education and training-2013 was published. The new classification includes 22 fields (2-digit classification) whereas it was 21 in FOET-99. This new classification has been used in Turkey since 2014. The two classification (FOET-99 and ISCED-F-2013) were used together in 2014 and 2016 surveys. FOET-99 did not take place in the surveys starting from 2017. Montt (2015) used FOET-99 classification because ISCED-13 was not published at the time when PIAAC surveys were prepared. As a result, since coding scheme which is used to measure field of study mismatch depends on FOET 99 classification, the data will cover at most the period 2009-2016. In other words, since FOET-99 was used between 2009 and 2016, the largest range for data can be 2009-2016.

For the occupation codes, Wolbers (2003) used ISCO-88 code. After ISCO-08 was published, Montt (2015) updated this coding scheme according to ISCO-08 codes. However, the new ISCO-08 codes has been in use in Turkey since 2012. Since Montt's (2015) coding scheme is used in this thesis, the data can not involve surveys of 2009, 2010 and 2011. Therefore, the data is narrowed to the period 2012-2016

Appendix A presents FOET 99 1-digit and 2-digit classification of fields of study; ISCO-08 codes; Wolbers's (2003) and Montt's (2015) three digit original coding scheme.

4.2.3. Decomposition of Whole Sample Size to Reach Target Group

The following steps are carried out to reach the target group. The following steps are common for each survey year but the figures given at each step belong to 2016 survey as a demonstration.

a. Since the mismatch phenomenon is based on the employed ones, the respondents who are unemployed and not in labor force are excluded. In 2016, the whole sample size of TURKSTAT Labor Force Survey includes 380.709 individuals who are aged 15 and over. Among those, 171.402 respondents are employed.

b. Then, among the employed ones, the employed sample size is further decomposed by latest school completed. Within this context, the main focus is on the graduates from vocational and technical high schools and higher education. In other words, the graduates from general high schools, lower secondary education, primary education and the others are excluded because these education levels do not have ISCO occupation codes. Among 171.402 employed ones, there are 50.661 individuals who are graduates from higher education and vocational and technical high schools.

c. Among the employed graduates from higher education and vocational and technical high schools, the sample is further decomposed by employment type. Only the wage-based employees are selected because this group is the regular group who are employed on a wage or salary base. The other three employment categories which are employers, self-employed ones and unpaid family workers are excluded. As a result, there are 42.494 wage-based employees who are graduated from higher education and vocational and technical high schools. This is the step where detailed analysis on field of study mismatch is conducted with respect to several factors.

As a demonstration, Figure 4.8 shows the basic steps taken to reach the target data for 2016 survey. Table 4.5 presents the decomposition of whole data for each year. As seen from Table 4.5, the target group consists of wage-based employees graduated from higher education and vocational & technical high schools. The target group for 2016 is 42.494 whereas it is 38.971 for 2012. The target group is circled at the last step. The detailed figures of sample size and the number of field of study mismatched ones for each year on the basis of FOET 1-digit and FOET 2-digit classification are provided in Appendix C.

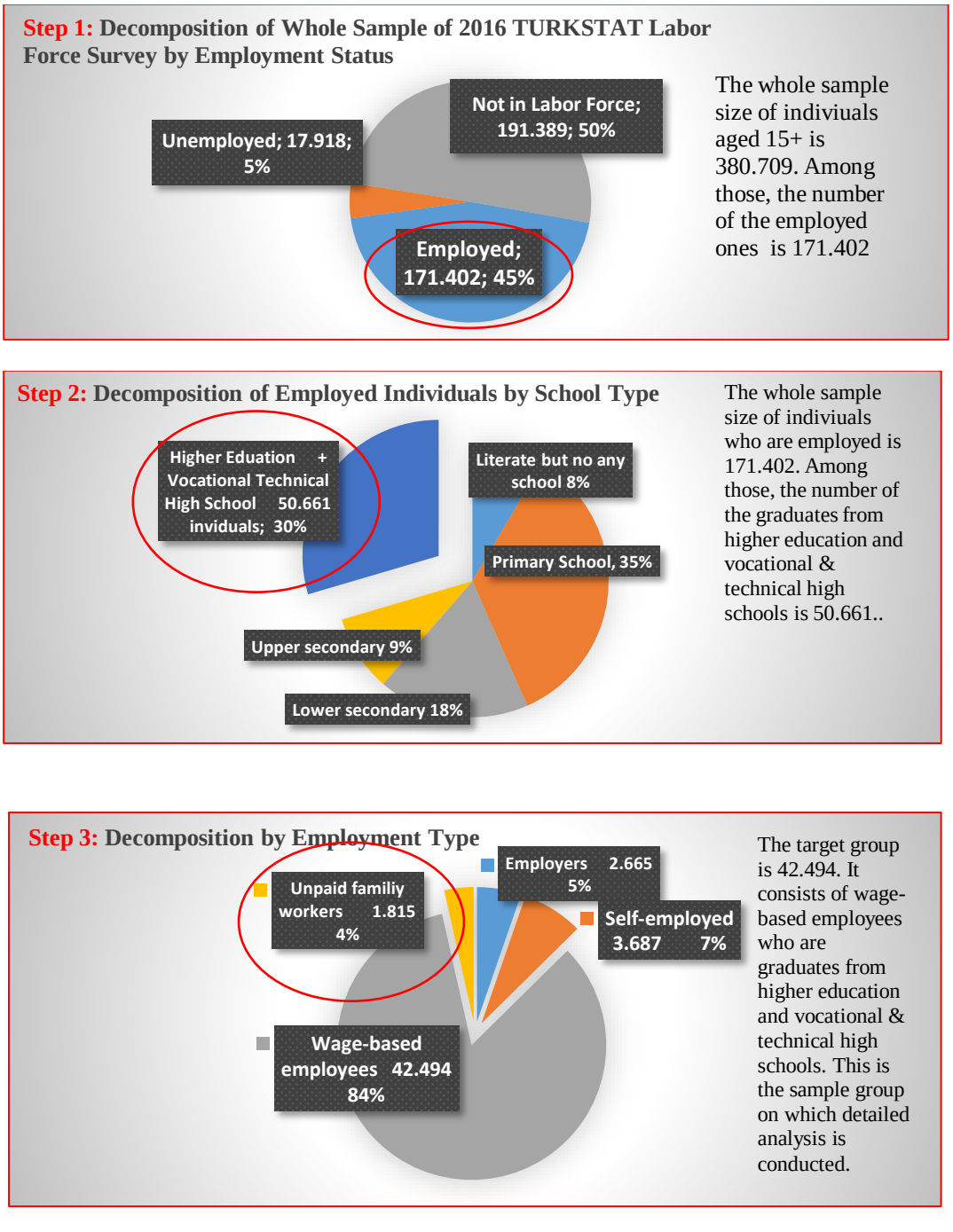

Figure 4. 8 Data Decomposition for Target Group: The Steps Taken to Reach the Target Group for 2016 Data
Source: Own construction

Table 4. 5 The Formation of Target Sample Size, 2012-2016						
		2012	**2013**	**2014**	**2015**	**2016**
The Whole Group: Survey	**Total Sample Size of Survey Age 15+**	383970	379742	393822	389035	380709
1-Decomposition of Sample Size by Employment Status	**Employed**	164698	164176	174287	174452	171402
	Unemployed	16016	16734	16680	17011	17918
	Not in Labor Force	203256	198832	202855	197572	191389
2-Decomposition of Employed Ones by Latest Education Level Completed	**Literate but not completed any educational institution**	15392	14491	18129	16342	14484
	Primary school (5 year)	59293	57875	62609	62181	59896
	Lower secondary education (8 years)	27766	28541	31112	31471	30836
	Upper secondary school (High school)	16167	16147	16074	15655	15525
	Vocational and technical high school	16035	16076	15929	16507	16801
	Higher education including masters and PhD degrees	30045	31046	30434	32296	33860
	Sum of Vocational and Technical Schools and Higher Education.	46080	47122	46363	48803	50661
	Total (Sum of All Levels)	**164698**	**164176**	**174287**	**174452**	**171402**
3-Decomposition of Employees (Graduates from Higher education and vocational & technical high schools) by Employment Type	**Wage / salaried employees**	**38971**	**40159**	**39258**	**41314**	**42494**
	Employers	2790	2733	2381	2440	2665
	Self-employed	3055	3006	3284	3408	3687
	Unpaid family workers	1264	1224	1440	1641	1815
	Total	**46080**	**47122**	**46363**	**48803**	**50661**

Source: Own construction based on TURKSTAT labor force surveys 2012-2016
Note: The selected data in each group is shaded in light blue color.

4.3. Analyzing Incidence of Field of Study Mismatch in Turkey

Field of study mismatch is measured and analyzed for wage-based employees consisting of two separate groups over time between 2012 and 2016. These are graduates from higher education and vocational and technical high schools. The detailed numbers and incidence levels over time for those groups and sum of them are provided in appendix C.

The analysis of incidence of field of study mismatch is conducted for each target group on the basis of FOET-99 1- digit and 2-digit classifications, and with respect to key individual and job-specific characteristics. They are age-group, gender, type of work place, firm size, contract type, permanency of job and NUTS1 regions.

4.3.1. Field of Study Mismatch by FOET-99 Classification

In this section the distribution of incidence of field of study mismatch is presented by both 1-digit and 2-digit FOET-99 classification separately.

4.3.1.1. Field of Study Mismatch for Vocational and Technical High Schools Only

In this section, the field of study mismatch for vocational and technical high school is analyzed.

Regarding wage-based employees who are graduated from vocational and technical high schools **(**From Table 4.6 and Figure 4.9 and Figure 4.10**)**

- Within 1-digit classification, the fields which have higher incidence than the country average are (as of 2016)
    - (3) Humanities, languages and arts, (5) Science, mathematics and computing
    - (7) Agriculture and veterinary
- Within 1-digit classification, the incidence of humanities, languages and arts decreased by 3.4 points from 86.1 % in 2012 to 82.7 % in 2016. When its sub-fields is analyzed within 2-digit classification, it is alarming that arts has 92.5 % of incidence of field of study mismatch. It is the highest incidence. The humanities has also more than 80% of incidence of mismatch although it decreased from 83.8 % in 2012 to 80.9% in 2016.
- Within 1-digit classification, the incidence of science, mathematics and computing was 86.7 % in 2012 and increased by 2.5 points to 89.2% in 2016. It has the highest incidence of field of study mismatch as of 2016. When its sub-fields is analyzed within 2-digit classification, it is seen that the incidence was not calculated for three sub-fields because these sub-fields have less than 30 observations. However, for the computing, it is 89.2 % of incidence of field of study mismatch which is the second highest within 2-digit classification.
- Within 1-digit classification, as of 2016, agriculture and veterinary has the third highest incidence of field of study mismatch. It is 66.7 % which is decreased by 0.6 points from 67.3 % in 2012. When its sub-fields is analyzed within 2-digit classification, the

agriculture, forestry and fishery has 72.7 % of mismatch which would be considered as another alarming situation. The other sub-field is veterinary. However, the incidence of mismatch for it was not calculated because of data insufficiency.

Table 4. 6 Change in Incidence of Field of Study Mismatch by FOET-99 1-Digit and 2-Digit Classification for the Graduates From Vocational and Technical High Schools Only, Turkey, 2012 and 2016

FOET 99 1-Digit Classification	İncidence of Field of Study Mismatch		Change in % Points (2016-2012)	FOET 99 2-Digit Classification		İncidence of Field of Study Mismatch		Change in % Points (2016-2012)
	2012	2016				2012	2016	
(2) Teacher training and education science	n/a	n/a	n/a	1	Teacher training and education science	n/a	n/a	n/a
(3) Humanities, languages and arts	86.1	82.7	-3.4	2	Arts	92.0	92.5	0.5
				3	Humanities	83.8	80.9	-2.9
(4) Social sciences, business and law	39.0	43.0	4.0	4	Social and behavioral science	n/a	n/a	n/a
				5	Journalism and information	n/a	n/a	n/a
				6	Business and administration	39.0	43.2	4.2
				7	Law	n/a	n/a	n/a
(5) Science, mathematics and computing	86.7	89.2	2.5	8	Life Science	n/a	n/a	n/a
				9	Physical Science	n/a	n/a	n/a
				10	Mathematics and Statistics	n/a	n/a	n/a
				11	Computing	87.2	89.2	2.0
(6) Engineering, manufacturing and construction	33.4	35.8	2.4	12	Engineering and Engineering Trade	32.0	34.3	2.3
				13	Manufacturing and processing	35.8	41.3	5.5
				14	Architecture and building	37.3	41.9	4.6
(7) Agriculture and veterinary	67.3	66.7	-0.6	15	Agriculture, forestry and fishery	69.8	72.7	2.9
				16	Veterinary	n/a	n/a	n/a
(8) Health and welfare	29.2	31.5	2.3	17	Health	8.6	6.9	-1.7
				18	Social Services	53.5	61.7	8.2
(9) Service	20.3	20.9	0.6	19	Personal Services	19.2	17.7	-1.5
				20	Transport services and environmental protection	26.8	37.9	11.1
				21	Security services	n/a	n/a	n/a
Country Average	**42.4**	**44.9**	**2.5**		**Country Average**	**42.4**	**44.9**	**2.5**

Source: Own construction

Note: The relevant detailed figures are available in Appendix B. İncidence is not calculated for the fields which have less than 30 observations in the sample size. For these fields, n/a is written.

- Social sciences, business and law has almost the average level of incidence of mismatch. It is 43.0%. However, it increased by 4 points from 39.0% in 2012. Its increase is the highest within one digit classification which would be considered as another high priority issue. The

incidence is not calculated for three of its sub-fields. The sub-field called "business and administration" has almost the average level of incidence.

- Within 1-digit classification, there are two fields whose incidence is between 30 % and 35 %. These are "engineering, manufacturing and construction" and "health and welfare". The sub-fields for engineering, manufacturing and construction have also the same incidence of field of study mismatch. However, for health and welfare which has 31.5 % of incidence, the sub-field called "social services" has 61.7% of incidence. Besides, it increased by 8.2 points from 53.5 %. This field is another one which requires further analysis. On the other side, the incidence of mismatch for the sub-field called "health" is the lowest incidence. It decreased by 1.7 points from 8.6 % to 6.9 %.
- Within 1-digit classification, the "services" has the lowest incidence of mismatch which is 20.9 %. For its sub-fields, personal services has almost the same level as its main field. Transport services and environmental protection, however, has 37.9 % of incidence of mismatch, which increased by 11.1 points from 26.8 %. This amount of increase is the highest one within 2-digit classification. The incidence of mismatch for security services is not calculated because of data insufficiency.

The incidence of mismatch for teacher training and education science was not calculated because it has less than 30 observations.

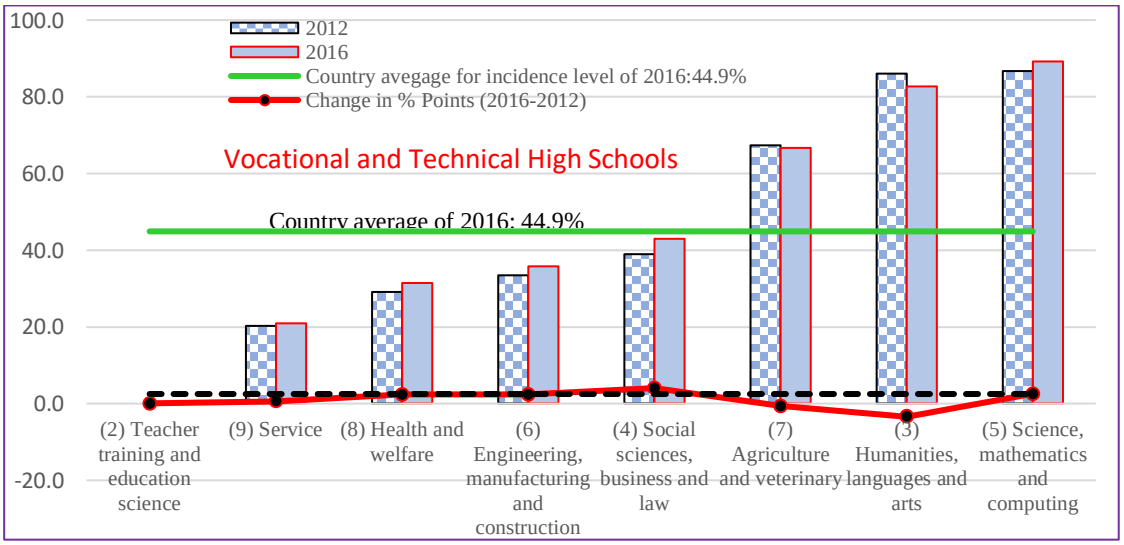

Figure 4. 9 Change in Incidence of Field of Study Mismatch by FOET 99 1-Digit Classification for Wage Based Employees Graduated From Vocational and Technical High Schools, Turkey, 2012 and 2016

Source: Own construction

Notes: The data is ranked in an ascending order by 2016 values. The incidence of mismatch for teacher training is not calculated (seen as zero) because it has less than 30 observations.

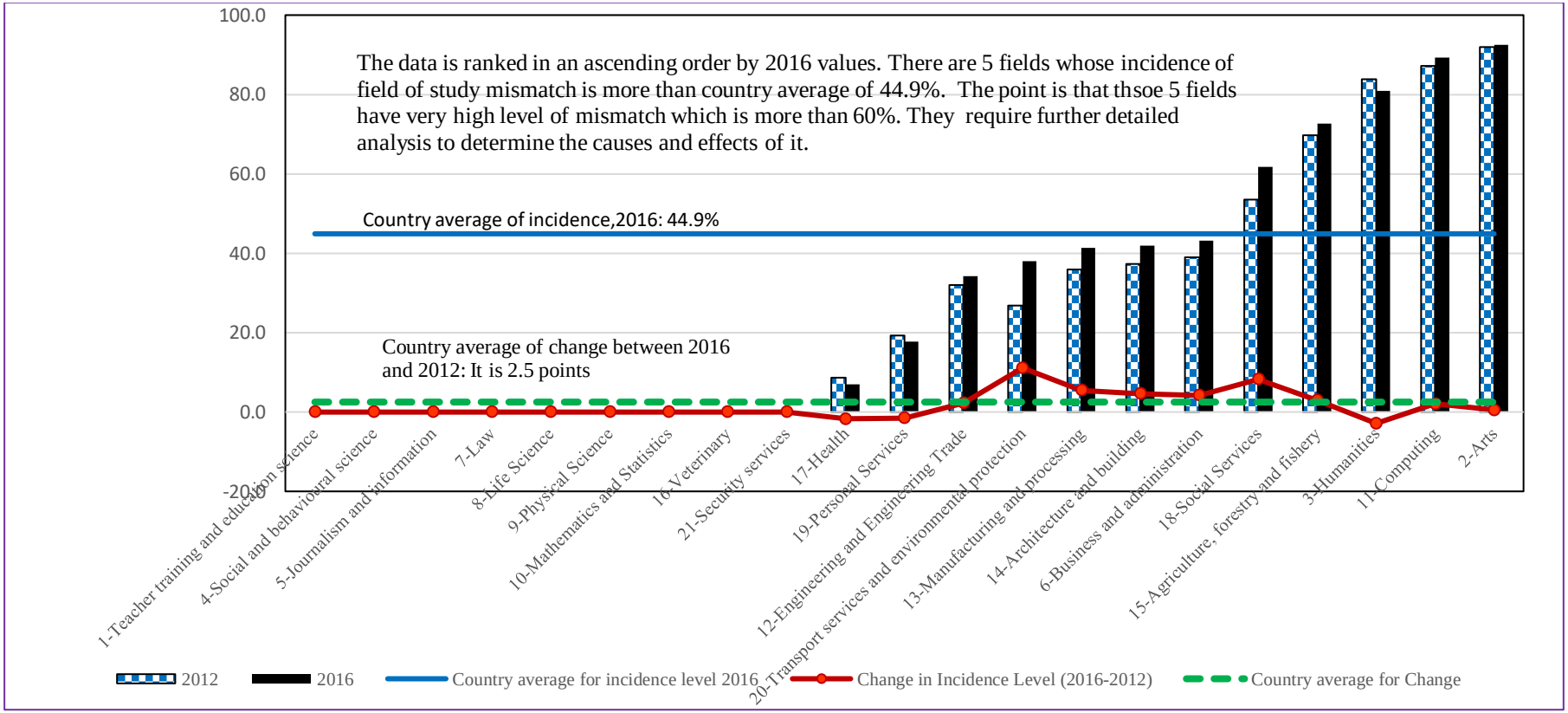

Figure 4. 10 Change in Incidence of Field of Study Mismatch by FOET 99 2-Digit Classification (21 Fields) for Wage Based Employees Who are Graduated From Vocational and Technical High Schools Only, Turkey, 2012 and 2016.

Source: Own construction

Notes: The data is ranked in an ascending order by 2016 values. It is seen that 9 fields have incidence of zero because calculation of mismatch is not carried out for them since they have less than 30 observations.

4.3.1.2. Field of Study Mismatch for Higher Education Only

The basic findings for higher education graduates depend on Table 4.7, Figure 4.11 and Figure 4.12.

Table 4. 7 Change in Incidence of Field of Study Mismatch by FOET-99 1-Digit and 2-Digit Classification for the Graduates From Higher Education Only, Turkey, 2012 and 2016

FOET 99 1-Digit Classification	İncidence of Field of Study Mismatch		Change in % Points (2016-2012)	FOET 99 2-Digit Classification		İncidence of Field of Study Mismatch		Change in % Points (2016-2012)
	2012	2016				2012	2016	
(2) Teacher training and education science	20.7	21.1	0.4	1	Teacher training and education science	20.7	21.1	0.4
(3) Humanities, languages and arts	32.2	32.5	0.3	2	Arts	52.8	51.9	-0.9
				3	Humanities	24.1	26.1	2.0
(4) Social sciences, business and law	15.2	17.9	2.7	4	Social and behavioral science	13.7	14.8	1.1
				5	Journalism and information	3.4	12.3	8.9
				6	Business and administration	16.5	19.4	2.9
				7	Law	5.0	10.3	5.3
(5) Science, mathematics and computing	35.9	41.0	5.1	8	Life Science	26.2	26.5	0.3
				9	Physical Science	32.2	33.0	0.8
				10	Mathematics and Statistics	29.6	36.8	7.2
				11	Computing	54.3	71.2	16.9
(6) Engineering, manufacturing and construction	32.2	35.5	3.3	12	Engineering and Engineering Trade	33.3	35.6	2.3
				13	Manufacturing and processing	38.9	52.3	13.4
				14	Architecture and building	25.9	24.7	-1.2
(7) Agriculture and veterinary	35.6	39.6	4.0	15	Agriculture, forestry and fishery	47.5	48.9	1.4
				16	Veterinary	12.4	20.0	7.6
(8) Health and welfare	6.8	9.6	2.8	17	Health	6.2	6.4	0.2
				18	Social Services	37.2	40.2	3.0
(9) Service	18.4	17.9	-0.5	19	Personal Services	25.0	27.1	2.1
				20	Transport services and environmental protection	72.0	36.2	-35.8
				21	Security services	7.6	7.9	0.3
Country Average	**21.9**	**24.0**	**2.1**		**Country Average**	**21.9**	**24.0**	**2.1**

Source: Own construction
Note: The relevant figures are available in Appendix B. The change in percentage points is the difference in the incidence of field of study mismatch between the values of 2016 and 2012.

Regarding wage-based employees who are graduated from higher education, the findings are as follows (Table 4.7, Figure 4.11 and Figure 4.12):

- Within 1-digit classification, the fields which have higher incidence than the country average are (as of 2016)
    - (3) Humanities, languages and arts,
    - (5) Science, mathematics and computing
    - (6) Engineering, manufacturing and construction
    - (7) Agriculture and veterinary
- Within 1-digit classification, the incidence of humanities, languages and arts increased by 0.3 points from 32.2 % in 2012 to 32.5 % in 2016. When its sub-fields is analyzed within 2-digit classification, it is alarming that arts has 51.9 % of incidence of field of study mismatch. The humanities has incidence of mismatch around country average.
- Within 1-digit classification, the incidence of science, mathematics and computing was 35.9 % in 2012 and increased by 5.1 points to 41 % in 2016. It has the highest incidence of field of study mismatch as of 2016 with the highest amount of increase. When its sub-fields is analyzed within 2-digit classification, the incidence of mismatch for life science is around country average, it is 33 % for physical science. It increased by 7.2 points and increased to 36.8% for mathematics and statistics which would need some attention to keep track of it. However, for the computing, it increased by 16.9 points from 54.3 % in 2012 to 71.2 % which is the highest level of incidence with the highest amount of increase.
- Within 1-digit classification, as of 2016, engineering, manufacturing and construction has the third highest incidence of mismatch which increased from 32.2 % to 35.5 %. When its sub-fields is analyzed within 2-digit classification, the incidence of mismatch for architecture and building is around country average, it is 35.6 % for engineering and engineering trade. However, for manufacturing and processing it increased by 13.4 points from 38.9% to 52.3 % which is the second highest incidence.
- Within 1-digit classification, as of 2016, agriculture and veterinary has the second highest incidence of field of study mismatch. It increased by 4 points from 35.6 % to 39.6%. When its sub-fields is analyzed within 2-digit classification, the agriculture, forestry and fishery has 48.9 % of mismatch which would be considered as another alarming situation. The other sub-field is veterinary which has lower incidence than country average.
- Within 1-digit classification, there are four fields whose incidence of field of study mismatch is lower than the country average.

- Teacher training and education science has 21.1% of incidence of mismatch. The other three fields have less than 20% of mismatch.
- Social sciences, business and law has 17.9 % of mismatch. Within this field, all of the four sub-fields have also less than 20 % of mismatch. However, the incidence for "law" increased by 5.3 points, and it increased by 8.9 points for journalism and information.
- On the other side, within the health and welfare field, the incidence of mismatch for the sub-field called "social services" increased by 3 points from 37.2 % to 40.2 % which is one of the highest incidence.
- For the "services", the sub-field called "transport services and environmental protection" has 36.2 % of incidence of mismatch which decreased from 72 % with a huge amount of 35.8 points.

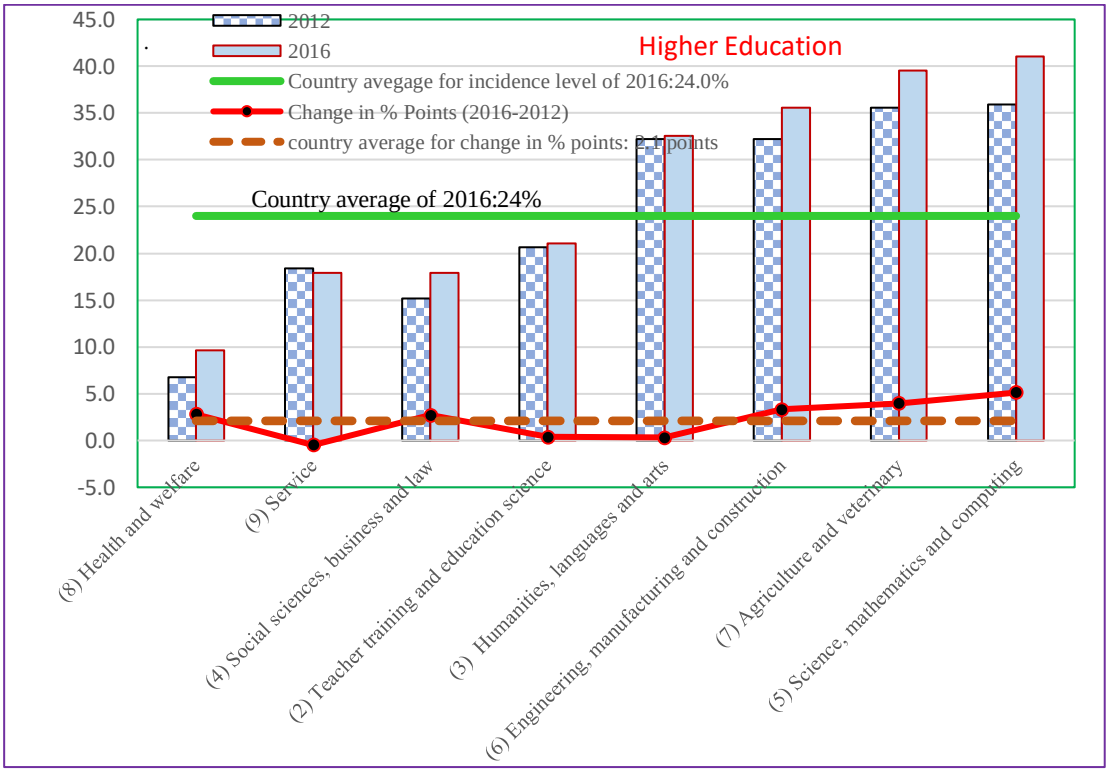

Figure 4. 11 Change in Incidence of Field of Study Mismatch by FOET 99 1-Digit Classification for Wage Based Employees Graduated From Higher Education Only, Turkey, 2012 and 2016

Source: Own construction

Notes: The data is ranked in an ascending order by 2016 values.

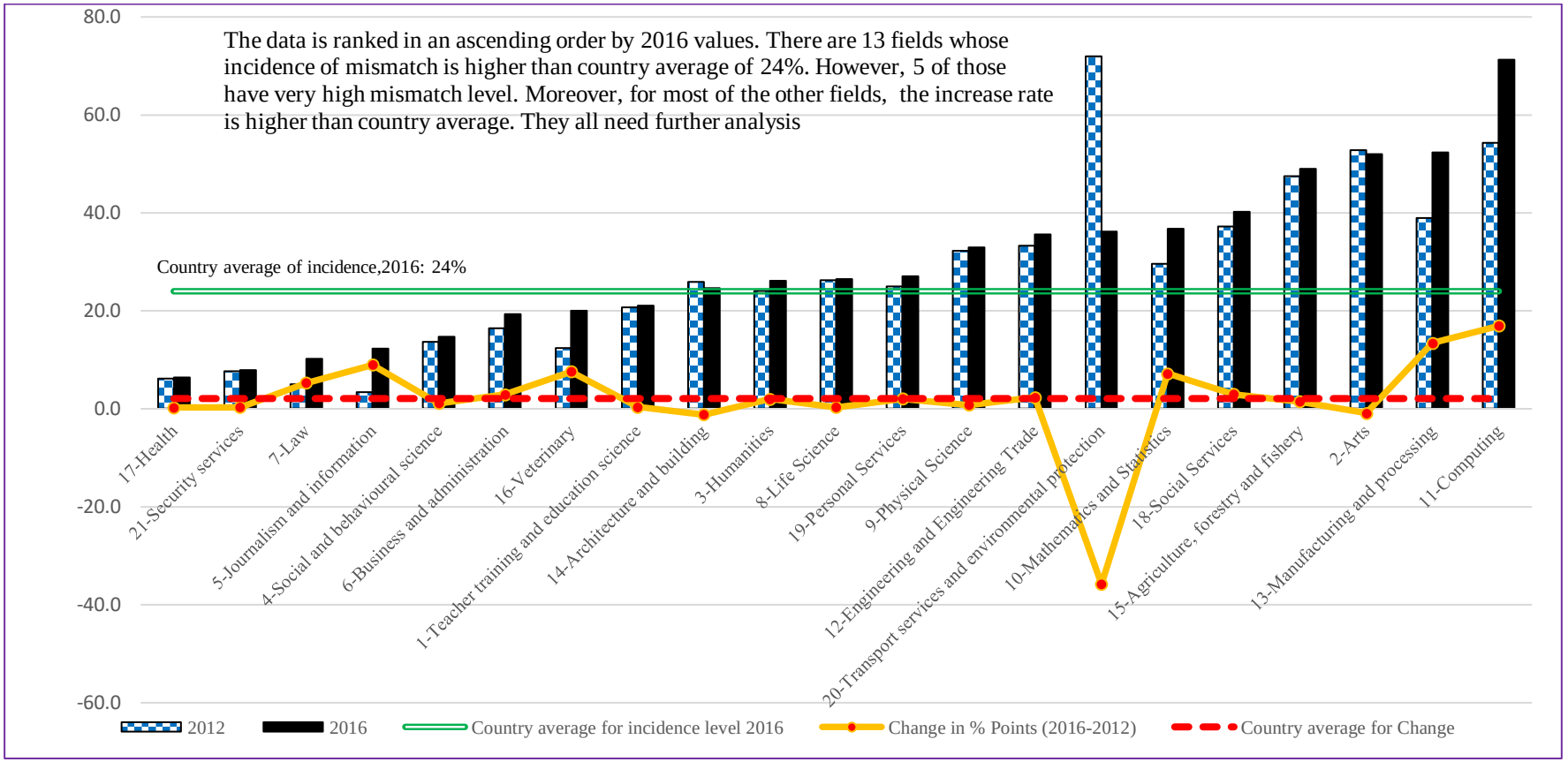

Figure 4. 12 Change in Incidence of Field of Study Mismatch by FOET 99 2-Digit Classification (21 Fields) for Wage Based Employees Who are Graduated From Higher Education Only, Turkey, 2012 and 2016
Source: Own construction

4.3.2. Field of Study Mismatch by Individual and Job-Specific Characteristics

The analysis is conducted with respect to key factors such as age-group, gender, firm size, type of work place (public, private, foundation), permanency of job, part-time versus full time and NUTS-1 regions. The findings are presented for both higher education and vocational and technical high schools. As seen from Table 4.8;

Regarding age, the incidence of field of study mismatch is slightly higher for 20-24 age group especially within higher education. Moreover, the wage-based employees who are over 65 age have very high level of incidence of mismatch mainly because they are accepting any job just to survive in their life. For the wage-based employees graduated from vocational and technical high schools, there is no significant difference of incidence within age-groups.

Regarding gender, females have higher incidence of mismatch than the males within vocational and technical high schools. It is the opposite for higher education where the incidence of mismatch of males is dominantly higher than that of the females.

Regarding type of employment, the full-time employees graduated from higher education have remarkably higher incidence of mismatch than the part-time employees. For the graduates from vocational and technical high schools, there is not any difference between full-time and part-time employment.

Regarding contract type, the employees working by temporary contracts have higher incidence of mismatch than the employees working by permanent contract. This is valid for both of two education levels.

Regarding type of work place, the employees working in private sector have higher incidence of mismatch than the ones working in public sector. The wage-based employees who work in foundations, associations etc. have the highest incidence of field of study mismatch. The findings are valid for both higher education and vocational and technical high schools.

Regarding firm size, as the firm size gets larger, the incidence of field of study mismatch decreases. This is valid for both higher education and vocational and technical high schools.

Regarding NUTS-1 regions, within the graduates from vocational and technical high schools, the incidence of mismatch is more than 50 % in TR9 Eastern Black Sea and TRA Northeastern Anatolia regions. The amount of increase in TRA and TR1 İstanbul is more than 7 points. Within the higher education, TRA Northeastern Anatolia has more than 30 % of incidence of mismatch. The amount of increase in TR5 Western Anatolia is very high more than 4 points.

Table 4. 8 Change in Incidence of Field of Study Mismatch by Some Individual and Job-Specific Characteristics, Turkey, 2012 and 2016

	A. Vocational and Technical High Schools			B. Higher Education (University)			Total (A+B)		
	2012	2016	Change in % Points (2016-2012)	2012	2016	Change in % Points (2016-2012)	2012	2016	Change in % Points (2016-2012)
Age Group									
15-19 age	41.2	44.9	3.7	n/a	n/a	n/a	41.0	44.6	3.6
20-24 age	41.3	45.8	4.5	24.5	27.7	3.2	32.2	35.6	3.4
25-29 age	41.5	46.2	4.7	22.5	23.7	1.2	28.4	29.2	0.8
30-44 age	43.8	45.0	1.2	20.8	24.1	3.3	27.5	30.0	2.5
45-64 age	40.7	42.3	1.6	22.8	21.9	-0.9	27.4	27.3	-0.1
65+ age	n/a	n/a	n/a	25.6	32.5	6.9	30.4	36.4	6.0
Gender									
Male	42.1	44.5	2.4	26.7	29.4	2.4	32.4	34.8	2.4
Female	43.6	46.3	2.7	13.9	15.4	1.5	20.1	21.6	1.5
Full or Part Time									
Full time	42.3	44.8	2.5	22.6	24.7	2.1	29.0	30.9	1.9
Part time	47.7	48.5	0.8	6.6	8.9	2.3	14.0	18.2	4.2
Permanency of Job									
Permanent	41.9	44.0	2.1	21.7	23.8	2.1	28.0	29.7	1.7
Temporary	49.6	54.0	4.4	29.6	30.5	0.9	40.4	42.5	2.1
Type of Work Place									
Private	43.7	45.4	1.7	27.5	29.2	1.7	35.3	36.4	1.1
Public	36.0	41.0	5.0	17.8	19.5	1.7	20.1	21.9	1.8
Other (Foundation, Association etc)	57.9	67.6	8.7	30.9	35.2	4.3	39.8	45.0	5.2
Firm Size									
Less than 10 employee	48.8	51.8	3.0	26.4	27.8	1.4	37.5	38.9	1.4
10-49 employee	44.5	46.6	2.1	19.7	20.1	0.4	26.3	26.4	0.1
More than 50 employee	36.9	38.7	1.8	22.2	25.2	3.0	26.5	28.9	2.4
Country Average	**42.4**	**44.9**	**2.5**	**21.9**	**24.0**	**2.1**	**28.4**	**30.3**	**1.9**

Source: Own construction

Note: The detailed figures are available in tabulated form in Appendix C. The incidence of mismatch is not calculated for higher education in 15-19 age group and for vocational and technical high schools in 65+ age-group because they have less than 30 observations.

Table 4.8. Change in Incidence of Field of Study Mismatch by Some Individual and Job-Specific Characteristics, Turkey, 2012 and 2016 (Cont'd)

	A. Vocational and Technical High Schools			B. Higher Education (University)			Total (A+B)		
	2012	2016	Change in % Points (2016-2012)	2012	2016	Change in % Points (2016-2012)	2012	2016	Change in % Points (2016-2012)
NUTS-1 Regions									
TR1 İstanbul	40.3	47.4	7.1	22.4	22.5	0.1	27.6	29.3	1.7
TR2 Western Marmara	41.5	40.9	-0.6	22.7	24.4	1.7	30.0	30.8	0.8
TR3 Aegean	39.3	40.8	1.5	21.7	23.8	2.1	27.6	29.1	1.5
TR4 Estern Marmara	38.9	37.7	-1.2	23.2	25.0	1.8	30.1	30.0	-0.1
TR5 Western Anatloia	46.3	48.5	2.3	20.4	24.9	4.5	27.5	31.4	3.9
TR6 Mediterranean	42.5	46.9	4.4	20.5	23.9	3.4	27.1	30.6	3.5
TR7 Central Anatolia	39.4	46.1	6.7	20.5	21.3	0.8	26.7	29.2	2.5
TR8 Western Blacksea	46.4	46.8	0.4	19.7	22.8	3.1	29.4	31.3	1.9
TR9 Eastern Blacksea	46.2	50.1	3.9	21.8	23.3	1.5	29.4	30.5	1.1
TRA North Eastern Anatolia	49.1	58.0	8.9	27.2	30.2	3.0	32.6	38.1	5.5
TRB Central Eastern Anatolia	50.2	48.9	-1.3	25.4	26.0	0.6	31.6	30.7	-0.9
TRC South Eastern Anatolia	43.3	44.0	0.7	22.9	22.8	-0.1	27.3	26.6	-0.7
Country Average	42.4	44.9	2.5	21.9	24.0	2.1	28.4	30.3	1.9

Source: Own construction
Note: The detailed figures are available in tabulated form in Appendix C. The incidence of mismatch is not calculated for higher education in 15-19 age group and for vocational and technical high schools in 65+ age-group because they have less than 30 observations

4.4 Measuring and Analyzing Vertical Mismatch

In this section, after the data and methodology for measuring vertical mismatch is explained briefly, the incidence of vertical mismatch and its association with field of study mismatch is analyzed on the basis of ISCO-08 occupation codes.

4.4.1. Data and Methodology

The data allows to measure vertical mismatch for the period 2014-2016 because the relevant survey question which captures the education level of an individual was changed in 2014. Before 2014, the graduates from higher education was grouped in only one category including the masters and PhD degrees. In other words, associate degree (MYO level), bachelor degree and graduate degree were all in one category. Since 2014, there are two options for higher education graduates. These are (i) 2, 3 or 4 year higher education and (ii) 5 or 6 years faculty, masters and PhD. This change made it possible to measure the vertical mismatch only before 2014 or after 2013. Hence, the new structure is chosen. However, vertical mismatch is measured for only TURKSTAT 2016 labor force survey. It is not measured for 2014 because there is a short time period between 2014 and 2016.

The target group consists of the sum of graduates from vocational and technical high schools and higher education who are working as wage-based employees. The realized matches method is used for measurement, which is an objective method.

For measuring vertical mismatch, first the mean years of schooling and the standard deviation are calculated for each occupation code. It is calculated by using the employees' responses given for the question regarding the latest education level. For example, for occupation codes of managers, the mean year of schooling is calculated by just simply dividing the sum of current realized schooling years by the number of employees working in that occupation code.

The acquired years of schooling for each education level for each individual is determined by making use of the following assumption based on ISCED level.

Category 0: Literate but not completed any school. Years of schooling: 0 years
Category 1: Primary School (5 year). Years of schooling: 5 years
Category 2: Lower secondary or primary education (8 year). Years of schooling: 8 years
Category 3: Upper-secondary high school (Including vocational and technical high school). Years of schooling: 12 years
Category 4: 2 or 3 year higher education or faculty or 4 years higher education or faculty. Years of schooling :16 years
Category 5: Masters degree (5 or 6 years faculty included) or Doctorate. Years of schooling: 19 years

If the worker's acquired education level is above or below one standard deviation from the mean years of schooling, then he/she is treated as overeducated or undereducated, respectively.

4.4.2. Analyzing Vertical Mismatch in Turkey

The basic findings are seen on Table 4.9 and Figure 4.13. Table 4.9 presents the distribution of vertically mismatched wage-based employees on the basis of ISCO 08 occupation codes.

Table 4. 9 Distribution of Undereducated and Overeducated Wage-Based Employees by ISCO 08 Occupation Codes, Turkey, 2016

ISCO-08 1 Digit Occupation Classification	Sample Size	Number of under educated Employees	Number of over educated Employees	% of Under Educated	% of Over Educated
1: Managers	3308	266	469	8.0	14.2
2: Professionals	14213	709	2413	5.0	17.0
3: Technicians and Associate Professionals	5245	1709	133	32.6	2.5
4: Clerical Support Workers	6292	1832	152	29.1	2.4
5: Services and Sales Workers	6490	3070	84	47.3	1.3
6: Skilled Agricultural, Forestry and Fishery Workers	59	0	15	0.0	25.4
7: Craft and Related Trades Workers	2963	0	759	0.0	25.6
8: Plant and Machine Operators and Assemblers	2024	0	460	0.0	22.7
9: Elementary Occupations	1900	0	441	0.0	23.2
Country Total	**42494**	**12857**	**3256**	**30.3**	**7.7**

Source: Own construction

As seen from Table 4.9, for the wage based employees who are graduated from higher education and vocational and technical high schools,

- The country average for undereducation is 30.3 % and 7.7 % for overeducated ones.
- Managers and professionals have higher incidence of overeducation than the country average but their incidence of undereducation is lower than the country average as expected.
- The occupations 6,7,8 and 9 have the highest incidence of overeducation and zero level of undereducation. This finding might indicate that the majority of the employees have education level of high school but the composition of education level has started

to change from high school level to higher education level. This is mainly because of the expansion in higher education.

- The occupation called "services and sales workers" has the highest incidence of undereducation which is 47.3 %. It has negligible level of overeducation. This shows that most of the employees have 2 or 3 years of higher education but there are still many employees who have high school level of education.

Another important issue is the share of overeducated employees among the field of study mismatched ones. This share shows the ratio of employees who downgrades his/her education level to a lower position which is outside his/her field of study. In other words, he/she accepts to work in a job which is both outside his/her field of study and requires lower level of education than the level he/she acquired. As Montt (2015) stated if this share is high then it will have higher costs or consequences for both individuals and economies.

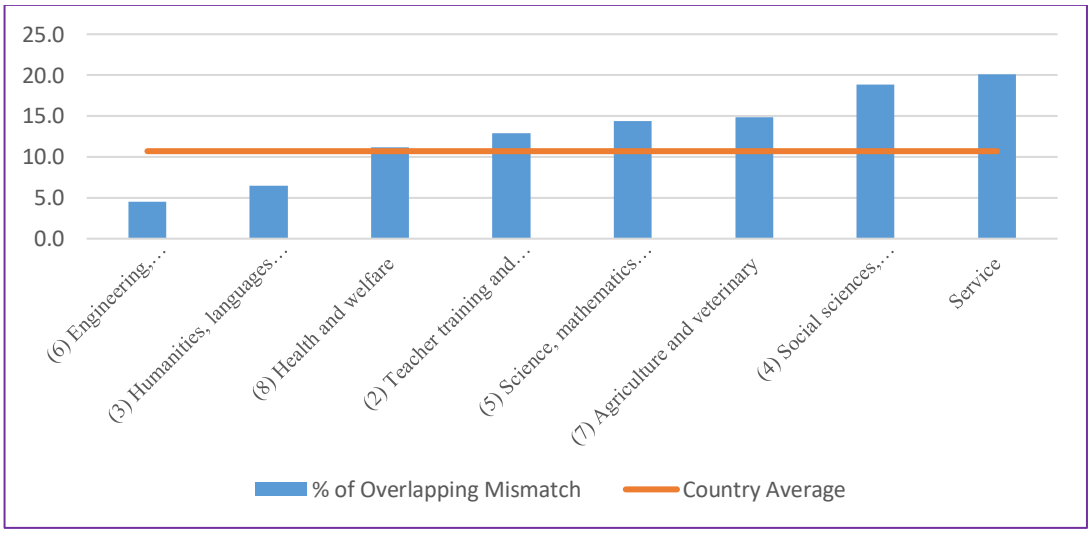

Figure 4. 13 The Percentage of Overeducated Employees Among the Field of Study Mismatched Ones, Turkey, 2016
Source: Own construction
Note: The detailed numbers are tabulated in Appendix C.

As seen from Figure 4.13, there are only two fields which have lower incidence of overlapping mismatch than the country average of 10.7 %. The services has the highest incidence which is 20.1 %. It means that 20.1 % of the field of study mismatched employees are also overeducated. Those findings strongly indicate that overeducation can be a cause for being field of study mismatch.

4.5. Concluding Remarks

In this chapter, the main focus was on measuring and analyzing incidence of field of study mismatch. In this context, first the basic findings of previous empirical studies on Turkey are presented. Then, by using TURKSTAT labor force surveys of 2012-2016, field of study mismatch for Turkey is measured by employing Montt's (2015) coding scheme. The main findings of incidence of field of study mismatch are analyzed for wage-based employees who are graduated from vocational and technical high schools and higher education, separately. The findings are presented by each field of study which is based on FOET-99 1- digit and 2-digit classifications, and with respect to some individual and job-specific characteristics.

Vertical mismatch is also analyzed. The incidence of vertical mismatch is analyzed on the basis of ISCO-08 1-digit classification, and its overlapping mismatch with field of study mismatch is analyzed on the basis of FOET-99 1 digit classification. It is measured by employing realized matches method with the data from TURKSTAT 2016 labor force survey.

The basic findings are summarized as follows:

Regarding the previous empirical studies on Turkey, there are only two studies which cover field of study mismatch of Turkey. These are Quintini (2011b) and OECD (2016). They found that the incidence of field of study mismatch for Turkey is 37.0% and 43.7%, respectively, which are all above the OECD average of 31.0% and 39.6 %. Those studies indicate that there is a very high level of incidences at an increasing trend for Turkey. Another problematic point is that the share of field of study mismatched workers among the overeducated workers is very high. It is 54,1%, which is above the OECD average of 44.1%.

Increase Over Time: It is found that Turkey has high incidence of mismatch at an increasing trend between 2012 and 2016. The findings are remarkably much worse for some fields.

The country average for the total group (sum of higher education and vocational and technical high schools) increased by 1.9 points from 28.4% to 30.3% (Appendix C). It corresponds to 6.7% increase.

For the vocational and technical high schools, it increased by 2.5 points from 42.4% to 44.9 % which corresponds to 5.8% increase.

For the higher education, it increased by 2.1 points from 21.9 % to 24 %. It corresponds to a very high rate of 9.5% increase within only 4 years of time period.

The increasing trend is valid for most of the fields. The number of fields which increased their incidence of mismatch from 2012 to 2016 in higher education is higher that of vocational and

technical high schools. In other words, although the incidences for each education level signal an alarming situation in terms of increase over time, it is more critical for higher education.

On the other side, the country average of field of study mismatch in 2016 (30.3 %) for the sum of those two groups is lower than the findings of Turkey in Quintini (2011b) and OECD (2016). Quintini (2011b) found that the incidence of field of study mismatch for Turkey was 37 % by using 2005 data. It was 31 % for the OECD average. OECD (2016) found that it was 43.7 % for Turkey and 39.6 % for OECD average by using 2012 and 2015 PIAAC data.

It can be considered that the incidence found in this thesis, which is 30.3 %, is an improvement when compared to the findings from Quintini (2011b) and OECD (2016). However, the finding is expected to be higher than 30.3% if three-digit ISCO-08 occupation codes were used in coding scheme of this thesis. Since TURKSTAT labor force surveys provide two-digit ISCO-08 codes, but not three-digit codes, three-digit codes are aggregated into two-digit codes which increases the range of well-matched employees and hence reduces the incidence of field of study mismatch as expected. For example, in Montt's (2015) coding scheme, if the graduates from teacher training and education science works in occupation code 342 (ISCO-08 occupation code), she/he is treated as well-matched (Appendix A). However, there are also two more occupation codes starting with 34. These are 341 and 343. When I design my own two-digit coding scheme, the codes 341 and 343 are aggregated to two-digit codes of 34. Hence, the graduates working in 341 and 343 are now well-matched, although they were not matched in Montt's (2015) original coding scheme. In other words, the range for well-matched individuals becomes larger. This larger coding scheme results in more well-watched individuals, which reduces the likelihood of incidence of field of study mismatch.

Regarding 1-digit field of study (8 fields of study), for vocational and technical high schools, there are three fields whose incidence of mismatch are higher than the country average of 44.9%. These are:

(3) Humanities, languages and arts
(5) Science, mathematics and computing
(7) Agriculture and veterinary

Among them, the incidence level for 3 and 5 are more than 80%, which is a very high level.

For higher education, four fields have higher incidence of mismatch than the country average of 24.0%. These are:

(3) Humanities, languages and arts
(5) Science, mathematics and computing

(6) Engineering, manufacturing and construction
(7) Agriculture and veterinary

Among them, the incidence level for 5 and 7 are almost 40%, which is a very high level.

The policy makers should give high priority to focus on those fields. However, focusing on 1-digit classification might mislead the researchers or policy makers because

- There are some sub-fields which have very high incidences but are not included in the above high priority fields.
- There are some sub-fields which have very low level of incidence although they are included in the above fields.

Therefore, policy makers or researchers should focus on 2-digit classification. As a result, the following results are presented.

Regarding 2-digit field of study (21 fields of study), for vocational and technical high schools on the basis of 21 sub-fields, there are 5 fields whose incidence of field of study mismatch is more than country average of 44.9%. As of 2016, they have very high level of mismatch which is more than 60%. These five sub-fields are:

- (2) Arts-92.5%
- (11) Computing-89.2%
- (3) Humanities-80.9%
- (15) Agriculture, forestry and fishery-72.7%
- (18) Social sciences-61.7%

As seen, fields 2,11 and 3 have more than 80 % of field of study mismatch. These fields seriously need further analysis.

For higher education on the basis of 21 sub-fields, as of 2016, there are 13 fields whose incidence of mismatch is higher than country average of 24%. However, 5 of those have very high mismatch level which is more than 40 %. Five fields whose incidence of mismatch is more than 40 % are:

- (11) Computing-71.2%
- (13) Manufacturing-52.3%
- (2) Arts-51.9%
- (15) Agriculture, forestry and fishery-48.9%
- (18) Social sciences-40.2%

As seen, four sub-fields are common in both target group. In addition to those four sub-fields, field 3 within vocational and technical high schools and field 13 within higher education require further detailed analysis to determine the causes and effects of it. Moreover, the other 8 sub-fields among 13 sub-fields within the higher education group have the second highest priority because their incidence is more than the country average.

These finding signal that there might be excess supply of or less demand for those graduates. I think that this might be because of the initial effects of huge expansion in higher education which has been started in 2006. Besides, the fields which have lower level of incidence of mismatch are the ones which are occupation-specific fields such as health, security services, law, veterinary, teacher training and education etc. These findings are all in parallel with Wolbers (2003), Montt (2015), Verhaest et al (2017). They stated that the graduates from specialized programmes have specific skills which prepare them for particular jobs, and hence have lower probability of being field of study mismatch. Moreover, Verhaest et al (2017) claimed that excess supply of skilled workers may force jobseekers to accept jobs below their level of education and/or outside their field of study.

Regarding Individual and Job-Specific Characteristics, it is found that the incidence of field of study mismatch is slightly higher for 20-24 age group especially within higher education. Females have higher incidence of mismatch than the males within vocational and technical high schools. It is the opposite for higher education where the incidence of mismatch of males is dominantly higher than that of the females. Regarding type of employment, the full-time employees graduated from higher education have remarkably higher incidence of mismatch than the part-time employees. For the graduates from vocational and technical high schools, there is not any difference between full-time and part-time employment. It is found that the field of study mismatch is higher for wage-based employees working in smaller firms in private sector with temporary contracts. Regarding NUTS-1 regions, within the graduates from vocational and technical high schools, the incidence of mismatch is more than 50 % in TR9 Eastern Black Sea and TRA Northeastern Anatolia regions. The amount of increase in TRA and TR1 İstanbul is more than 7 points. Within the higher education, TRA Northeastern Anatolia has more than 30 % of incidence of mismatch. The amount of increase in TR5 Western Anatolia is very high which is more than 4 points.

Regarding Vertical Mismatch, in summary, as remembered from Table 4.4, the previous studies reveal that incidence levels of vertical mismatch for Turkey has a very large range of values because of mainly five reasons. These are the measurement method, the data source, the target group, the wording of survey questions and the categorization of education level

used in the survey. For example, the wording of survey questions especially for worker's self-assessment method is an important factor. As McGuinness (2006) found that overeducated workers may less respond to questionnaires due to on-the-job apathy, which may lead to bias in the form of underestimation of overeducation in the samples. As another example, although Filiztekin (2011) and I used the same data source of TURKSTAT labor force surveys but in different years, and applied the same objective realized matches method (mean years of schooling) we have different findings. He found 9.6 % of incidence for undereducation, and 15.1 % of incidence for overeducation in 2002. I found overeducation as 7.7 % and undereducation as 30.3 % in 2016. The main reason behind the reduction in overeducation is the progress over time. The education level of population in Turkey has been increasing because of the expansion in higher education. The increase in education level can cause an increase in overeducated people if the same amount of corresponding jobs are not created for those highly educated people. The other reasons behind the differences in our findings is the definition or categorization of education levels and the target group that we focused on. First, he used six education groups. These are illiterates, literates without a degree, 5-year primary school graduates, 8-year primary school graduates, high school graduates and college and above graduates. High school and college graduates are assigned 11 and 15 years of education, respectively. Literate individuals without a degree are assigned only one year of education. Moreover, his target group consists of all education levels whereas the target group in this thesis includes only the higher education and vocational and technical high schools.

CHAPTER 5

ANALYZING CAUSES OF FIELD OF STUDY MISMATCH IN TURKEY

In this chapter, the main focus is on the analysis of causes of field of study mismatch in Turkey, with an emphasis on the effect of labor market conditions. There are five sections. In the first section, the previous empirical framework regarding the determinants of field of study mismatch is presented. The second and third sections include a binary logistic regression model and its regression results. The likelihood of having field of study mismatch is regressed over 5 variable groups which include 12 explanatory variables all of which are categorical variables. The target group consists of graduates from vocational and technical high schools and universities who have been working since 2009 as a wage-based employee at the time of survey year of 2016. In the fourth section, a graphical analysis is conducted to figure out the interaction effects of some variables on having field of study mismatch on the basis of FOET-99 1-digit classification (8 fields of study). For this purpose, estimated marginal means[4] of field of study mismatch with regards to key variable groups is analyzed. The last section summarizes the concluding remarks.

5.1. Empirical Framework for the Causes of Field of Study Mismatch

In this section, first the background information regarding previous regression model specifications is presented. Then, the empirical findings from those previous regression models are provided. In this context, the common groupings of independent variables are summarized and the estimated effects of independent variables on having field of study mismatch is reviewed. Moreover, the main findings of previous studies which include Turkey are examined.

5.1.1. Regression Models for Determining Causes of Field of Study Mismatch

In the literature, there are few studies which cover determinants of field of study mismatch when compared to the studies which analyze the consequences of field of study mismatch. The

[4] The Estimated Marginal Means in **SPSS GLM** tells us the mean response for each factor, adjusted for any other variables in the model

leading ones are Wolbers (2003), Robst (2007a), Boudarbat and Chernoff (2009), Montt (2015), OECD (2016), Verhaest et al (2017). In those studies, the likelihood of having field of study mismatch is regressed over the potential determinants by estimating binary logistic models or multilevel multinomial logit models.

Dependent Variables: In those models, the dependent variable is a categorical variable which has the value of 1 when there is field of study mismatch and 0 (zero) when there is a well-match. In some of those studies, the field of study mismatch is measured by subjective methods by asking respondents the degree of relationship between their work and educational field. (i.e. Robst (2007a), Boudarbat and Chernoff (2009) and Verhaest et al (2017)). In the other studies, it is measured by coding scheme, which is originally developed by Wolber's (2003) and updated by Montt (2015).

Independent Variables: In those previous studies, there are some common or similar determinants used as independent variables in predicting the likelihood of field of study mismatch. The context of those independent variables differ according to the data sources used in regression models. Most of the aforementioned studies focus on cross-country analysis. Robst (2007a) and Boudarbat and Chernoff (2009) focused on a single country. However, the basic approach for determining the main groups of determinants is almost the same.

Moreover, in analyzing the causes of field of study mismatch, some leading researchers tested and analyzed some hypotheses, some of which are repeated in other studies. (e.g. Wolbers (2003), Robst (2007a, 2008), Verhaest et al (2017).

In this context, the relevant regression model specifications from the previous studies are explained briefly. It will cover Wolbers (2003), Robst (2007a), Boudarbat and Chernoff (2009), Montt (2015) and Verhaest et al (2017) because they are the pioneer ones which studied the causes of field of study mismatch by grouping the independent variables into some individual, job-specific and labor market related determinants or variable groups.

Wolbers (2003), applied binary logistic model by using the ad hoc module "school to work transition" of the Labor Force Survey conducted in 13 European countries. His target group was the school leavers which were 15-35 years-old and left initial education within the past five years. He measured the field of study mismatch by using his own and leading coding scheme. He investigated the determinants of job mismatches under three different headings. He categorized all the determinants as individual characteristics, job related characteristics and labor market related structural characteristics. Under individual characteristics, he analyzed the education level of an individual, the age, gender, and the field of study. For the second category, he studied the effects of type of contracts (part-time/fulltime, temporary/permanent)

and experience on the likelihood of being mismatch. Under the structural characteristics as the third group, he looked at the effects of firm size, the sector where the firm operates in (private/public), and the unemployment ratio at the time of entry to the labor market.

Robst (2007a) employed an ordered logistic model by using the data from the USA-1993 National Survey of College Graduates (NSCG) from the National Science Foundation. He measured the field of study mismatch by using worker assessment method, which is a subjective method. The respondents were asked "Thinking about the relationship between your work and education, to what extent was your work on your principal job is related to your highest degree of field? Was it closely related, somewhat related or not related? The responses "not related" and "somewhat related" was considered as mismatch. Those responses were assigned as 1 and the well-match as 0 (zero).

Robst (2007a) built his model as $\Pr(Mismatch)ij = X_{ij}\beta + Z_j\alpha + \varepsilon_{ij}$ where X is the vector for demographic variables for individual i and degree field j and Z denotes the degree fields. Individual related variables include age, the latest educational level, race, disabled and marital status. The education levels were classified as professional, masters, doctoral and other. The degree fields were taken from USA's own categorization of college majors. Although the NSCG reports 146 distinct fields of study in USA, in order to have adequate sample sizes, majors are grouped into 23 categories.

Boudarbat and Chernoff (2009), by using the data from Follow-up Graduates Survey, Class of 2000 among university graduates in Canada, analyzed the causes of field of study mismatch. For this purpose he used a subjective method which is obtained by asking the respondents "How closely is the (main) job you held last week related to your certificate, diploma or degree?" Three choices are given to graduates. These are closely related; somewhat related; not related. To focus on the determinants of obtaining a close match, they used a binary measure of whether graduates have a job that is closely related to their degree (value 1), or otherwise (value 0). Then, they built binary logistic model to determine the variables that are associated with the close match.

For the potential determinants, they break down the variables into three general categories. These are education characteristics, employment characteristics and demographic characteristics. Under the first group, there are four variables which are the field of study, the level of education, grades and major activities before enrolling in the completed program. For the second group of variables, there are four variables which are method used to obtain employment, full-time vs. part-time employment, permanence of employment, and industry type. For the last group, the effects of gender and family background were analyzed.

Montt (2015), clearly followed Wolbers (2003) for measuring field of study mismatch as he made use of coding scheme. He updated Wolbers's (2003) coding scheme by using ISCO-08 occupation codes instead of ISCO-88 codes. He used PIAAC data to conduct his regression analysis. He proposed novel measures such as field saturation and transferability of skills—as proxies of skill demand and supply, respectively in attempting to find explanations for the variations in occurrence of field of study mismatch. He defines and estimates field saturation as the ratio of the number of graduates from a particular field to the number of workers in the corresponding occupational group. He defined each field of study's skill transferability as the proportion of workers working in another occupational group that are not mismatched in terms of skills or qualifications.

In order to analyze the relationship between those variables and field of study mismatch, he applied a binary logistic regression iteratively in 6 different models. His model is as follows:

$$\ln\left(\frac{P(mismatch)_i}{1-P(mismatch)_i}\right) = \beta_0 + \beta_1 S_i + \beta_2 T_i + X^{\iota}\gamma + Z^{\iota}\mu + \varepsilon$$

$S_i \, and \, T_i$ are saturation and skill transferability measures described above. X is a vector of individual-level covariates used for control and associated with the likelihood of mismatch in previous studies. Z is a vector for country-level covariates.

In his model 1, he included only S and T variables. In model 2, he adds the socio-economic variables which are age, gender, marital status, number of children and education level. In model 3, the variables such as firm-size, contract type (part-time vs full-time), permanency of job, experience and type of work place (public or private or NGO) were included. Model 4 adds the skills and education mismatch such as overskilled, underskilled, overeducated, undereducated to isolate the effect of other forms of mismatch. Model 5 and 6 include the country level variables such as union density, unemployment protection level and relative unemployment rate (annual and aggregated macro rate).

OECD (2016) included the effects of individual socio-demographic and job characteristics on the likelihood of being mismatch. They used PIAAC data and coding scheme by following Montt (2015). They conducted a cross country analysis, including Turkey.

Verhaest et al (2017), by using REFLEX and HEGESCO survey data, studied the causes of individual and cross-country differences in mismatch under three headings. These are individual level characteristics, field of study-level characteristics and country level characteristics.

They used a subjective method for measuring field of study mismatch. The respondents were asked "What field of study do you feel was most appropriate for this work?" The respondents

could choose between: (1) exclusively own field, (2) own or a related field, (3) a completely different field, or (4) no particular field. The first two answers were understood as a field of study match, and the last two, as a mismatch.

They applied multilevel multinomial logit regression. Their dependent variables were mere vertical mismatch, mere field of study mismatch and full mismatch which means the overlapping mismatches of vertical mismatch and field of study mismatch.

In summary, in the literature, the number of empirical studies which cover causes of field of study mismatch is very limited. The leading ones are Wolbers (2003), Robst (2007a), Boudarbat and Chernoff (2009), Montt (2015), OECD (2016), Verhaest et al (2017). In those studies, the likelihood of being field of study mismatch is regressed over the potential determinants by regressing binary logistic models or multilevel multinomial logit models.

5.1.2. Effects of Common Determinants on Having Field of Study Mismatch

In this section the empirical findings for causes of field of study mismatch are presented under three sub-sections. While doing so, the related hypotheses which have been already tested and analyzed in the literature will be first put at the center and then the empirical findings will be provided around it.

I will follow Wolbers's (2003) variable categorization to provide the regression results of the previous regressions to discuss the effects of determinants on field of study mismatch, in which some other determinants will be further categorized under one of those three headings. Therefore, in the following sub-sections, the effects of individual characteristics, that of job-specific characteristics, and finally the effects of structural (labor market) characteristics on likelihood of being field of study mismatch are presented.

5.1.2.1. Effects of Individual Characteristics on Having Field of Study Mismatch

In this section, the factors related to educational and demographic context will be presented empirically. More specifically, the effects of the level of education, specificity level of programmes, the age and gender on likelihood of field of study mismatch will be covered.

The following hypotheses are usually suggested and analyzed by many researchers which are very critical in explaining the causes of field of study mismatch, overeducation and their joint mismatches.

Hypotheses:

- At an individual level, graduates from a higher level of education are less likely to be field of study mismatch.
- At an individual level, graduates from more general study programmes are more likely to be mismatched by any type than the graduates from specialized programmes.
- At a country level, countries with a more generally oriented educational systems have a higher incidence of mere field of study mismatch and joint mismatch.
- Male workers are more likely to be mismatched by field of study
- Older workers are more likely to be mismatched by field of study.

The education level determines the likelihood of being employed in a non-matching job. In a situation of overeducation, the over-supply of highly educated graduates may lead to 'bumping down' as these better-educated graduates start competing with less-educated ones. As a result, better educated ones find work in a related field, but at a lower job level. For less and well-educated graduates, however, this strategy is less useful, since their opportunities to switch to an even lower level job are restricted, simply due to the smaller range of alternatives that exist for them. Therefore, the level of education attained by graduates is negatively correlated with the likelihood of being in a non-matching job (Wolbers, 2003).

The specificity level of the programmes is considered as a determinant in determining the mismatch. Wolbers (2003) stated that general study programmes offer a wider array of skills that can be used across occupations. They usually focus more on learning and analytical skills and less on directly applicable skills. He found that graduates from occupation specific fields are less likely to be mismatched by field of study. When the workers who are graduated from general study programmes are field of study mismatched, they will be relatively more productive than graduates from a specialized study programme. Conversely, when there is a match in terms of field of study, those with a more specialized study programme will be relatively more productive.

In the literature, the occupation specific programmes are considered mainly to be the ones related with engineering, manufacturing, construction, teacher training, health, science and mathematics. Wolbers (2003) stated that in vocational programmes which are mainly occupation-specific, graduates have specific skills which prepare them for particular jobs. According to him, good examples are the fields of "education" and "health/welfare", where a close link exists between the field of education completed and the occupation found. Both fields of education prepare for a small number of professions such as teacher or medical doctor occupations that are accessible only with the right certificates.

According to Verhaest et al (2017), there are few mismatches observed in the graduates from specialized programmes when compared to those graduated from humanities and arts degree. However, they found some differences of mismatch probabilities within specialized programmes. Although the graduates from engineering, manufacturing and construction are less likely to be field of study mismatch, they are significantly more likely to be overeducated. Moreover, graduates from health and welfare are better in terms of field of study mismatch when compared to other specialized fields. They stated that even if graduates of a general study programme manage to find a job that matches their field of study, they are more often required to start in a lower-level job to gain some practical work experience before being promoted to a higher position.

Robst (2007a, 2007b) states that accepting a job on another field of study depends on both supply and demand factors. Supply factors include the transferability of skills acquired in formal training in the particular field. In this context, the degrees that have a higher emphasis on the provision of general skills and job/field/occupation-specific skills are considered. Robst (2007a) found that vertical mismatch is more likely among workers with degree fields that provide general skills and less likely among graduates of majors providing occupation specific skills.

Montt (2017) suggested that fields of study that provide more transferrable skills offer their graduates more opportunities to find work in other fields and increase the likelihood of being field of study mismatch. He found that graduates from fields that offer greater transferability are more likely to be mismatched by field only and less likely to be overeducated. These workers seem better able to make horizontal moves without having to downgrade. Workers can find jobs at the adequate qualifications level, thus reducing both the individual and system-level costs associated with field of study mismatch. However, the transferability of skills is not equally predictive of field of study mismatch across all countries, pointing to the articulation of education systems and curricula and the extent to which a particular field provides the same set of general skills across all countries and how credentials are used as signals of worker skills (Montt, 2015).

Regarding gender effect on mismatch, there are some controversial findings, may be stemming from data pool or the country specific reasons. For example, Robst (2007b), by using the 1993 National Survey of College Graduates, found that 20% of graduates report that their work is not related to their degree and the reasons for this differ by gender. According to his findings and Wolbers (2003), being male slightly increases the likelihood of being field of study mismatch. Contrary to the assumption that women are more likely to be overeducated because

of family constraints, OECD (2016), by using PIAAC data, indicated that women are slightly less likely to be overeducated than their male counterparts. However, Boudarbat and Chernoff (2009) did not find any significant effect of gender on any type of mismatch. Garcia and Ibanez (2006) similarly found no significant effect of gender on field of study mismatch when they analyzed whether university graduates in Spain who have attained a satisfactory match between education and employment obtain better labor achievements than those who have not.

For the effects of age, the findings yield that older workers are more likely to be mismatched by field of study as indicated empirically by Wolbers (2003), Robst (2007a) and Montt (2015). Montt (2015), further interpreted that this finding is expected as workers age, their career moves depend more on their past experience than their formal education training. Such an interpretation is consistent with "employer learning" where employers learn about their workers true skill levels as they gain experience. Thus, as workers spend more time in the firm, and get experienced, employers are better able to reward their true skill levels.

5.1.2.2. Effect of Job and Firm-Related Characteristics on Having Field of Study Mismatch

Assignment theories suggest that the process of allocation of workers to jobs needs to consider both the supply of and demand for workers to understand field of study mismatch. This has motivated researchers to verify how firm characteristics relate to mismatch (Montt, 2017).

The following hypotheses are suggested and analyzed very frequently by many researchers which are very critical in explaining the causes of field of study mismatch.

Hypotheses:

- Workers with a temporary and/or part-time contract are more likely to have field of study mismatch job than workers with a permanent and/or full-time contract.
- Workers working in larger firms are less likely to have field of study mismatch than the ones working in small firms.

Boudarbat and Chernoff (2009) found that working full time strongly affects the education-job match. Wolbers (2003) and Montt (2015) found that workers with a temporary or part-time contract are more frequently employed in a job that does not match their field of study than those with a permanent or full-time contract. Garcia and Ibanez (2006), however found that having a temporary contract increases the match.

Regarding firm size, Wolbers (2003) found that field of study mismatch is more common among workers in small firms which are in the private sector. He hypothesized that a larger firm might increase the match because there are more positions available for one to find a position that matches his/her skills.

OECD (2016) found that workers in larger firms and workers working full time are less likely to be overeducated and also less likely to be mismatched by field of study than workers in smaller firms or part-time workers. He stated that one possible explanation for this is that establishment size is a proxy for the quality of human-resource policies, with larger establishments being better at screening candidates and at understanding how overeducation may affect satisfaction at work and, ultimately, productivity. Furthermore, it is suggested that large establishments may also have larger internal labor markets through which workers can be transferred to better matching tasks and jobs inside the firm.

Moreover, Wolbers (2003) stated that graduates from a vocational programme in education science and health/ welfare are less likely to have a job mismatch because he claimed that the public sector comprises all educational and health care organizations which results in lower likelihood of having a job mismatch in public sector regarding these two fields.

Montt (2015) found similar results. His findings showed that field of study mismatch is less likely among workers with more experience, in larger firms, in the public sector or with a full-time contract.

5.1.2.3. Effect of Labor Market Conditions on Being Field of Study Mismatch

There are some hypotheses suggested and empirically tested. The followings are some of the main hypotheses suggested and analyzed which are very critical in explaining the causes of field of study mismatch.

Hypotheses:

- Excess supply of highly educated workers face a higher incidence of overeducation and joint mismatch of field of study and overeducation. The vice-versa holds also true. They are also valid for explaining the differences among the individuals, within and across countries.
- The economic recession at the time when graduates enter the labor market increases the likelihood of being overeducated and mismatched jointly by field of study and overeducation.

- Countries with a higher level of employment protection face a lower incidence of mere field of study mismatch and a higher incidence of overeducation.
- Countries with more generous unemployment benefits have a lower incidence of any type of mismatch

Regarding the excess supply of highly educated workers, according to Verhaest et al (2017), there are two opposing theoretical explanations. On the one hand, an excess supply of skilled workers may force jobseekers to accept jobs below their level of education and/or outside their field of study. On the other hand, excess supply allows employers to be more discriminating. Employers may prefer more highly educated, and thus overeducated individuals. By using the data from REFLEX and HEGESCO surveys and applying multilevel multinomial logit estimation models, they found that structural country-level imbalances between the supply of and demand for graduates drive the incidence of overducation and the joint mismatch of field of study and overeducation, but not the mere field of study mismatch. They state that graduates are prepared to accept lower-level positions when they face difficulties in finding jobs that match their type of education.

Caroleo and Pastore (2015) state that most research focuses on the supply side and individual factors, most probably because overeducation is typically studied based on individual level data and, in particular, on data drawn from labor force surveys. The authors find that demand side variables and differences in the imbalances between the composition by field of study of the demand for and supply of education are more important than institutional factors.

Montt (2015) state that field of study mismatch is responsive to the broader labor market context; it is not an individual outcome or one that results uniquely from workers' choice. He added that the demand for skills in the labor market is one of the drivers of mismatch. When there are more graduates from a particular field than jobs available in that field, some necessarily need to look elsewhere for a job. In this situation, mismatch is indeed preferable to unemployment. In other words, workers from fields that show higher saturation levels are more likely to be unemployed or out of the labor force. He found that labor market conditions in the form of field saturation is predictive of a higher likelihood of individual field of study mismatch. Graduates from fields that are more saturated are more likely to be working in other fields, both at their qualification level and below their qualification levels. They are also less likely to be overeducated in their own field. That is, graduates from saturated fields are more likely to work in other fields and, often, have to downgrade in order to do so.

Regarding economic recession, Wolbers (2003) investigated cross-country differences in field of study mismatches and found that a high unemployment rate in the year of labor market entry

increases the likelihood of field of study mismatch. In the periods of high unemployment, workers are more likely to accept a job in which they are mismatched by field of study. Quintini (2011b) found similar results for overeducated workers.

Montt (2015), however, claimed that mismatched workers may be more likely to become out of work has not been fully explored. He stated that if mismatched workers are less productive – as indicated by their lack of job-specific skills in the first years in the job and their lower levels of pay – or less satisfied in the workplace, they may be the first ones employers decide to lay off in periods of economic difficulty. If they are less satisfied, they may be more likely to resign.

Similarly, Wolbers (2003) observed that a period of economic recession is an opportunity for employers to select their most productive employees, which are most likely to be the matched ones. He found that workers from fields that experience higher levels of saturation are more likely to be unemployed or out of the labor force, and those who graduated from fields with a higher level of skills transferability are less likely to be unemployed or out of the labor force.

Regarding employment protection level, Verhaest et al (2017) found that a strict employment protection level reduces the incidence of mere field of study mismatch five years after graduation. This fits with the expectation that employers are reluctant to hire graduates from non-matching fields of study since these individuals do not provide any reliable signal regarding their productivity. Furthermore, although they claim that in countries with strong employment protection level, employers would rely more on internal promotions, thus increasing the likelihood of overeducation, this was not confirmed by their analyses. As Béduwé and Giret (2011) stated, it may be the case that employers also perceive employment of overeducated individuals to be risky. Individuals may become dissatisfied with their job if they are not promoted resulting in demotivation and lower productivity.

Regarding generous unemployment benefits, it is expected in general that more generous unemployment benefits allow jobseekers to be more selective, resulting in fewer mismatches. Verhaest et al (2017) used the replacement ratio - the proportion of expected income from work that is replaced by unemployment and related welfare benefits- to measure the generosity of unemployment benefits in a country. They found that higher replacement ratios are associated with a lower incidence of mere field of study mismatch. Its estimated effects on overeducation was found to be statistically insignificant.

However, the findings coming from Croce and Ghignoni (2012) do not confirm this, which might be because their analysis is based on data for the full labor force. Given that

unemployment is generally higher among young individuals, the unemployment benefit regime may be a more important factor for the sample where younger workers are analyzed.

In summary, after reviewing the empirical studies, it can be said that the causes of field of study mismatch is analyzed around some similar determinants and effects. The determinants are generally grouped as individual characteristics, job/firm specific characteristics and labor market related conditions.

5.1.3. Empirical Studies on Turkey

The aim of this section is to examine the basic findings of the previous studies which include Turkey within the context of *causes* of field of study mismatch. However, as mentioned earlier in the previous chapter, there are only six studies which cover field of study mismatch and vertical mismatch that include Turkey at a national and/or international level. These six studies are Galasi (2008), Filiztekin (2011), Barlett (2013) Mercan et al (2015), Quintini (2011b) and OECD (2016). They all analyzed the vertical mismatch. However, there is only one study which examines the causes and consequences of field of study mismatch, including Turkey. It is OECD (2016), which analyzed the incidence levels, causes and consequences of field of study mismatch and its overlapping mismatch with vertical mismatch, at an international perspective to make cross-country comparisons.

OECD (2016) analyzed the effects of individual socio-demographic and job characteristics on the likelihood of being field of study mismatch. They used data from PIAAC survey.

Regarding the causes of field of study mismatch, the effects of age, firm size, contract type and employment type on likelihood of being field of study mismatch is examined.

For the effect of age, in some countries 16-24 year-olds are more likely to be field of study mismatched than 25-44 year-olds although the relationship is often not statistically significant. For Turkey, for this age-group there is a small but non-significant effect on field of study mismatch. In many countries, the older age-group has no significant effect on mismatch. Turkey is the only country who has a very significant but negative effect on mismatch. In other words, contrary to many previous findings, as workers get older, the field of study mismatch decreases in Turkey, unexpectedly.

For the firm size, as expected, in many countries the likelihood of field of study mismatch decreases as the firm size gets larger. For Turkey the sign of the effect is the same but it is not significant. OECD (2016) claims that one possible explanation for this result is that establishment size is a proxy for the quality of human-resource policies, with larger

establishments being better at screening candidates and at understanding how overeducation may affect satisfaction at work and, ultimately the productivity. Moreover, large establishments may also have larger internal labor markets through which workers can be transferred to better matching tasks and jobs inside the firm.

Regarding contract type, in many countries the full-time workers are less likely to be mismatched by field of study than part-time workers. For Turkey, the sign of effect is as expected but it is insignificant. According to OECD (2016), part-time jobs may have lower skills content, but they attract qualified workers because they are more compatible with personal/family life or a preferred option over unemployment during economic downturns. Fixed-term contract jobs could be expected to have lower education requirements than permanent jobs, but they often attract tertiary-educated workers who cannot find a permanent position. For Turkey, the effect is insignificant.

In summary, it is very clear that there is a huge literature gap on mismatch issues of Turkey. Therefore, this thesis will contribute to the literature in terms of analyzing causes of field of study mismatch in Turkey, which will be conducted in the next section.

5.2. A Binary Logistic Regression Model for Turkish Case

In this section, the data, variables, and model specification is presented.

5.2.1. The Data

The data for the binary logistic regression model comes from TURKSTAT 2016 Labor Force Survey. In the regression model, some field specific variables are used. For example, the employment rates and the unemployment rates are measured for each field of study, and these field specific rates are used in the regression model. In other words, if an employee who graduated from any field of study (i.e. field A) starts to work in his current job in 2010, then the employment rate for field A in 2010 is used as an explanatory variable. In order to use field specific indicators of labor market, FOET-99 classification is needed. Since FOET-99 has been available in TURKSTAT Labor Force Surveys since 2009, 2016 data is narrowed to this group which covers the respondents who start to work in their current position after 2008.

In other words, data or the target group is defined as, "*at the time of survey year of 2016, the graduates from vocational and technical high schools and universities who have been working since 2009 as a wage-based employee*". [5]

The following steps are carried out to reach the target group.

a. The respondents who are unemployed and not in labor force are excluded in order to focus only on the employed individuals. In 2016, the whole sample size of TURKSTAT Labor Force Survey includes 380.709 individuals who are aged 15 and over. Among those, 171.402 respondents are employed.
b. Among the employed ones, the sample is further decomposed by employment type. Only the wage-based employees are picked-up because the focus of study is on them. The employers, self-employed ones and unpaid family workers are excluded As a result, among 171.402 employees, 104.102 individuals are wage-based employees.
c. Then, among the wage-based employees, graduates from vocational and technical high schools and higher education are selected because there is no occupation specific data for other education levels. In other words, the graduates from general high schools, lower secondary education etc are excluded. Hence, 42.494 individuals are graduated from higher education and vocational and technical high schools.
d. Finally, 42.494 individuals are decomposed by the starting year of current job. The ones who started to work between 2009 and 2016 are selected in order to use field specific employment rate and field specific unemployment rate. As a result, the target group that is used for the regression analysis consists of 25.957 individuals.

Figure 5.1 shows the basic steps taken to reach the target group**.**

5.2.2. The Variables of the Model

A binary logistic regression model is employed in this thesis as Wolbers (2003), Robst (2007a), Boudarbat and Chernoff (2009) and Montt (2015) did. SPSS 17- version is used. The explanation of dependent variable and independent variables are presented in the following paragraphs.

[5] I will regress my model for the target group consisting of sum of graduates from vocational and technical high school and higher education who are working as wage-based employees as of 2016. I also regressed the same model for the group consisting of higher education only and presented the regression results for the sake of researchers' interest in Appendix D.)

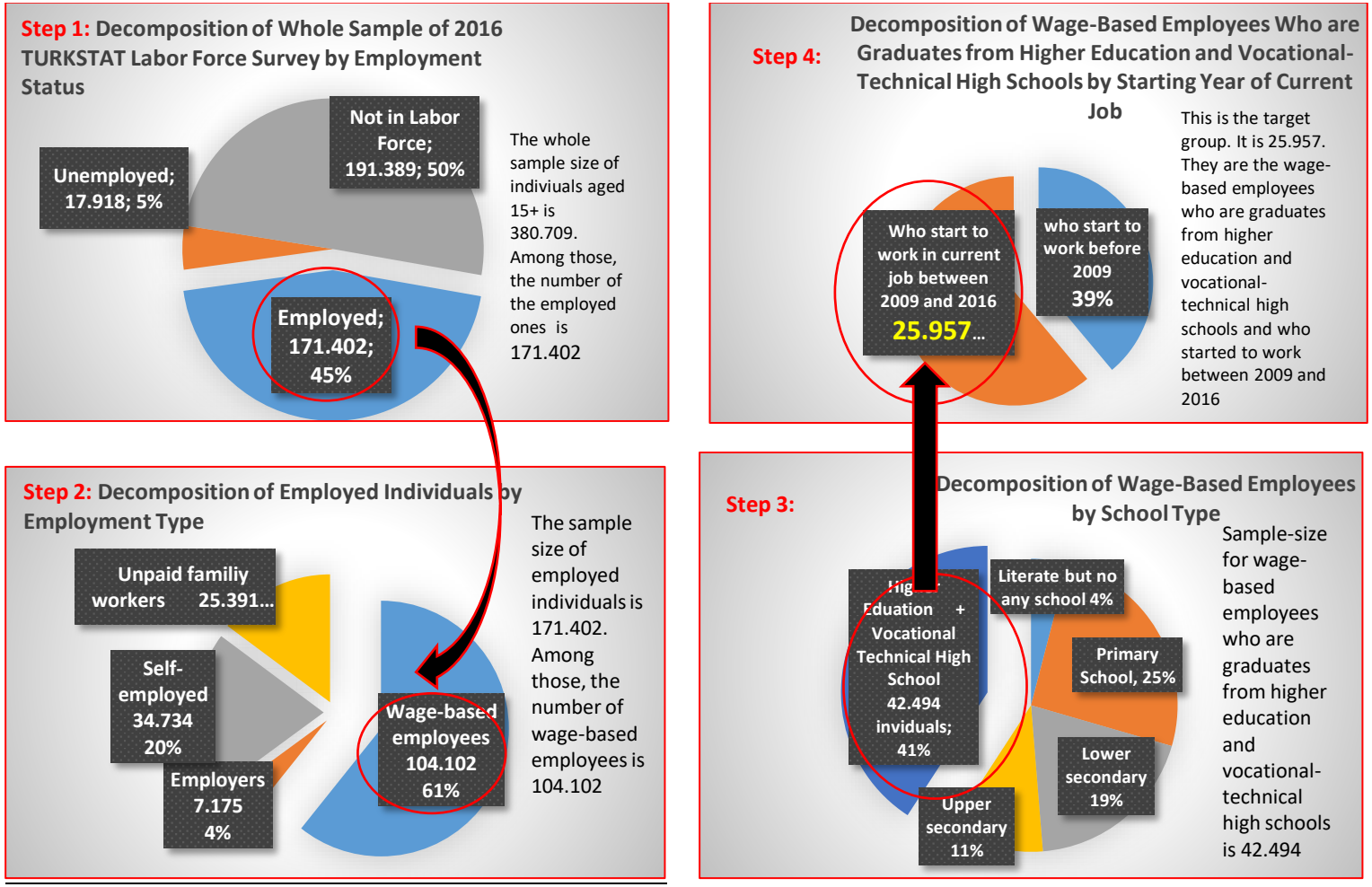

Figure 5. 1 Data Decomposition for Target Group: The Steps Taken to Reach the Target Group of Sample Size Used for Regression Model

Source: Own construction

Dependent Variable is field of study mismatch. For the measurement of field of study mismatch, Montt (2015)'s updated coding scheme is used which was originally developed by Wolbers (2003). (Appendix A presents the coding scheme which indicates the well-matched occupations with respect to field of study)

The field of study mismatch is a categorical variable and has the value of 1 if there is a mismatch according to coding scheme. In other words, if an employee works in an occupation which is outside his/her field of study according to the coding scheme, then the field of study mismatch occurs. It has the value of 0 (zero) if there is a well match.

Independent Variables: The relevant independent variables are proposed by making use of previous empirical studies. In other words, most of the variables of this regression are derived from the previous empirical studies. However, some unique variables are also proposed which are used for the first time in the literature regarding causes of field of study mismatch. All of the independent variables are categorical. Some of them have two levels and some have multi levels. There are five groups of variables. These are:

a. Labor market conditions. These are field specific employment rate and field specific unemployment rate in the starting year of current job.
b. Demographic characteristics. It includes two variables. These are gender and age-groups.
c. Education background. It includes three variables. These are the latest educational level completed, the FOET 99 1-digit classification of field of study (8 fields) and the status whether the individual is overeducated or not.
d. Job-specific characteristics. It includes two variables. These are the contract type (part-time/full time) and the permanency of job.
e. Work place related characteristics. It has three variables. These are the work status of work place (public, private, NGO), firm size and the NUTS1 regions.

Under the above groups, there are 12 different variables. Table 5.1 illustrates the above variable groups. In this context, for each independent variable, the categorical levels, the detailed explanation and the expected effects of each variable on having field of study mismatch are presented in Table 5.1. Table 5.2.displays the frequencies of independent variables.

Table 5. 1 The Variables of Binary Logistic Regression Model: The Explanations and The Expected Effects		
Variable Group 1: Variables related to labor market conditions		
Categorical Variable and its Levels	**Explanation**	**Expected Effect on Dependent Variable**
1- Field Specific Employment Rate in the Starting Year of Current Job	Using field specific employment rate in the context of regression analysis of field of study mismatch is unique. It captures the absorption capacity of the labor market for a specific field of study at the time of entry to the labor market. In other words, it captures the signal of saturation level coming from the labor market for that specific field of study at the time of entry. The Formula is the ratio of employed graduates from a field of study to the total number of graduates coming from that field at the time of starting year of current job. The total number of graduates includes the employed ones, unemployed graduates and the ones who are not in the labor force in working age population. For example, if this rate for field A is70% , it means that out of 100 individuals who are graduated from field A, 70 of them are working in any job. This ratio is calculated for each FOET-99 1-digit field of study for each year covering 2009-2016. A higher ratio is favorable. More technically, when I compare field A with field B whose employment rate is 70 % and 55 % respectively, it means that there is higher demand for field A than field B by the employers. Lower ratio is a critical signal for policy makers. In other words, there is high saturation for field B which implies that the supply of graduates from field B needs to be reduced after detailed, comprehensive and further analyses are conducted, if sufficient jobs can not be created by the employers. Why as a categorical variable but not a continuous variable? Although this variable is originally a continuous variable, I prefer to use it as a categorical variable to improve the quality of interpretations of the regression results. After analyzing the distribution of this data and histogram, I used a 4 level categorical variable, where the cut-off for each of them is the quartiles.	My assumption is that the likelihood of being field of study mismatch decreases as the field specific employment rate at the time of labor market entry gets higher. The lower rate means less demand for or surplus of supply of those graduates. Hence, they will be more likely to search, find and accept jobs outside their education field, even where they will be overeducated.
1.1. 53%-63%		
1.2. 63,1%-64,5%		
1.3. 64,6%-69,1%		
1.4. Field specific employment rate: 69,2% and more		
2-Field Specific Unemployment in the Starting Year of Current Job	This variable is also unique in the context of field of study mismatch regression analysis. In the literature, it is observed that the annual aggregated unemployment rates were used as continuous independent variable in various models but the field of study specific unemployment rates have not been ever used. It captures the unemployment rate of a specific field of study at the time of starting year of current job. The formula is the ratio of unemployed graduates from field A to the active labor force of that field of study. The lower rates are favorable. If it is very high for some fields, more than the aggregate unemployment rate of Turkey, it will be a signal of further analyzing the insufficient demand for that field or surplus of supply of graduates from that field. Why as a categorical variable but not a continuous variable? Although this variable is originally a continuous variable, I prefer to use it as a categorical variable to improve the quality of interpretations of the regression results. After analyzing the distribution of this data and histogram, I used a 4 level categorical variable, where the cut-off for each of them is the quartiles	In the literature, it is assumed that graduates who enter the labor market during an economic recession suffer disadvantages with respect to the chance of finding a job that matches the field of education attended. A high rate of unemployment makes graduates adjust their goals and, therefore, more easily switch to jobs outside their field of education, instead of continuing to search for a job that is better suited to the skills acquired in their field of education (Wolbers, 2003). Hence, as this rate increases, the likelihood of being field of study mismatch increases.
2.1. 6%-8,5%		
2.2. 8,6%-9,9%		
2.3. 10%-11,9%		
2.4. 12% and more		

Table 5.1. The Variables of Binary Logistic Regression Model: The Explanations and The Expected Effects (Cont'd)		
Variable Group 2: Variables for demographic characteristics		
Categorical Variable and its Levels	**Explanation**	**Expected Effect on Dependent Variable**
3-Gender	Regarding gender effect on mismatch, there are some controversial findings. Wolbers (2003) stated that women's unemployment risk is larger, they may be more easily inclined to accept jobs outside their own occupational domain, and he added that since their opportunities for career mobility are smaller, their probability of moving from a non-matching job to a better fitting job is smaller. However, he and Robst (2007b) found empirically that being male slightly increases the likelihood of being field of study mismatch. On the other hand, Boudarbat and Chernoff (2009) did not find any significant effect of gender on any type of mismatch.	In Turkey, the labor force participation rate of women is very low when compared to developed countries or OECD countries. By also taking into account Wolbers(2003)'s claim, I expect higher likelihood of field of study mismatch for females. If such a finding is found, the employment policies regarding gender equality should be examined once more.
3.1. Male		
3.2. Female		
4-Age Group	In the literature, as Wolbers (2003) and Mont (2015) stated, the relative value of vocational qualifications attended in initial education in the total amount of human capital acquired decreases during the career, since other forms of human capital (work experience, on-the-job-training) accumulate with age. In other words, as workers age, their career moves depend more on their past experience than their formal education. According to Montt (2015), such an interpretation is consistent with "employer learning" where employers learn about their workers' true skill levels as they gain experience. Thus, as workers spend more time in the firm, and get experienced, employers are better able to reward their true skill levels. In TURKSTAT 2016 Labor Force Survey, there are 11 age groups starting from age 15 to age 65+, each group consisting of five-year periods. However, because of the following reasons I prefer to use an age-group based on 3 category. First reason is that the average age of graduation from university is more than 22. Taking an age group of 15-19 does not mean anything but only the employees from high school degree. Also, the age group of 20-24 will cover mostly the high school graduates. But in the group of 15-29, the younger graduates will be consisting of highly evenly distributed graduates of both from high school and university degree. The second reason is the fact that having more categories will make it difficult to design or propose age-related policies in the context of my research questions. The third reason would be the problem of degrees of freedom.	For the effects of age on having field of study mismatch, the findings yield that older workers are more likely to be mismatched by field of study as indicated empirically by Wolbers (2003), Robst (2007a) and Montt (2015). My suggestion is the same direction of age effect. Moreover, different from them, this regression model uses the target group who have started to work in their current job since 2009. So, if a worker who is more than 50 years-old started to work in his current job in 2009 or 2010 in Turkey, he will be more likely to be field of study mismatched because of the fact that he/she is a retired person who is looking for any supportive income in any job, whether this job is related or unrelated to his/her field.
4.1. 15-29 age		
4.2. 30-44 age		
4.3. 45-65+ age		

Table 5.1. The Variables of Binary Logistic Regression Model: The Explanations and The Expected Effects (Cont'd)		
Variable Group 3: Variables related to education background		
Categorical Variable and its Levels	**Explanation**	**Expected Effect on Dependent Variable**
5-The latest educational level completed 5..1. 2-4 year of higher education 5.2. 5-6 year of higher education or Masters or Doctorate 5.3. Vocational and Technical High School	The education level determines the likelihood of being employed in a non-matching job. In a situation of overeducation, the over-supply of highly educated graduates may lead to 'bumping down' as these better-educated graduates start competing with less-educated ones. As a result, better educated ones find work in a related field, but at a lower job level (Wolbers, 2003). The education level indicates the latest level completed. For an individual who graduated from engineering discipline in 1995 but completed masters degree in social sciences in 2005, it is coded as category level 2. (5.2.) The 2 - 4 years of higher education level is preferred to be used as reference category because it has the highest frequency and is a basis for my research questions.	The level of education attained by graduates is negatively correlated with the likelihood of being in a non-matching job as empirically found by Wolbers (2003) and Mont (2015). I also suggest a negative correlation between the level of education and likelihood of being field of study mismatch. Employees having higher degrees will have lower likelihood of mismatch.
6-FOET 1-Digit Field of Study 6.1.Teacher training and education science 6.2.Humanities, language, arts 6.3.Social sciences, business and law 6.4.Science, mathematics and computing 6.5.Engineering, manuf. and construction 6.6. Agriculture and veterinary 6.7.Health and welfare 6.8.Service	The specificity level of the programmes is considered as a determinant in determining the mismatch. Wolbers (2003) stated that general study programmes offer a wider array of skills that can be used across occupations. They usually focus more on learning and analytical skills and less on directly applicable skills. Likewise, Montt (2017) suggested that fields of study that provide more transferrable skills offer their graduates more opportunities to find work in other fields and increase the likelihood of being field of study mismatch. In the literature, the specialized programmes are considered mainly to be the ones related with teaching; engineering, manufacturing, construction; health; science and mathematics. Wolbers (2003) stated that in vocational programmes that are mainly occupation-specific, graduates have specific skills which prepare them for particular jobs. According to him, good examples are the fields of education and health/welfare, where a close link exists between the field of education completed and the occupation found. Both fields of education prepare for a small number of professions such as teacher or medical doctor occupations that are accessible only with the right certificates. Those have less likelihood of being mismatch. The field of study last graduated indicates the latest field completed. For an individual who graduated from engineering discipline in 1995 but completed master degree in social sciences in 2005, it is coded as social sciences (6.3) in labor force survey.	Wolbers (2003) found that graduates from occupation specific fields are less likely to be mismatched by field of study. Montt (2017) found that graduates from fields that offer greater transferability are more likely to be mismatched by field only and less likely to be overeducated. Like Wolbers (2003) and Montt (2015), I also took teacher training and education science as the reference category because this field is occupation specific which provides more clear insights for comparison. When compared to reference category (teaching), I expect lower likelihood of being field of study mismatch for health, slightly higher likelihood for engineers and very higher likelihood of being field of study mismatch for the other fields.
7-Over educated 7.1. Well or under educated 7.2. Over educated in his/her occupation group	Verhaest et al (2017) and Robst (2007a) stated that even if graduates of a general study programme manage to find a job that matches their field of study, they are more often required to start in a lower-level job to gain some practical work experience before being promoted to a higher position. However, Verhaest et al (2017) found some differences of mismatch probabilities within specialized programmes. They found that, although the graduates from engineering, manufacturing and construction are less likely to be mismatched by mere field of study and jointly mismatched by field of study and vertically, they are significantly more likely to be overeducated. Although there are some controversial findings, especially within specialized programmes, overducation is an important issue which has significant effects on the consequences of field of study mismatch. When the supply of graduates from a particular field of study is more than the jobs available for that field, some graduates are forced to accept jobs below their education level and/or outside their fields.	I expect a positive and high level of correlation between overeducation and field of study mismatch. Montt (2015) found that overeducated employees are more likely to be field of study mismatch than the well-matched ones.

Table 5.1. The Variables of Binary Logistic Regression Model: The Explanations and The Expected Effects (Cont'd)		
Variable Group 4: Variables related to job specific characteristics		
Categorical Variable and its Levels	**Explanation**	**Expected Effect on Dependent Variable**
8-Part time or full time job	In the literature, in general, labor-market opportunities for workers in a temporary and/or part-time job are worse than for those in a permanent and/or full-time position. An important reason for the less favorable labor-market position of employees with a temporary and/or part-time contract is that it is less profitable for employers to invest in such workers, because of the shorter pay-off period (Psacharopoulos, 1987). In the case of part-time employment,, the returns to investment must be recovered in a smaller number of hours. In the case of temporary employment, employers are more reluctant to invest, because of the greater risk of employees leaving, resulting in a shorter expected pay-off period. It is assumed that these investment arguments also hold with respect to job mismatches. In addition to this, temporary and/or part-time employment often leads to a loss of productive skills and a lack of relevant work experience. (Groot and Maassenvan den Brink,1996). On the basis of these arguments, it is suggested that graduates with a temporary and/or part-time contract more often have a mismatched job than those with a permanent and/or full-time contract	Wolbers (2003) and Montt (2015) found that workers with a temporary or part-time contract are more frequently employed in a job that does not match their field of study than those with a permanent or full-time contract. Garcia and Ibanez (2006), however found that having a temporary contract increases the match. Since there are controversial empirical findings it is hard to estimate the effect. However, when I consider Turkey's economic and cultural context, I expect lower likelihood of field of study mismatch for part-time and higher mismatch for temporary positions.
8.1. Full time		
8.2. Part time		
9-Permanency of job		
9.1. Permanent		
9.2. Temporary or limited-term		
Variable Group 5: Variables for work place related characteristics		
	Explanation	**Expected Effect on Dependent Variable**
10-The status of work place	In general, it is suggested that graduates working in public sector are less likely to be field of study mismatch than the ones in private sector. Wolbers (2003) stated that graduates from a vocational programme in education science and health/ welfare are less likely to have a job mismatch because he claimed that the public sector comprises all educational and health care organizations which results in lower likelihood of having a job mismatch in public sector regarding these two fields.	Since public sector usually prefers to employ the new graduates, the recruiting process gives high level of significance to the education background. This results in better fit between field and the job requirements. I expect the same effect.
10.1. Private		
10.2. Public		
10.3. Foundations, NGOs		
11-Firm Size	In the literature, it is assumed that field of study mismatch is more common among workers in small firms. OECD (2016) stated that one possible explanation for this is that establishment size is a proxy for the quality of human-resource policies, with larger establishments being better at screening candidates. Furthermore, it is suggested that large establishments may also have larger internal labor markets through which workers can be transferred to better matching tasks and jobs inside the firm.	Wolbers (2003), Montt (2015) and OECD (2016) found that employees in larger firms are less likely to be field of study mismatch. Based on the theoretical explanations and empirical findings, I expect the same effect too.
11.1. 10 or less		
11.2. 10-19		
11.3. 20-49		
11.4. 50 or more		
12-NUTS1 regions 12 regions of Turkey. TR1-TR9 and TRA,TRB and TRC	This variable is unique. To the best of my knowledge, it is used for the first time in the context of regression analysis of field of study mismatch. As it is known, NUTS1 has 12 regions in Turkey. The reference category is Istanbul. The regression might yield such findings which require regional policies	I expect high level of field of study mismatch especially in technical fields when I move to eastern part of Turkey.

Table 5. 2 Frequencies of Dependent and Independent Variables			
		Frequency	**Percent**
Dependent Variable	**Field of Study Well Match** **Field of Study Mismatch**	**17210** **8747**	**66.3** **33.7**
Variable Group 1: Labor Market Related Variables	**Field Specific Employment Rate at the Time Of Entry to Labor Market**	**25957**	**100.0**
	Employment Rate: 53%-63%	6549	25.2
	Employment Rate: 63,1%-64,5%	6309	24.3
	Employment Rate: 64,6%-69,1%	6766	26.1
	Employment Rate: 69,2% and more	6333	24.4
	Field Specific Unemployment Rate at the Time Of Entry to Labor Market	**25957**	**100.0**
	Field Specific Unemployment Rate 6%-8,5%	6123	23.6
	Field Specific Unemployment Rate 8,6%-9,9%	6337	24.4
	Field Specific Unemployment Rate 10%-11,9%	6985	26.9
	Field Specific Unemployment Rate 12% and more	6512	25.1
Variable Group 2: Individual Demographic Variables	**Age Group**	**25957**	**100.0**
	15-29 age	13198	50.8
	30-44 age	10845	41.8
	45-65+ age	1914	7.4
	Gender	**25957**	**100.0**
	Male	16563	63.8
	Female	9394	36.2
Variable Group 3: Individual Education Background	**The latest educational level completed**	**25957**	**100.0**
	2-4 years of higher education	15075	58.1
	5 or 6 years faculty, Master's degree, Doctorate	1560	6.0
	Vocational and Technical High School	9322	35.9
	FOET 1-Digit Field of Study	**25957**	**100.0**
	(2) Teacher training and education science	2507	9.7
	(3) Humanities, languages and arts	2516	9.7
	(4) Social sciences, business and law	7782	30.0
	(5) Science, mathematics and computing	1681	6.5
	(6) Engineering, manufacturing and construction	7969	30.7
	(7) Agriculture and veterinary	487	1.9
	(8) Health and welfare	1957	7.5
	(9) Service	1058	4.1
	Over educated	**25957**	**100.0**
	Well or under educated	22999	88.6
	Over educated in his/her occupation group	2958	11.4

Table 5.2. Frequencies of Dependent and Independent Variables (Cont'd)			
		Frequency	**Percent**
Variable Group 4: Job Specific Characteristics	**Permanency of job**	**25957**	**100.0**
	Permanent	23772	91.6
	Temporary or limited-term	2185	8.4
	Part time or full time job	**25957**	**100.0**
	Full time	24796	95.5
	Part time	1161	4.5
Variable Group 5: Work Place Related Characteristics	**Firm Size**	**25957**	**100.0**
	10 or less	7220	27.8
	10-19	2104	8.1
	20-49	5609	21.6
	50 or more	11024	42.5
	The status of work place	**25957**	**100.0**
	Private	19111	73.6
	Public	6619	25.5
	Other (Foundations, NGOs)	227	0.9
	NUTS1 regions	**25957**	**100.0**
	TR1 ISTANBUL	3994	15.4
	TR2 WEST MARMARA	2001	7.7
	TR3 AEGEAN	3089	11.9
	TR4 EAST MARMARA	2801	10.8
	TR5 WEST ANATOLIA	3732	14.4
	TR6 MEDITERRANEAN	2645	10.2
	TR7 CENTRAL ANATOLIA	1373	5.3
	TR8 WEST BLACKSEA	1880	7.2
	TR9 EAST BLACKSEA	930	3.6
	TRA NORTHEAST ANATOLIA	906	3.5
	TRB CENTRALEAST ANATOLIA	1114	4.3
	TRC SOUTHEAST ANATOLIA	1492	5.7

Source: Own construction based on regression data

Under this framework, Table 5.3 presents the summary of hypotheses of the regression model.

Table 5. 3 Summary of the Hypotheses of the Regression Model	
Variable Groups	**Hypotheses for Each Relevant Variable**
Labor market conditions	Employees who start to work at higher field-specific employment rates at the time of entry to the labor market are less likely to be field of study mismatched. Employees who start to work at higher field specific unemployment rates at the time of entry to the labor market are more likely to be field of study mismatched.
Demographic characteristics	Male workers are more likely to be mismatched by field of study Older workers are more likely to be mismatched by field of study
Education background	Graduates from a higher level of education are less likely to be field of study mismatch. Overeducated graduates are more likely to have field of study mismatch than vertically well-matched ones Graduates from more general study programmes are more likely to be mismatched by any type than the graduates from specialized programmes
Job-specific characteristics	Workers with a temporary and/or part-time contract are more likely to have field of study mismatched job than workers with a permanent and/or full-time contract
Work place related characteristics	Workers working in larger firms are less likely to have field of study mismatch than the ones working in small firms The employees working in public sector are less likely to be field of study mismatch. The employees working in eastern Anatolia are more likely to have field of study mismatch than the ones working in Istanbul

Source: Own construction

5.2.3. Model Specification: Binary Logistic Regression Model

Under the framework of the above data and variables, and by following Wolbers (2003) and Montt (2015), the model specification is as follows:

$$\ln\left(\frac{P(mismatch)_i}{1-P(mismatch)_i}\right) = \beta_0 + \beta_1 ER_i + \beta_2 UR_i + X\gamma + Y\theta + Z\mu + W\delta$$

where

P: The probability of having field of study mismatch

ER_i: Field specific employment rate for of field of study i at the time of starting year of current job.

UR_i : Field specific unemployment rate for field of study i at the time of starting year of current job

X: Control variable matrix for individual demographic characteristics

Y: Control variable matrix for individual education background

Z: Control variable matrix for job-specific characteristics

W: Control variable matrix for work place related characteristics

β_0: Constant term

While regressing the model, the stepwise logistic regression approach is not applied as many other researchers did. It is claimed in the literature that the stepwise logistic regression approach resulted in models that are unstable and not reproducible (Austin and Tua J.V., 2004). Instead, the model is regressed in SPSS by using the block entry method in which 5 groups of independent variables are used. In fact, these blocks are the variable groups that are proposed for regressing the model. As a result, five different models at a time are generated by using this method.

In the block-entry method of SPSS, the regression procedure works as follows.

a. First, the regression is run by using only the first variable group. The results are generated for only this model which has only the first block.
b. Then, the variables of the second group are added to the model. The total model is regressed as two different models. The first model generates the same result of the first block. The second model is the larger model which takes into account all the variables of two blocks.

c. The iterations continue like this. For example for the fifth iteration, the model generates five different models for each block. The model of the fifth block includes all the five blocks. In other words, it includes all the independent variables. This is the final model that indicates the regression findings that will be analyzed.

The iterations are illustrated in the following Table 5.4.

Table 5. 4 Variable Setting of Model Specification

Model 1	Model 2	Model 3	Model 4	Model 5
Variable Group1	Variable Group1 Variable Group2	Variable Group1 Variable Group2 Variable Group3	Variable Group1 Variable Group2 Variable Group3 Variable Group4	Variable Group1 Variable Group2 Variable Group3 Variable Group4 Variable Group5

Source: Own construction

As Montt (2015) based his regression on labor market variables such as the field saturation levels and field transferability, this thesis also based the regression on the field specific labor market signals such as the field specific employment rate and field specific unemployment rate. By taking into account the block-entry method iterations, for the model, the variables for labor market conditions took place in each model. To control for the effects of other blocks, they are added to model step by step. First, to control for the demographic effects, age and gender are included in block two. Then, the variables related to education background are added to the model in block three. Finally, the job-specific and work place related variables take place in blocks four and five, respectively.

5.2.4. Correlation Analysis

Before running the regression, the correlation among the independent variables is examined. As Graham (2003) stated, detecting correlation for binary logistic model has not a unique solution because there are different suggestions on this issue.

For this purpose the relevant syntax in SPSS is run. First the correlation is examined by generating correlation matrix between independent variables. Then the output of SPSS for collinearity statistics is analyzed. The values for Tolerance and Variance Inflation Factor (VIF) are generated. These results are shown in Table 5.5 and Table 5.6.

As seen from Table 5.5 for the VIF correlation, all the values are less than two which shows that there is not any risk of correlation. In the literature, the VIF values which is around three might be a problem but it is high risk of correlation when it is more than five (Hair et al, 2006).

As seen from Table 5.6, there is not any Pearson correlation value that is more than 0.5. In the literature, generally the correlation value of 0.7 is thought to be a source of correlation. The highest value of correlation is 0.45 that is between field specific employment rate and unemployment rate.

Table 5. 5 Collinearity Statistics-Tolerance and Variance Inflation Factor

	Collinearity Statistics	
	Tolerance	VIF (Variance Inflation Factor)
Field Specific Unemployment Rate	.757	1.321
Gender	.886	1.129
Age Group	.973	1.027
The latest educational level completed	.824	1.214
FOET 1-Digit Field of Study	.891	1.122
Over educated	.905	1.105
Part time or full time job	.914	1.094
Permanency of job	.903	1.108
The status of work place	.996	1.004
Firm Size	.943	1.060
NUTS1 regions	.957	1.045
Field specific employment rate of Labor Market	.726	1.378

Source: Own construction based on SPSS test results.

Table 5. 6 Correlation Matrix, Pearson Correlation Values, (N=25.957)												
	Field specific employment rate of Labor Market	Field Specific Unemployment Rate	Gender	Age Group	The latest educational level completed	FOET 1-Digit Field of Study	Over educated	Part time or full time job	Permanency of job	The status of work place	Firm Size	NUTS1 regions
Field specific employment rate of Labor Market	1	-,450	-,237	,019	,143	,166	-.008	-,066	-,026	-,018	,018	-,057
Field Specific Unemployment Rate	-,450	1	.010	,020	-,076	-,194	.002	-,032	,027	.010	-,035	-,058
Gender	-,237	.010	1	-,112	-,161	-,078	-,046	,099	,014	,020	-.004	-,044
Age Group	,019	,020	-,112	1	,034	-,037	,064	.011	-,031	,029	.006	-,053
The latest educational level completed	,143	-,076	-,161	,034	1	,210	-,257	-.005	,094	-,023	-,148	-,045
FOET 1-Digit Field of Study	,166	-,194	-,078	-,037	,210	1	,055	-,097	-,029	-.007	,051	-,049
Over educated	-.008	.002	-,046	,064	-,257	,055	1	-.007	-.004	-.010	,102	-.011
Part time or full time job	-,066	-,032	,099	.011	-.005	-,097	-.007	1	,240	.006	-,105	,027
Permanency of job	-,026	,027	,014	-,031	,094	-,029	-.004	,240	1	-.001	-,145	,126
The status of work place	-,018	.010	,020	,029	-,023	-.007	-.010	.006	-.001	1	-,040	,020
Firm Size	,018	-,035	-.004	.006	-,148	,051	,102	-,105	-,145	-,040	1	-,035
NUTS1 regions	-,057	-,058	-,044	-,053	-,045	-,049	-.011	,027	,126	,020	-,035	1

Source: Own construction based on SPSS test results

5.3. Analyzing the Regression Results

In this section first the meaning of odds ratio is revisited. Then, the beta values and odds ratios are interpreted.

5.3.1. The Beta Values and Odds Ratios

Table 5.7 [6] displays the results of the binary logistic regression analysis of having field of study mismatch. Both the beta coefficients and odds ratios are presented. The beta coefficients which are found to be significant at alpha=0.05 are signed as bold with stars. In a linear regression, the beta coefficients are easy to interpret. But for the binary logistic regression, the interpretation is made on the basis of odds ratios.

An odds ratio is a measure of association between an exposure and an outcome. It represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. In other words, odds ratios are used to compare the relative odds of the occurrence of the outcome of interest, given exposure to the variable of interest. When a logistic regression is calculated, the regression coefficient (beta) is the estimated increase in the log odds of the *outcome per unit increase* in the value of the *exposure.* In other words, the exponential function of the regression coefficient (exp(beta)) is the odds ratio associated with a one-unit increase in the exposure. Hence,

Ln (P (mismatch))/(1-P(mismatch)) is actually the logs of odd ratio, where P is probability of having field of study mismatch.

In this context, in a binary logistic regression model, a negative beta value means a negative correlation between the dependent and independent variable. As it is negative, the odds ratio has to be a value between zero and one because odds ratio is exponential of beta, exp(beta). In other words, if the odds ratio is smaller than 1, then the direction of correlation is negative indicating that the beta value is negative. Moreover, odds ratio presents a more meaningful interpretation. Since the outcome has two options of possibility (mismatch or well-match), the odds ratios presents the effect of betas on a scale of "more likely" or "less likely" to have a mismatch.

[6] Please note that this thesis regressed the model for the target group, as of 2016, consisting of sum of graduates from vocational and technical high school and higher education who have been working as wage-based employees since 2009. A model for the group consisting of higher education only is also regressed. The regression results are presented in Appendix D for the sake of researchers' interest.

Table 5. 7 Results of Binary Logistic Regression Analysis of Having Field of Study Mismatch										
Variables	**Model 1**		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
	Beta	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**
Constant	**-.508***	**.602**	**-.194***	.824	**-.742***	.476	**-.694***	.500	**-.171***	.843
1-Field Specific Employment Rate in the starting year of current job *Ref: (53%-63%)*										
63,1%-64,5%	**-.990***	.372	**-1.021***	.360	**-.212***	.809	**-.215***	.807	**-.208***	.812
64,6%-69,1%	**-.670***	.512	**-.765***	.465	**-.209***	.811	**-.224***	.799	**-.279***	.757
69,2% and more	-.196	**.822**	**-.429***	.651	**-.256***	.775	**-.274***	.761	**-.376***	.687
2-Field Specific Unemployment Rate in the starting year of current job *Ref: (6%-8,5%)*										
8,6%-9,9%	**.164***	1.178	**.097***	1.102	-.089	.915	-.090	.914	**-.118***	**.**889
10%-11,9%	**.312***	1.366	**.245***	1.278	.005	1.005	.009	1.009	-.033	.967
12% and more	**.588***	1.801	**.464***	1.590	.066	1.068	.058	1.059	-.002	.998
3-Gender *(Ref: Male)*			**-.582***	.559	**-.432***	.649	**-.410***	.664	**-.412***	.663
4-Age Group *(Ref: 15-29 age)*										
30-44 age			.051	1.052	**.092***	1.097	**.091***	1.09	**.102***	1.107
45-65+ age			**.231***	1.260	**.259***	1.295	**.278***	1.321	**.244***	1.276
5-The latest edu. level completed (*Ref: 2, 3 or 4 year higher edu)*										
5 or 6 years fac.,Masters and PhD					**-2.116***	.121	**-2.09***	.123	**-1.915***	.147
Vocational and Tech High Sch					**1.101***	3.009	**1.101***	3.007	**.978***	2.658
6-FOET 1-Digit Field of Study (*Ref:Teacher training &edu sci)*										
Humanities, languages, arts					**.915***	2.497	**.901***	2.462	**.728***	2.071
Social science, business, law					**-.507***	.603	**-.548***	.578	**-.788***	.455
Science, math, computing					**.986***	2.680	**.956***	2.602	**.763***	2.145
Engineering, manufact., construction					**-.446***	.640	**-.477***	.620	**-.666***	.514
Agriculture and veterinary					**1.126***	3.083	**1.091***	2.978	**.975***	2.652
Health and welfare					**-.599***	.549	**-.653***	.520	**-.837***	.433
Service					**-.909***	.403	**-.959***	.383	**-1.213***	.297
7-Overeducated *(Ref: Well-matched)*					**1.473***	4.363	**1.465***	4.328	**1.359***	3.891
8-Part time *(Ref: Full time)*							**-.661***	.516	**-.653***	.521
9-Permanency of job *(Ref: Permanent)*							**.155***	1.168	**.169***	1.185
10-The status of work place *(Ref: Private sector)*										
Public									**-.545***	.580
Other (Foundations, NGOs)									**.518***	1.678
11-Firm Size (*Ref: 10 or less*)										
10-19									**-.324***	.723
20-49									**-.357***	.700
50 or more									**-.118***	.889
12-NUTS1 *(Ref: İstanbul)*										
TR2 WEST MARMARA									.058	1.059
TR3 AEGEAN									.011	1.011
TR4 EAST MARMARA									-.074	.929
TR5 WEST ANATOLIA									**.137***	1.147
TR6 MEDITERRANEAN									**.130***	1.139
TR7 CENTRAL ANATOLIA									-.072	.931
TR8 WEST BLACKSEA									.104	1.110
TR9 EAST BLACKSEA									.084	1.088
TRA NORTHEAST ANATOLIA									**.444***	1.559
TRB CENTRALEAST ANATOLIA									.152	1.164
TRC SOUTHEAST ANATOLIA									-.106	.899

Note:The dependent variable for binary logistic regression model is having field of study mismatch. * means significant at p=0.05

Source: Own construction based on regression results

If there are two exposures or factors, which are A and B, and if odds ratio for factor A is 1.27, it means that the likelihood of outcome is 27 % more likely to happen ((1.27-1)*100) when compared to factor B. In other words, if factor A is used instead of factor B, then the likelihood of outcome is 27% more likely to happen. If the same example is given when odds ratio is 0.30, then the likelihood of mismatch will be 70% less likely to happen ((1-0.3)*100). When the odds ratio is very high, much more than 3, or very close to zero, the interpretation of them will be improved by other means. In this case, using P values instead of odds ratios are more effective. Since Odds ratio = P/(1-P) where P is the probability of occurrence of an event, (in our case the probability of having field of study mismatch) we can derive probability of the event. So, we can easily find that P=Odds ratio/(1+odds ratio). As a result, if odds ratio is more than 3 or close to zero, using the probability-P value will be more effective in terms of interpretation (Szumilas, 2010).

Moreover, the selected model is model 5 which includes all the blocks of variables. As seen from Table 5.8, the Nagelkerke R square value increases by each model and model 5 has the value of 0.218. The accuracy ratio is the power of prediction. Model 5 has the accuracy ratio of 72 which means that the model predicts 72 % of the time correctly the observations. For example, if there are 100 observations which are really field of study mismatch, the model predicts 72 of them correctly. This accuracy ratio of the model is thought to be very high.

Table 5. 8 Some Statistics About the Models (N=25.957)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Model Chi_Square	822.2	1239.6	3998.2	4077.5	4434,3
Degrees of Freedom	6	9	19	21	37
Model Significance	p<.000	p<.000	p<.000	p<.000	p<.000
-2 Log Likelihood	32351.4	31934	29175.3	29096.1	29739.3
Nagelkerke R Square	0.043	0.065	0.198	0.202	0.218
Accuracy Ratio	66.4	67.9	72	71.7	72

Source: Own construction based on SPSS regression results

5.3.2. The Effects of Labor Market Conditions on Field of Study Mismatch

Field Specific Employment Rate in the Starting Year of Current Job: (The relevant portion of the regression results are shown in the table below)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**
Field Specific Employment Rate in the starting year of current job ***Ref: (53%-63%)***										
63,1%-64,5%	**-.990***	.372	**-1.021***	.360	**-.212***	.809	**-.215***	.807	**-.208***	.812
64,6%-69,1%	**-.670***	.512	**-.765***	.465	**-.209***	.811	**-.224***	.799	**-.279***	.757
69,2% and more	-.196	**.822**	**-.429***	.651	**-.256***	.775	**-.274***	.761	**-.376***	.687

This independent variable is the base variable which is derived by the author. It takes place in all models. Except for the first model, all the sub-variables are significant. All the beta values are negative as expected. For the selected model, Model 5, when compared to reference category of field specific employment rate at the time of starting year of current job, which is 53%-63%, it is very clear that;

- The graduates who start to work in the year when the field specific employment rate is between 63.1% and 64.5% are 18.8% (1-.812) less likely to be field of study mismatch.
- It is 24.3% (1-.757) less likely for the ones who start to work when the field specific employment rate is between 64.6%-69.1%.
- For the last group, the graduates who start to work in the year when the field specific employment rate is more than 69.2 % are 31.3% (1-.687) less likely to be field of study mismatch.

As you recall, the field specific employment rate in the starting year of current job is the ratio of employed workers from a field to the total number of graduates from that field. (The total graduates include the employed, unemployed and not- in labor force individuals who are in working age population) Higher values of field specific employment rate is preferable because it means that there is high demand for those graduates which makes most of those graduates being employed. It is clear that the likelihood of having field of study mismatch decreases as the field specific employment rate gets higher and higher. In other words, the likelihood of having field of study mismatch is lower for the employees who graduated from a field whose

field specific employment rate at the time of starting year of current job is higher. Since this variable captures the saturation level of a field, if there is a low level of employment rate for a field, then the supply of this field has to be further examined by taking into account some other factors. For example, for a specific field of study, a lower level of field specific employment rate with higher level of unemployment rate and a low level of inactivity rate might signal us the fact that there is a huge surplus of supply of this field (more than demand for them) for a long time in such a way that some of the graduates become so hopeless that they will not find a job.

Field Specific Unemployment Rate in the Starting Year of Current Job (The relevant portion of the regression results are shown in the below table)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**
Field Specific Unemployment Rate in the starting year of current job ***Ref: (6%-8,5%)***										
8,6%-9,9%	**.164***	1.178	**.097***	1.102	-.089	.915	-.090	.914	**-.118***	.889
10%-11,9%	**.312***	1.366	**.245***	1.278	.005	1.005	.009	1.009	-.033	.967
12% and more	**.588***	1.801	**.464***	1.590	.066	1.068	.058	1.059	-.002	.998

It is another base variable that takes place in all models. In the first two models, all the sub-variables of this categorical variables are significant and have the expected sign of positive correlation. As the unemployment rate at the time of job entry gets higher, I expect a higher likelihood of being field of study mismatch. As Wolbers (2003) stated, a high rate of unemployment makes graduates adjust their goals and, therefore, more easily switch to jobs outside their field of education, instead of continuing to search for a job that is better suited to the skills acquired in their field of education. However, in Model 3 and Model 4, none of the sub-variables found to be significant.

In Model 5, the first sub-category is significant with an odds ratio of 0.889. Although this is not an expected sign of correlation, when compared to reference category of unemployment rate of 6%-8,5%, the odds ratio of 0.889 means that the graduates who start to work in the year when the field specific unemployment rate is between 8.6% and 9.9% are 11.1% (1-.889) less likely to be field of study mismatch. As the unemployment rate increases, the likelihood of having mismatch decreases unexpectedly. Moreover, the other two categories are found to be statistically insignificant.

5.3.3. The Effects of Demographic Characteristics on Field of Study Mismatch

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio
Gender *(Ref: Male)*			**-.582***	**.**559	**-.432***	.649	**-.410***	.664	**-.412***	.663
Age Group *(Ref: 15-29 age)*										
30-44 age			.051	1.052	**.092***	1.097	**.091***	1.096	**.102***	1.107
45-65+ age			**.231***	1.260	**.259***	1.295	**.278***	1.321	**.244***	1.276

(The relevant portion of the regression results are shown in the above table)

Gender: Gender is a demographic variable. The demographic variables started to take place in Model 2 to control for the effect of demographic characteristics of individuals. In all models, the gender effect is significant and has negative correlation with the dependent variable. Since our reference is males, in Model 5, it is obvious that females are 33.7% (1-.663) less likely to be field of study mismatch. This result is in parallel with the findings of Wolbers (2003), Robst (2007b), Montt (2015) and OECD (2016).

Age-group: Age is another demographic variable which takes place in models 2 through 5. In all models, it is found to be significant with a positive correlation as expected. There are 3 levels of category. The reference category is 15-29 age group. (The reason why I revised the number of age groups from 11 to 3 is explained in Table 5.1) When compared to reference age-group (15-29 age), the Model 5 indicates that;

- Employees who are in age group of 30-44 are 10.7% (1.107-1) more likely to be field of study mismatch.
- Workers whose age are more than 44 are 27.6% (1.276-1) more likely to be field of study mismatch.

In our model data, as you remember, regardless of their age, the employees who start to work in their current jobs between the years of 2009 and 2016 are our target population. By considering this fact, it is clear that the older workers who start to work in their current jobs after 2008 (between 2009 and 2016) are most probably working in their 2nd, 3rd or 4th jobs. For the last age group category, some of those employees might be the retired ones. Retired employees might prefer to work in a job which is not close to his/her field of study, even at a low level of job as an overeducated individual. But for most of the older workers, as Wolbers (2003) and Montt (2015) stated, as workers age, their career moves depend more on their past experience than their formal education. In other words, from the employer's point of view,

their past experience and on the job training might be more favorable than their education background.

However, OECD (2016) found that Turkey is the only country where the incidence of mismatch decreases as the employees get older. In parallel with this unexpected result, when I consider the incidence of field of study mismatch with respect to age-group which is analyzed in the previous chapter, it is very clear that the incidence level of field of study mismatch is higher among the younger graduates. The regression results regarding age might stem from the fact that the target group is the employees who start to work in their current jobs between 2009 and 2016. I mean, if there is not such a restriction, the regression results would be different. It would be highly probable to have regression results similar to the picture obtained from analysis of incidence level of field of study mismatch in chapter 4, and that of OECD (2016).

5.3.4. The Effects of Education Background on Field of Study Mismatch

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**
The latest edu. level completed (*Ref: 2, 3 or 4 year higher educ)*										
5 or 6 years faculty, Masters or Doctor.					**-2.116***	.121	**-2.098***	.123	**-1.915***	.147
Vocational and Tech High Sch					**1.101***	3.009	**1.101***	3.007	**.978***	2.658

Education Level: (The relevant portion of the regression results are shown in the above table)

This variable is related to education background of an individual. To control for the effects of educational background, they are added to the modelling process in Model 3. In models 3 to 5, all the sub-categories found to be significant with the expected sign of effect. When compared to reference category of 2-4 years of higher education, the following regression results are generated.

- As seen from Table 5.8, the odds ratio of the second category is 0.147 with a negative beta value which means that there is a negative correlation. Therefore, the graduates from 5 or 6 year faculties or those who have master or doctorate degree is 85.3 % (1-0.147) less likely to be field of study mismatch than the ones in the reference base category.

- The odds ratio for the third category is 2.658 with a positive beta value which indicates a positive correlation when compared to base category. Hence, the graduates of vocational and technical high schools are much more likely (156.8 %) than the base category to be field of study mismatch.

When the odds ratio is very high, more than 2, or very low closer to zero, the interpretation of them will be improved by other means. Odds ratio = P/(1-P) where P is the probability of occurrence of an event, in our case the probability of having field of study mismatch. Since I know odds ratio, I can derive probability of the event. P=Odds ratio/(1+odds ratio). As a result, for category 2, P=0.147/1.147 that is 0.128. This means that the probability of being mismatch for category 2 is 0,128 which is relatively very small as expected when compared to reference category. By applying it for category 3, the probability of being field of study mismatch for vocational and technical school graduates is (2.658/3.658) 0.726 which is relatively very high when compared to reference category.

I think that there are three reasons why the second category (5 or 6 years of higher education plus the graduate study) has a lower likelihood of mismatch than the reference category. The first one is that the 5 or 6 year faculty graduates are mostly from the faculties of medicine, dentistry and pharmacy. These are all health related disciplines. As Wolbers (2003) and Mont (2015) stated, the graduates from specialized programmes have specific skills which prepare them for particular jobs, and hence have lower probability of being field of study mismatch. Since health science is a specialized programme, it lowers the likelihood of being mismatch in category 2. Moreover, those type of graduates are usually employed by the government with strict and specific job requirements which lowers the likelihood of being field of study mismatch. Besides, it is clear that there is still high demand for health professionals in Turkey.

The second reason is that other than the 5 or 6 year faculty graduates in this category, the graduates from masters or doctorate degree might adapt themselves to their current job by attending and completing a graduate study which is very closer to their current job requirements than their original bachelor degree. For example, if a chemical engineer starts to work in a marketing and promotion position, then this is a field of study mismatch according to Wolber's (2003) coding scheme. She/he can decide to attend to a master degree in marketing to improve her/his relevant skills required by current job. If she/he completes this master degree, then according to TURKSTAT labor force survey, her/his latest level of education is coded as category 2 with the latest completed field of marketing. In this case, originally a mismatch individual becomes well match. I believe that these type of cases can be observed very often in Turkey. Moreover, those cases might increase the probability of being

overeducated. The individual who completed master degree in marketing might become overeducated in marketing position.

The third reason is that the reference category includes 2 or 3 year MYO-associate degree graduates. As of 2017-2018 academic year, the total number of students excluding graduate study is approximately 7 million and the proportion of MYOs (associate degree) is almost 40%. Hence, from the reverse side, the relative higher likelihood of mismatch in category 1 when compared to category 2 might stem from this high proportion of MYO (associate degree) graduates who have more difficulty in finding the right job.

The main reason why the vocational school graduates have higher likelihood of being field of study mismatch would be quantitative expansion in higher education which has been effective since 2006. Wolbers (2003) stated that in a situation of overeducation, the excess supply of highly educated graduates may lead to 'bumping down' as these better-educated graduates start competing with less-educated ones. As a result, better educated ones find work in a related field, but at a lower job level. Since high educated graduates shift to lower level positions, the graduates from high schools have difficulty in finding right jobs for them. They start to search for other jobs which are outside their education field.

Type of Field of Study: (The relevant portion of the regression results are shown in the below table)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio
FOET 1-Digit Field of Study (*Ref: Teacher training and education science)*										
Humanities, languages, arts					**.915***	2.497	**.901***	2.462	**.728***	2.071
Social science, business, law					**-.507***	.603	**-.548***	.578	**-.788***	.455
Science, math, computing					**.986***	2.680	**.956***	2.602	**.763***	2.145
Engineering, manufact., construction					**-.446***	.640	**-.477***	.620	**-.666***	.514
Agriculture and veterinary					**1.126***	3.083	**1.091***	2.978	**.975***	2.652
Health and welfare					**-.599***	.549	**-.653***	.520	**-.837***	.433
Service					**-.909***	.403	**-.959***	.383	**-1.213***	.297

This is another variable of education background. Since it has 8 categories, I have to choose one of them as the reference category in SPSS regression modeling. As in other previous studies, the teacher training and the education science is selected as the reference category because it is thought that this field is an occupation specific which might provide more clear insights while comparing it with others. In the literature, the specificity level of the programmes is considered as a determinant in determining the mismatch. The main consensus

is that the general programmes have higher likelihood of being mismatch because general study programmes offer a wider array of skills that can be used across occupations, and because they usually focus more on learning and analytical skills and less on directly applicable skills. On the other side, the fields that produce occupation specific skills prepare the graduates for specific jobs.

This variable takes place in Model 3 through Model 5. In all of those models, all of the sub-categories are significant. When compared to base category, some of them have negative correlation and the others have positive correlation. In Model 5, when compared to reference category of teacher training and education science, the following results are summarized.

- The graduates from
    - humanities, languages and arts, (the odds ratio: 2.071) (P:0,67)
    - science, mathematics and computing (the odds ratio: 2.145) (P:0,68)
    - agriculture and veterinary (the odds ratio: 2.652) (0,72)

  are more likely to have field of study mismatch

- The graduates from
    - social sciences, business and law (the odds ratio: 0.455) (P:0.31)
    - engineering, manufacturing and construction (the odds ratio: 0.514) (P:0.34)
    - health and welfare (the odds ratio: 0.433) (P:0.30)
    - services (the odds ratio: 0.217) (P:0.178)

  are less likely to have field of study mismatch

When the probabilities (the P values are calculated by the author and written in parenthesis) of having a mismatch for a specific field are examined, it is clear that the probabilities for higher odds are more than two-thirds. For example, the probability of having field of study mismatch for science, mathematics and computing graduates is 0.68, a relatively high value. For the smaller odds ratio values, the probabilities are almost less than one-third, very low levels when compared to base category. For example, the graduates from engineering, manufacturing and construction have 0,34 probability of being mismatch when compared to teacher training.

It seems that those findings are in parallel with the general discussion of literature that occupation specific programmes reduce the risk of having a mismatch. It is interesting to note that the graduates from services has the lowest likelihood of field of study mismatch. This field includes transport services and environmental protection and security services. It is very clear that those graduates work especially in their fields. Another point is that graduates from

teacher training field have higher probabilities of having mismatch when compared to "social science, business and law" and "engineers, manufacturing and construction". The higher probability of being mismatch for science, mathematics and computing is one of the other significant issue to be taken into consideration because those graduates are the candidates for being scientists to conduct basic research and development activities together with the other complementary fields. To my opinion, the reason of this mentioned situation for teachers and science graduates is the excess supply of labor in these fields.

Overeducation: (The relevant portion of the regression results are shown in the below table)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio
Over educated *(Ref: Well Educated)*					**1.473***	4.363	**1.465***	4.328	**1.359***	3.891

Overeducation is another variable for controlling the effect of education background on having field of study mismatch. In the literature there is a discussion whether overeducation is a cause for field of study mismatch or a consequence of it. However, Montt (2015) considered it as a determinant of field of study mismatch and found significant positive correlation as I found in the regression. In Model 5, when compared to well-matched ones, overeducated employees are 289.1 % (3.891-1) far more likely to be field of study mismatch. In other words, the probability of having mismatch for overeducated ones is almost 0.8. It is a very high level of probability which requires further analysis.

The main reason why the overeducated graduates are very far likely to be field of study mismatch lies under the uncontrollable expansion of higher education system as I mentioned above when I was trying to explain the effects of level of education. I strongly believe that the huge and rapid expansion in higher education which has been intensely active since 2006 changes the name of the game in the labor market dynamics in our country. In other words, as Montt (2015) stated, if the supply of graduates from a particular field of study is more than the jobs available in that field, then job-seekers are forced to accept jobs outside their fields by downgrading their education level. Moreover, the excess supply might affect the employers' recruitment process in such a way that they prefer high educated candidates which require less investment in "on the job training" and future plans. This situation yields a shift in employment policies of firms which can increase the overeducation level of employees within an

occupation group. On the other side, the available jobs in the market is limited and there is a huge competition for those scarce jobs. Besides, at the time of economic recessions, those limited number of vacancies decrease further. This factor increases the likelihood of having field of study mismatch and overeducation.

5.3.5. The Effects of Job-Specific Characteristics on Field of Study Mismatch

(The relevant portion of the regression results are shown in the below table)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**	**Beta**	**Odds Ratio**
Part time *(Ref: Full time)*							**-.661***	.516	**-.653***	.521
Permanency of job *(Ref: Permanent job)*							**.155***	1.168	**.169***	1.185

Part time job**:** The contract type is a job-specific characteristics. It is added to the regression analysis in Model 4. The effect of part-time job when compared to full-time job is found to be significant in models 4 and 5 but with an unexpected sign. In the literature while the part-time workers have higher likelihood of being field of study mismatch, it is found that part-time workers are 47.9 % (1-0.521) less likely to have mismatch than the full-time workers. In other words, the probability of being mismatch for part-time workers is only 0.34 when compared to full-time positions.

The main reason behind this unexpected sign would be the fact that the proportion of part-time workers in our model sample size is only 4.4%. Moreover, the culture of working as part-time employee is not so widespread in Turkey. It is clear that the few ones who work as part-time work in well-matched jobs.

Permanency of job: The permanency of job is the other job-specific characteristic. It is added in model 4. The effect of temporary job on being field of study mismatch is significant in models 4 and 5 with an expected positive correlation. The workers who work in temporary jobs are 18.5% (1.185-1) more likely to have field of study mismatch than the ones who work in permanent jobs.

As Groot and Maassenvan den Brink (1996) claimed, in the case of temporary employment, employers are more reluctant to invest in such positions because of the greater risk of employees leaving, resulting in a shorter expected pay-off period. I believe that such an argument holds true In Turkey.

5.3.6. The Effects of Work Place Characteristics on Field of Study Mismatch

(The relevant portion of the regression results are shown in the below table)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio
The status of work place *(Ref: Private sector)*										
Public									**-.545***	.580
Other (Foundations, NGOs)									**.518***	1.678
Firm Size (*Ref: 10 or less*)										
10-19									**-.324***	.723
20-49									**-.357***	.700
50 or more									**-.118***	.889

The Status of Work Place: This variable belongs to our last group, which is work place related characteristics. There are three levels in this categorical variable and the reference is the private sector. As it is seen from the regression results in model 5, when compared to reference category, the employees working in public sector are 42% (1-0.580) less likely to be field of study mismatch. On the other hand, the workers in NGOs and foundations are 67.8 % (1.678-1) more likely to be mismatch than the ones working in private sector.

There might be two reasons why the likelihood of mismatch is lower for public sector. The first one is the fact that public sector is almost the only employer for the graduates from teacher training and health science whose likelihoods of being 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 well-match is higher than that of mismatch.

The Firm Size**:** In TURKSTAT 2016 labor force survey, there are 5 categories, one of which is "Do not know but more than 10". This category has only 42 observations in our model data. So, these data is moved to the category of "More than 10 but less than 20" to decrease the

levels of this categorical variable and to minimize the degrees of freedom effect. As seen from Model 5, all of the categories are found to be significant with the expected sign of correlation. When compared to base category of 10 or less employee;

- The employees working in firms having 10-19 employee are 27.7% (1-0.723) less likely to have field of study mismatch.
- The workers in the firm size of 20-49 employee are 30% (1-0.7) less likely to have mismatch than the reference category.
- The workers in larger firms (more than 50 employees) are 11.1 % (1-0.889) less likely to have field of study mismatch.

The likelihood of being mismatch decreases as the firm size increases when compared to reference category. However, the last category has a reduction in decrease. By considering the odds ratio of the second category, the odds ratio for the last category is expected to be less than 0.70. The findings are in line with Wolbers (2003), Montt (2015) and OECD (2016)

The reason why field of study mismatch is more common among workers in small firms might be the fact that larger establishments are better at screening candidates and they have larger internal labor markets through which workers can be transferred to better matching tasks and jobs inside the firm.

NUTS1 Regions:

(The relevant portion of the regression results are shown in the below table)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio	Beta	Odds Ratio
NUTS1 regions *(Ref: İstanbul)*										
TR2 WEST MARMARA									.058	1.059
TR3 AEGEAN									.011	1.011
TR4 EAST MARMARA									-.074	.929
TR5 WEST ANATOLIA									**.137***	1.147
TR6 MEDITERRANEAN									**.130***	1.139
TR7 CENTRAL ANATOLIA									-.072	.931
TR8 WEST BLACKSEA									.104	1.110
TR9 EAST BLACKSEA									.084	1.088
TRA NORTHEAST ANATOLIA									**.444***	1.559
TRB CENTRALEAST ANATOLIA									.152	1.164
TRC SOUTHEAST ANATOLIA									-.106	.899

This variable tries to capture the significant regional differences (if any) while explaining the effects of living or working in a specific region when compared to base category, which is Istanbul. There are 12 regions. My hypothesis before the regression was that the likelihood of

mismatch increases when we move from western part of Turkey to eastern part. However, the regression did not provide strong evidence to support my hypothesis. It is seen that 3 regions have significant effect on field of study mismatch. These are TR5 West Anatolia, TR6 Mediterranean, TRA North East Anatolia. All of them have positive correlation meaning that their likelihood of being field of study mismatch is higher than reference category. When compared to Istanbul region, the regression results yield the followings:

- The employees working in TR5-West Anatolia are 14.7% (1.147-1) more likely to have mismatch
- The workers in TR6-Mediterranean region are 13.9% (1.139-1) more likely to have field of study mismatch
- The employees working in TRA North east Anatolia are 55.9% (1.559-1) more likely to have field of study mismatch.

To the best of my knowledge, the regional differences are studied for the first time in the literature while analyzing causes of field of study mismatch.

5.4. Graphical Analysis of Estimated Marginal Means of Field of Study Mismatch with Respect to Key Variable Groups

The regression analysis provided us the effects of each variable on having field of study mismatch. Those findings are not on the basis of each field of study. Moreover, the regression does not cover the interaction effects because of degrees of freedom problem.

In this section, graphical analysis will be conducted to provide the interaction effects of variables on the dependent variable. For this purpose, estimated marginal means[7] of field of study mismatch with regard to some critical variables will be analyzed. The data analyzed in this section is the same as the regression data. It comes from the regression results which is based on TURKSTAT 2016 Labor Force Survey. In other words, this analysis is for the 25.957 individuals who are graduated from higher education and vocational technical high schools, and have started to work in their current jobs between 2009 and 2016 as a wage-based employee.

Regarding the graphical analysis, two variables will be fixed. The first one is the estimated marginal means of field of study mismatch. It will be always on the y-axis. Moving up on the

[7] The Estimated Marginal Means in **SPSS GLM** tells us the mean response for each factor, adjusted for any other variables in the model

y-axis means having higher likelihood of field of study mismatch, which is not favorable. In this context, the variables that require further analysis and policy interventions will be the ones which are on the upper side of y-axis.

The other fixed variable will be the FOET-99 1-digit classification of field of study. In other words, I will perform graphical analysis by each field of study with respect to fixed-y axis and changing x-axis values. The interactions between the y-axis and the variable on the x-axis are examined by each field of study. Since the variables on the x-axis will change for different variables, the comments will depend on their relative positions on the x-axis, whether they are on the left-hand side or on the right-hand side. (In some cases, for providing graphically visual interactions, the FOET 99 classification of each field of study was used on the x-axis and the critical variable as the target variable.)

The following figures are used for the purpose of providing only the visual key messages. The statistical significance of them is out of scope of this section.

5.4.1. With Respect To Starting Year of Current Job

Since the main focus of regression analysis is on the starting years of current job between 2009 and 2016, first the situation over this time period is analyzed.

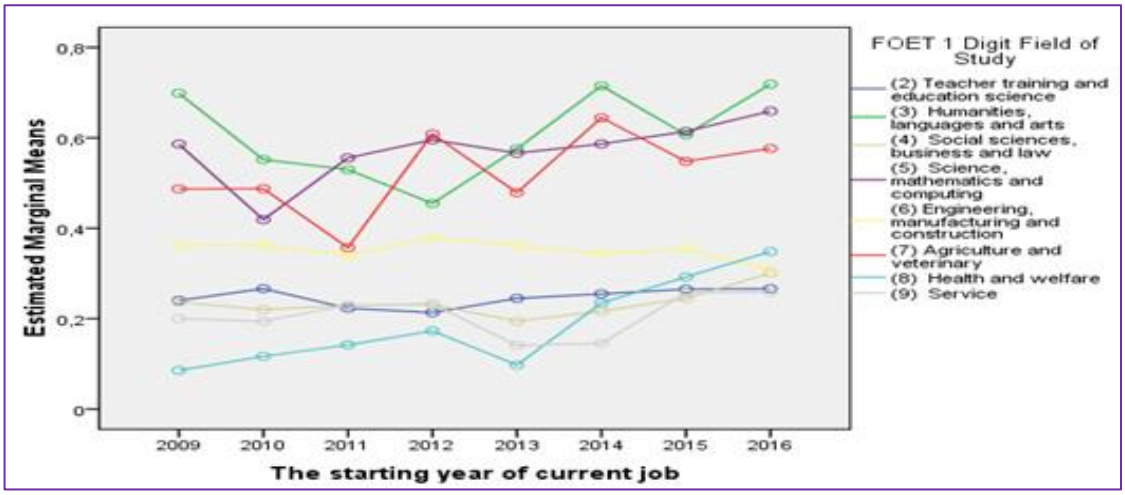

Figure 5. 2 Estimated Marginal Means of Field of Study Mismatch With Respect to Starting Year of Current Job (2009-2016)
Source: Own construction based on SPSS

As it is seen from Figure 5.2, although this is a short time period, it is clear that;

- The likelihood of being mismatch increases slightly over time. For example, the graduates from humanities, languages and arts who start to work in their current job in 2016 are more likely to be field of study mismatch than the ones who start to work in 2010.
- Besides, three of those fields have higher likelihood of mismatch than the other five fields. These three fields of study are (i)humanities, languages and arts, (ii) science, mathematics and computing, (iii) agriculture and veterinary

Moreover, the estimated marginal mean values of field of study mismatch for all fields in 2009 are very high when compared to other years. I think that this is because of the effect of 2008 global economic crisis which also affected our labor markets. The trend of increase will become more visible if 2009 data is excluded

When the same relationship in our larger sample size is analyzed, which has no restriction on the starting year, the increase in likelihood of being mismatch over time becomes clearer. As it is seen from Figure 5.3, the starting year of current job for some respondents in 2016 survey goes back to 1988. This does not mean that the data for starting years was taken from different surveys that covers 1988 through 2016. They are taken from the TURKSTAT Labor Force Survey 2016. These data stand for the job-starting years of the employees who told that they have a job at the time of 2016 survey.

It is seen very clearly from Figure 5.3 that;

- The difference in marginal mean values of field of study mismatch becomes larger over time for almost each field.
- The humanities, languages and arts has the highest likelihood of being mismatch in almost every year.
- The engineering, manufacturing and construction field is the only one which decreases its estimated marginal means of field of study mismatch slightly over time.
- Three fields (field numbers 3,5 and 7) start to act as a group having higher likelihood of being mismatch than the other five fields after the early 2000s. The difference of estimated means between this group and the other five fields start to widen in early 2000s and become larger and larger since then.

In summary, while the graduates from any field who start to work in the past have high likelihood of being field of study WELL-match, the ones who have started to work recently have high likelihood of being mismatch. The figures and graphs signal us that there might be excess supply of graduates and/or high saturation especially in (i)humanities, languages and

arts, (ii) science, mathematics and computing, (iii) agriculture and veterinary. The new graduates are having difficulty in finding relevant jobs because those restricted job opportunities have already been captured by the older graduates, and new job vacancies are not created sufficiently.

Figure 5. 3 Estimated Marginal Means of Field of Study Mismatch With Respect to Starting Year of Current Job (1988-2016)
Source: Own construction based on SPSS

5.4.2. With Respect To Labor Market Conditions

Field Specific Employment Rate by FOET-99 1-Digit Field of Study: As seen from Figure 5.4, it is clear that except for the "agriculture and veterinary", the likelihood of being field of study mismatch decreases as the field specific employment rate of that field increases. Moreover, three fields are more inclined to be field of study mismatch than the others. (The fields 3, 5 and 7). These findings are consistent with the regression results.

The lower level of field specific employment rate means lower level of demand for those graduates or excess supply of those graduates or both of them at the same time. In such circumstances, since the graduates can not find a job in their field, they might prefer to work in jobs which are outside their field of study.

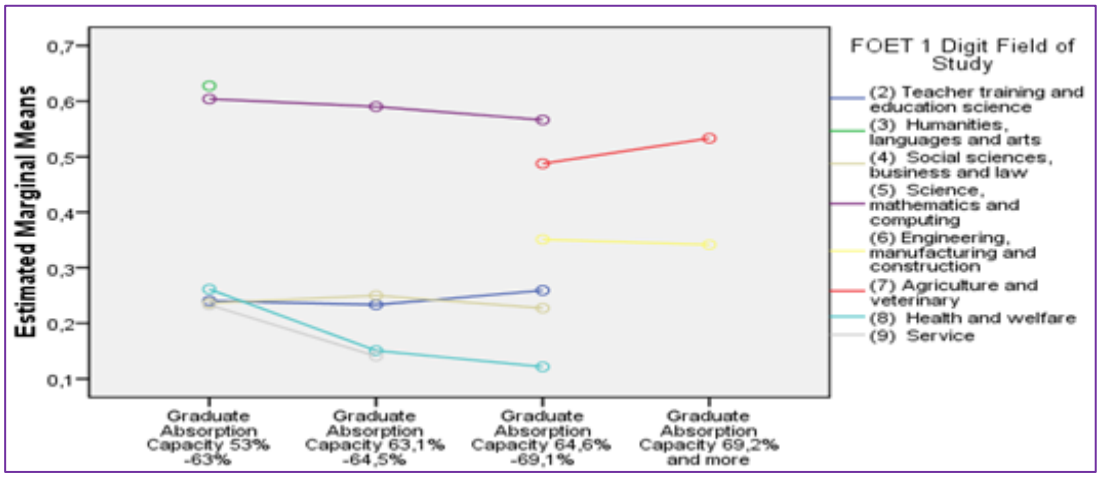

Figure 5. 4 Estimated Marginal Means of Field of Study Mismatch With Respect to Field Specific Employment Rate
Source: Own construction based on SPSS

In this context, the findings which have high priority of further analysis are as follows.

- The field specific employment rate for the fields 2,3,4,5,8 and 9 has never reached to the highest category level, which is more than 69.2%. The fields called "agriculture and veterinary" and the "engineering, manufacturing and construction" have never had any employment rate below the 64.5% (2nd and 1st category). Furthermore, it is clear that all the employees from "humanities, languages and arts" are all in the base reference category which is the lowest absorption capacity. (It is circle, not a line). The employment rate for this field did not change between 2009 and 2016. This is one of the worst findings to be underlined.
- There are four fields whose likelihood of field of study mismatch is lower although some of them start to work at a time of lower field specific employment rate. This is very favorable and a good indication for future employability. The best fitted ones are the "health and welfare" and the "services" whose probability of mismatch decreases clearly as the absorption capacity increases. Besides, the "services" achieved this result although it has lower likelihood of mismatch than "health and welfare".
- The field called "humanities, languages and arts" (the green circle) has the lowest level of field specific employment rate which means that most of the graduates from this field could not find any job. This is one of a worse finding. However, the situation gets worse than that because this field has also the highest level of likelihood of being mismatch. In other words, there are few employed individuals and most of them are unfortunately working outside their own fields. This finding has the highest priority which requires some further assessments.

- Although “science, mathematics and computing” (purple line) has the similar range of absorption capacity (between 60% and 67%) with the fields 2,4,8 and 9, it has a higher likelihood of being mismatch. The graduates from this category are considered as the candidates for future scientists in basic and applied research. However, most of them are working outside their fields and hence having field of study mismatch. The supply side of this field should be planned more carefully or further measures are required to employ them to benefit from their expertise.
- The fields called “agriculture and veterinary” and the “engineering, manufacturing and construction” have the highest level of field specific employment rate which can be seen as a good indicator because this means that most of the graduates from those fields are working in any job. However, despite this high level of absorption capacity, the graduates from “agriculture and veterinary” are more inclined to be field of study mismatch. Two opposing assessments can be inferred from this finding. The first perspective claims that this is not a problem because they are able to find and work in any job, whether well-match or mismatch. The other one underlines that working as a field of study mismatched is a problem and has some individual and national level consequences which can cause low wage, lower productivity, less satisfaction, opportunity cost, sunk cost of education etc. The effect might be larger if moving from their field to another one comes with overeducation.

Field Specific Unemployment Rate by FOET-99 1-Digit Field of Study: The estimated marginal means of field of study mismatch for each field of study with respect to field specific unemployment rates are displayed in the Figure 5.5.

It is seen that there is not a clear trend of increase (decrease) in estimated means of field of study mismatch as the unemployment rates increases (decreases). In some fields, there is a slight increase in this regard.

More specifically;

- The unemployment rate for the field called ”teacher training and education science” has never increased to more than 9.9%. Moreover, the likelihood of being mismatch is also low when compared to many fields. These two findings can be considered as a favorable situation. However, this finding has to be cross-checked whether there is high or low level of graduates who are out of labor force (inactivity rate). If there is a high proportion of “not being in the labor force”, then this might signal that some teacher candidates lost their hope to find a job and hence left the labor force.

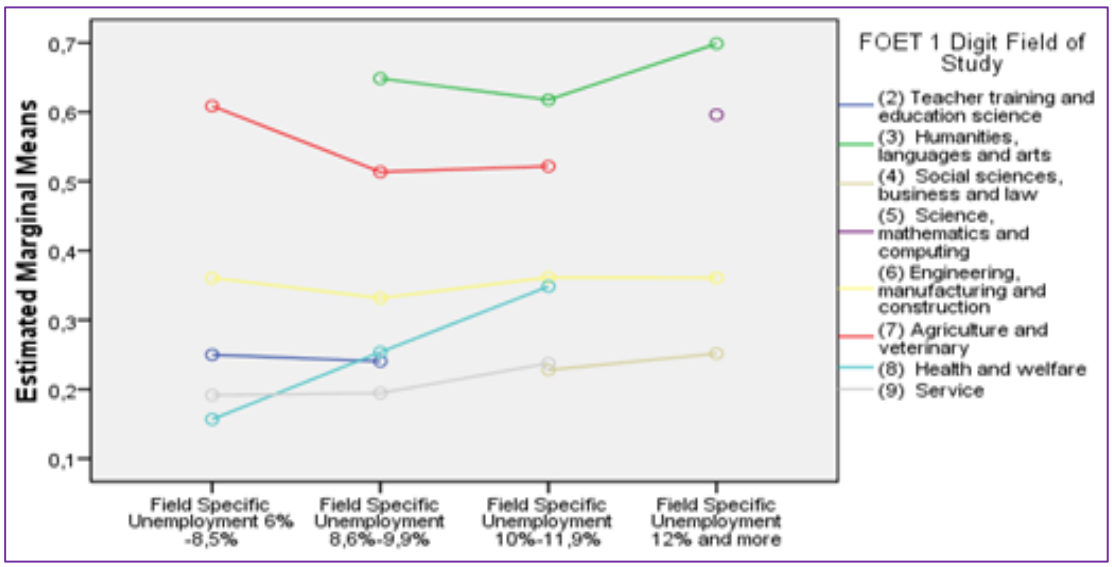

Figure 5. 5 Estimated Marginal Means of Field of Study Mismatch With Respect to Field Specific Unemployment Rate
Source: Own construction based on SPSS

- Although the graduates from "services" are in the category level of high unemployment rates, their likelihood of being mismatch is almost the lowest. This might indicate that even though there is insufficient demand for or excess supply of them, they work in fitted jobs. In other words, this field is very occupation specific which prevents them finding jobs in other or mismatched jobs. If this is the case, then the supply of them should be planned very carefully since the unemployed ones have difficulty in finding other jobs because they can not transfer their skills easily to other occupation groups. Moreover, a third perspective whether their labor force participation rate is lower or higher should provide complementary insight. If the labor force participation rate is low, then it might signal us that there are some portion of graduates who wait for a long time to find a job but later left the labor force because of losing their hopes.
- As found before, the fields 3,5 and 7 have higher likelihood of being field of study mismatch when compared to other fields. The interesting point is that "graduates from "agriculture and veterinary" who start to work in favorable economic context (lowest unemployment rate) have the highest probability of being mismatch.
- The field called "science, mathematics and computing" has the same level of unemployment rate between 2009 and 2016. It has not a line but only a circle. In other words, the graduates who start to work in their current job in 2009 or 2016 faced the

same unemployment rate which is the highest one. Moreover, they are very likely to be field of study mismatch and their field specific employment rate is lower. Hence, it produces an alarming situation for this field.

- The "engineering, manufacturing and construction" field is the only one which touches upon every category of unemployment field. The point is that the graduates from this field have the same average likelihood of field of study mismatch no matter they belong to which category of unemployment rates (the yellow line).

5.4.3. With Respect To Individual Demographic Characteristics

In this section the estimated marginal means of field of study mismatch for each field of study will be graphically analyzed with respect to gender and age-group.

Gender by FOET-99 1-Digit Field of Study:From the regression results it is found that the mismatch is higher for males when compared to females. When this relationship for each field of study is examined (Figure 5.6), the males are, in general, more likely to be field of study mismatch in many fields. Thus, this finding is in parallel with the regression results.

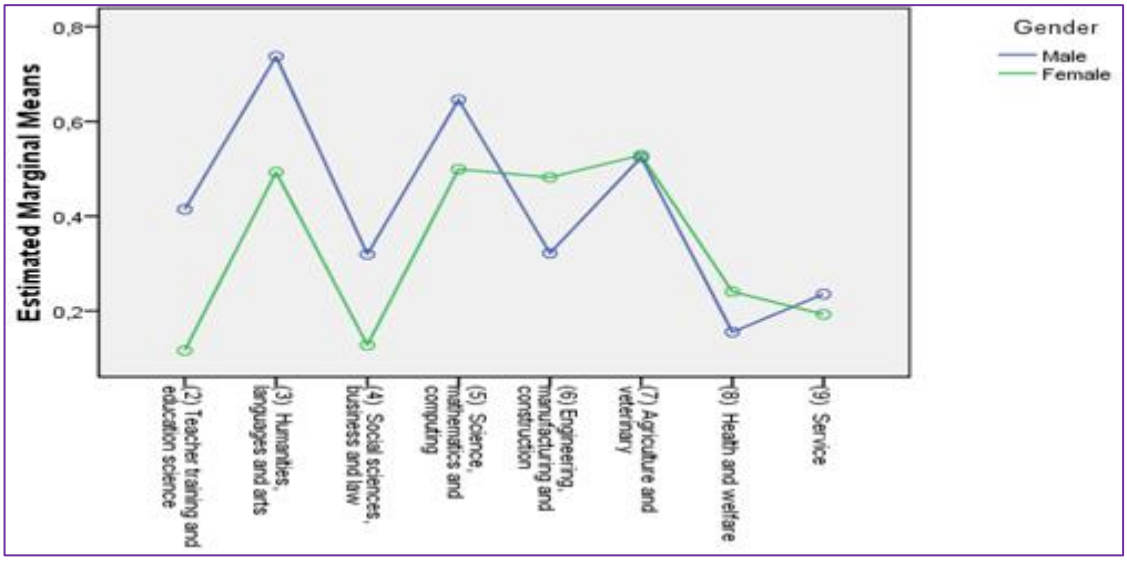

Figure 5. 6 Estimated Marginal Means of Field of Study Mismatch by Gender
Source: Own construction based on SPSS

The only field of study where the females have higher likelihood of mismatch is the "engineering, manufacturing and construction". This finding might be explained in such a way that the females who are graduated from this field willingly prefer to work in other occupation groups or the demand for the male graduates is higher than females. For the fields, "health and

welfare", "agriculture and veterinary" and "services" there is not a difference between the likelihood of being mismatch for males and females. For the other fields of study, males are far more likely to be mismatch than females.

Age-Group by FOET-99 Field of Study: From the regression results it is found that the mismatch increases in older age-groups when compared to reference age-group of 15-29. When the same relationship is examined in each field of study (Figure 5.7):

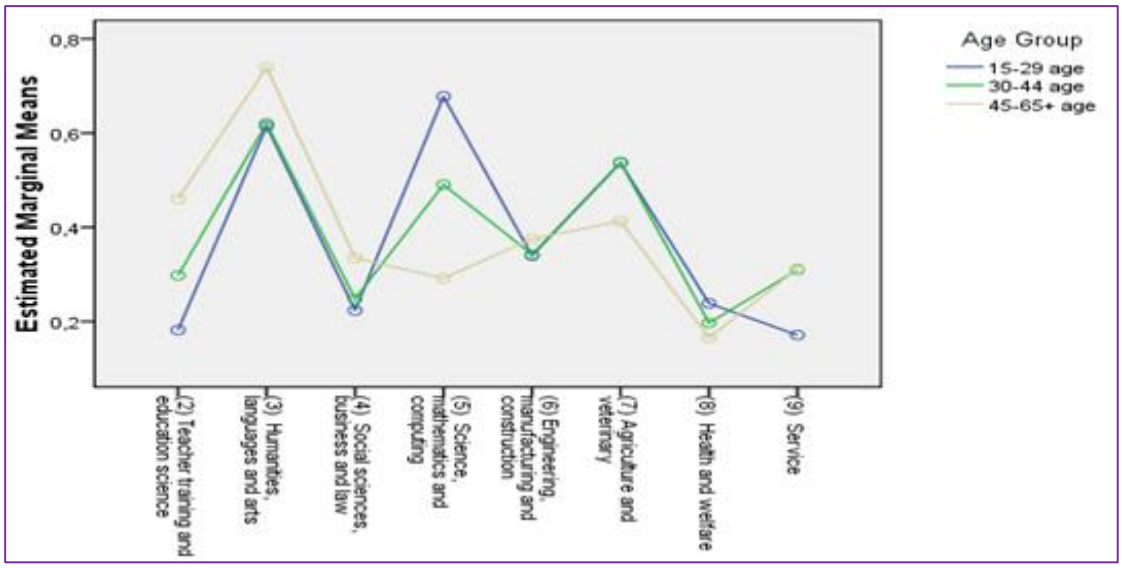

Figure 5. 7 Estimated Marginal Means of Field of Study Mismatch by Age-Group
Source: Own construction based on SPSS

- The field called "teacher training and education science" is the only field where the likelihood of the oldest graduates are far more likely to be field of study mismatch. When we recall that the regression analysis covers the employees who start to work in their current job between 2009 and 2016, the oldest graduates from this field find jobs outside their field mostly because they are retired or they face less demand than their younger colleagues in their fields. The difference of likelihood between the oldest and the youngest age-group is also very prominent in field "humanities, languages and arts".
- For "science, mathematics and computing", the youngest graduates have very high likelihood of being mismatch when compared to older ones. This is an alarming situation for new graduates from this field because they can not find jobs related to their field. Interestingly, the oldest age-group easily find jobs close to their field

although they start to work in their current jobs after 2008. In other words, the employers prefer the experienced and older graduates when needed.

- For the three fields "engineering, manufacturing and construction", "health and welfare" and "social sciences, business and law", the age-group categories make no sense in estimating marginal means of field of study mismatch because all the age groups is these fields are almost overlapping.
- An interesting finding is that the youngest graduates from "services" has the lowest likelihood of mismatch. This might mean that the younger graduates face higher demand than the older ones may be because of the nature of the sector. In other words, the sector might not prefer older ones when recruiting the graduates.

5.4.4. With Respect To Individual Education Background

In this section the estimated marginal means of field of study mismatch for each field of study will be graphically analyzed with respect to education level and overeducation.

The Latest Education Level by FOET-99 1-Digit Field of Study: From the regression results, when compared to 2-4 year higher education graduates, it is found that the likelihood of mismatch increases for the graduates from vocational high schools and decreases for the graduates from 5-6 year higher education or master or doctorate degrees. When the same relationship is examined in each field of study (Figure 5.8):

- Except for the "services", the graduates from all other fields of study at high school level are more likely to be mismatch than the reference category, which is 2-4 year of higher education.
- Except for three fields, the graduates from all other fields of study at highest level of education are less likely to be mismatch than the reference category. The lowest level of likelihood of mismatch at masters or doctorate degrees might be because the employers prefer the highest education levels in their own field stemming from the high competition in labor markets. Since there is excess supply of graduates, employers desire to invest in the graduates who have highest education levels because they will need less training on the job and will be expected to be more productive. However, most probably they will not be paid higher wages in proportion to their education levels.

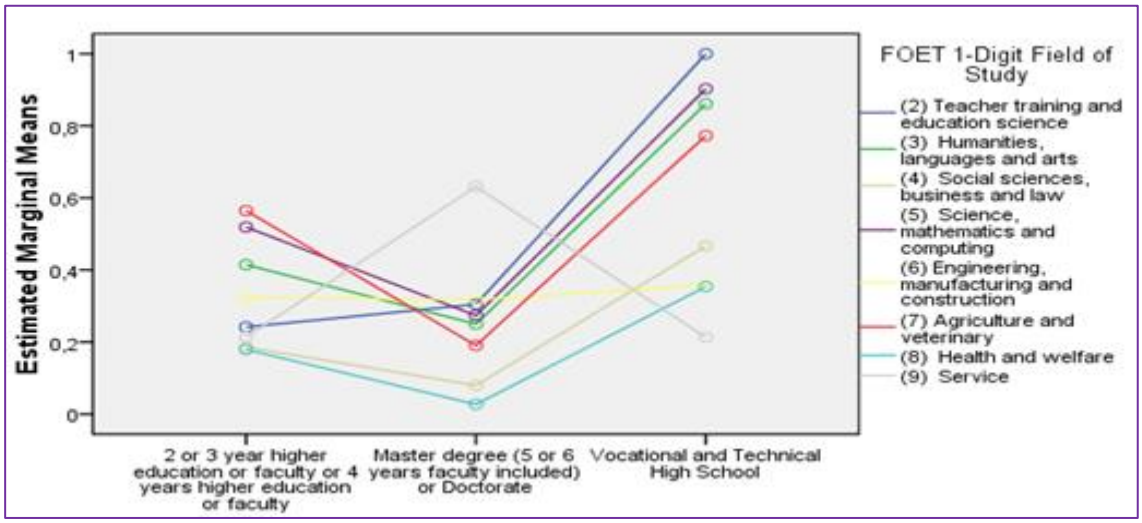

Figure 5. 8 Estimated Marginal Means of Field of Study Mismatch With Respect to Latest Educational Level Completed
Source: Own construction based on SPSS

- These fields are "teacher training and education science", "services" and the "engineering, manufacturing and construction". Graduates from these fields at higher degrees (master or doctorate) are more likely to be field of study mismatch. This might be because of the fact that the ones who could not find a job in their field first decided to attend to graduate study to increase their probability of employability. Then, despite their education investment by attending to graduate study, if they could not still find a job in their field, they move to a different occupation group. Since they have master or doctorate degree, when they move to an occupation where most of employees are from 2-4 year higher education they might be overeducated. This is only a low probability. However, if they move to a high school level occupation, then they will be automatically overeducated which has several negative consequences both for him and the economy (Montt, 2015).

Overeducation by FOET-99 1-Digit Field of Study: The regression results generated that the overeducated graduates are more likely to be mismatch when compared to well-matched ones. When the same relationship is examined for each field of study (Figure 5.9), the following findings are yielded.

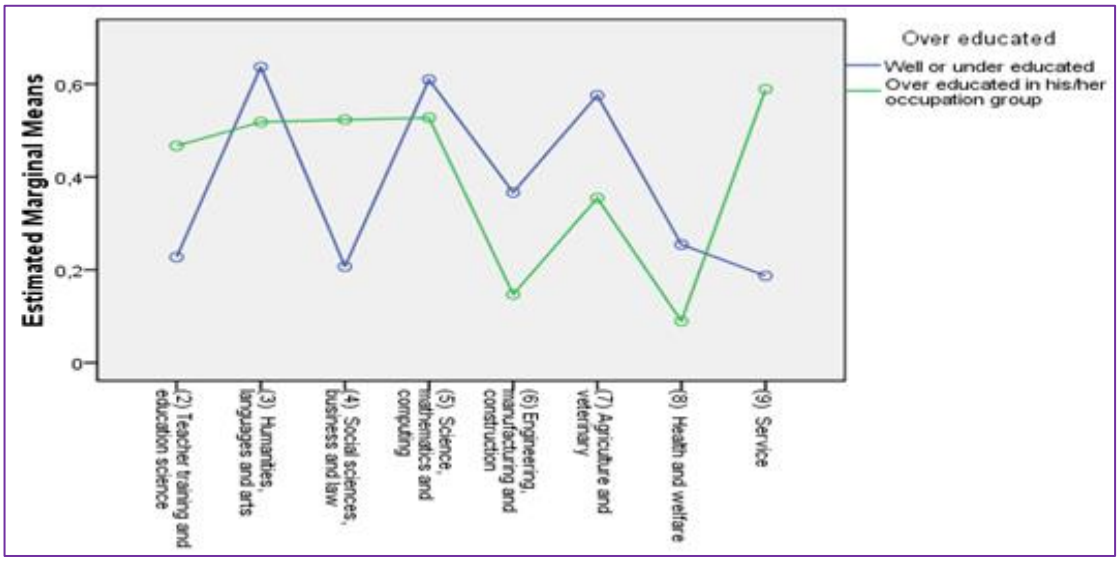

Figure 5. 9 Estimated Marginal Means of Field of Study Mismatch With Respect to Overeducation
Source: Own construction based on SPSS

- First, overeducated employee does not necessarily mean a graduate having a master or doctorate degree. As you remember, overeducation can also be realized when a 4 year university graduate starts to work in a job where the majority of current employees in that job are 2 year or high school graduates.
- The overeducated graduates from three fields are more likely to be mismatch than the vertically well-matched ones. These are "teacher training and education science", "social sciences, business ad law" and "services". The difference of estimated marginal means of field of study mismatch between the overeducated and vertically well-matched ones are significantly very large. The same difference is very small or negligible for the fields where the likelihood of field of study mismatch is higher for educationally well-matched ones.
- For the "teacher training and education science", by also taking into account the previous findings, the graduates who can not find a job in this field prefer two ways of escaping from this unemployed status. After a long time of being unemployed, the first way is that they attend to higher degrees in their fields (i.e. masters) to increase their employability, at least in private schools. If they could not achieve this goal, they move to a different occupation group where their education level is more than average education level. The second way is that by keeping their current education level, they decide to work in a different occupation group where the most of the employees are coming from high school or MYO-associate degree (2-3 year higher education)

degrees. In other words, because of less demand for or excess supply of them, they are forced to move to a different occupation group by downgrading their education level which cause them to be overeducated in their new occupation group. As Montt (2015) stated the individual and national costs of field of study mismatch becomes larger when it is overlapped by also the overeducation. For example, there is a high probability that his motivation and satisfaction levels will be lower, their wage level will be small and there will be a huge lost in terms of sunk cost of education and productivity at the national level.

5.4.5. With Respect To Job-Specific Characteristics

In this section the estimated marginal means of field of study mismatch for each field of study will be graphically analyzed with respect to contract type (part-time or full-time) and permanency of job.

The Contract Type (Part-Time or Full-Time) by The FOET-99 Field of Study: In the regression analysis, it is found that the part-time employees are less likely to be field of study mismatch when compared to full-time ones. This result was unexpected because the empirical and theoretical framework proposed the reverse effect.

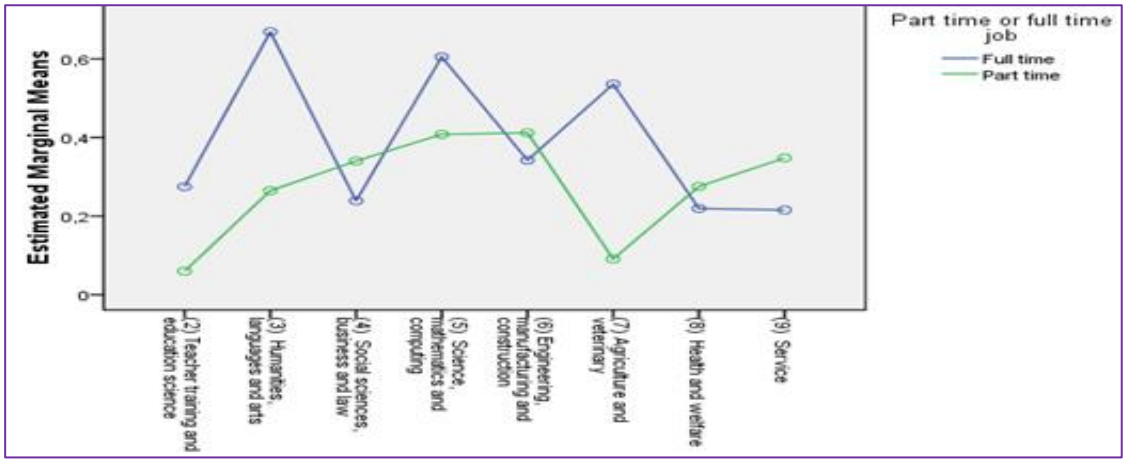

Figure 5. 10 Estimated Marginal Means of Field of Study Mismatch With Respect to Job Contract Type
Source: Own construction based on SPSS

When the same relationship is examined for each field of study (Figure 5.10), it is clear that the part-time graduates from four fields have higher likelihood of mismatch. In three of them, the difference value in estimated marginal means is almost negligible. For the "services", the part-time graduates are very more likely to be mismatch than the others. This situation might

be because the graduates who could not find any job related to their field moves to different occupations even with a part-time contract.

The Permanency of Job by FOET-99 Field of Study: From the regression results, it is found that the temporary jobs are more likely to be mismatch than the permanent jobs.

When the details (Figure 5.11) for each field of study is examined, it is clear that for "social sciences, business and law", "science, mathematics and computing", "services" and the "health and welfare" this likelihood is more prominently higher than the other fields. The employees graduated from these fields move to different occupation groups even with a temporary contract to find a job.

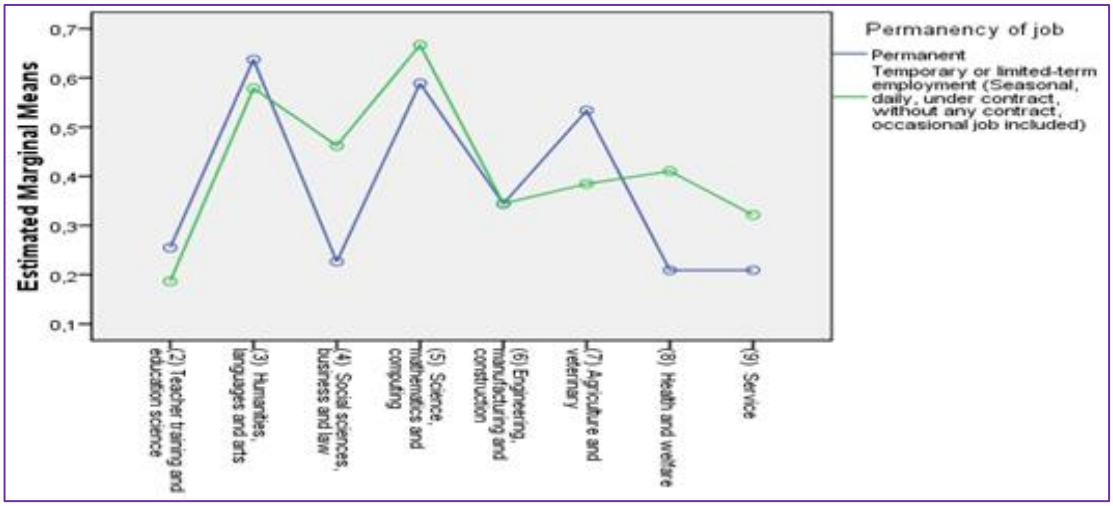

Figure 5. 11 Estimated Marginal Means of Field of Study Mismatch With Respect to Permanency of Job
Source: Own construction based on SPSS

5.4.6. With Respect To Work-Place Related Characteristics

In this section the estimated marginal means of field of study mismatch for each field of study will be graphically analyzed with respect to firm size, status of work place and NUTS1 regions.

The Firm Size by FOET-99 Field of Study: From the regression results, it was found that the likelihood of being mismatch decreases as the firm size increases when compared to reference category of the smallest firm. When the details for each field of study is analyzed (Figure 5.12), it is seen that, in general, the larger firms prefer to employ the graduates from the well-matched ones.

However, for some fields, the lowest likelihood of mismatch is observed in 20-49 firm size and then increases again for the largest firm size group. The smooth decrease in likelihood of mismatch is observed in "engineering, manufacturing and construction" and the "health and welfare".

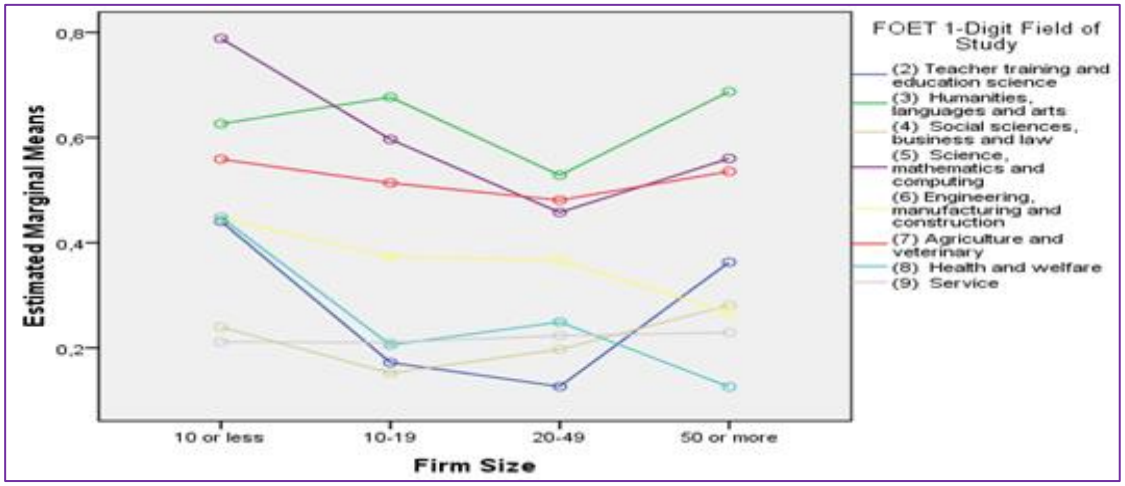

Figure 5. 12 Estimated Marginal Means of Field of Study Mismatch by Firm Size
Source: Own construction based on SPSS

The Status of Work Place by FOET-99 1-Digit Field of Study: From the regression results, when compared to private sector, it was found that the employees working in public sector are less likely to be mismatch and the ones working in NGOs are more likely to be field of study mismatch. When the details for each field of study is examined (Figure 5.13), only the graduates from "engineering, manufacturing and construction" working in public sector are more likely to be mismatch than the ones working in private sector. Besides, the graduates from this field have the highest likelihood of mismatch while they are working in NGOs. In other words, when the graduates from "engineering, manufacturing and construction" could not find a job related to their field move to a different occupation group in NGOs. Moreover, for the NGOS, the graduates from "agriculture and veterinary" and "teacher training and education science" are the ones whose likelihood of being mismatch is the lowest. This indicates that when they work in NGOs, they are better fitted to their fields of study. In other words, they work in their sector specific NGO.

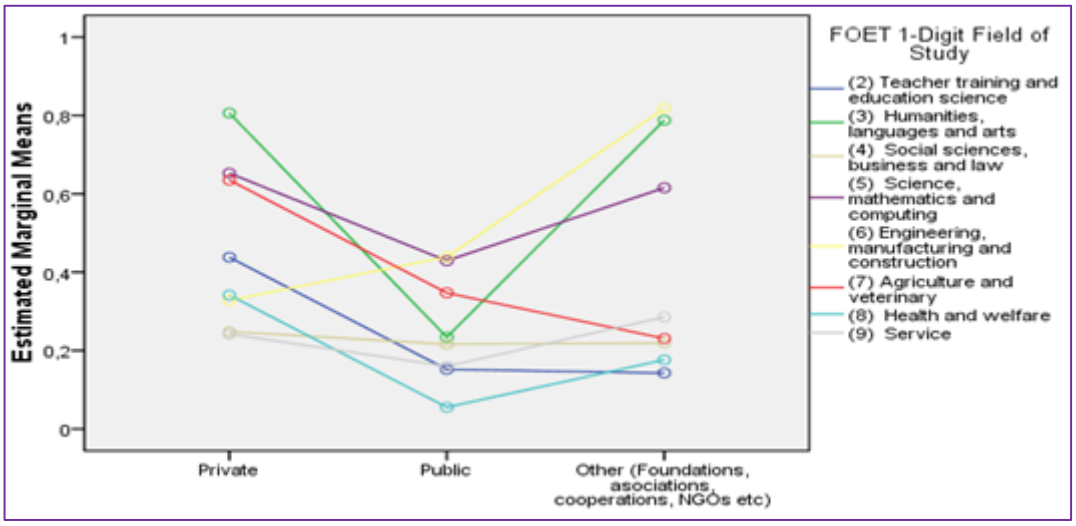

Figure 5. 13 Estimated Marginal Means of Field of Study Mismatch With Respect to Type of Work Place
Source: Own construction based on SPSS

The FOET-99 Field of Study and The NUTS1 Regions: From the regression results, when compared to İstanbul (the reference category), it was found that the employees working in TR5-West Anatolia, TR6-Mediterranean and TRA North East Anatolia were more likely to be mismatch. When the details for each field of study is examined (Figure 5.14), it is hard to state that the likelihood of mismatch decreases or increases when I move towards to eastern part of Turkey. However, the decrease is very prominent in "agriculture and veterinary", "humanities, languages and arts", "teacher training and education science" and "health and welfare". Except for the "humanities, languages and arts", these fields are occupation specific which make them disadvantageous to find a different job outside their field. This might imply that the graduates from these fields have less chance to move to a different occupation group because of fewer vacancies in those regions. These graduates mainly have two options. The first one is that they are working in their own fields thus have less likelihood of mismatch. Second one is the fact that since their possibility to find different jobs in other sectors is low, they might prefer not to participate in labor force.

On the other side, the likelihood being mismatch increases for the graduates from" engineering, manufacturing and construction" and the "social sciences, business and law" when I move to eastern regions of Turkey. This might imply the fact that there are fewer demands for those fields which causes them to move to different occupation groups.

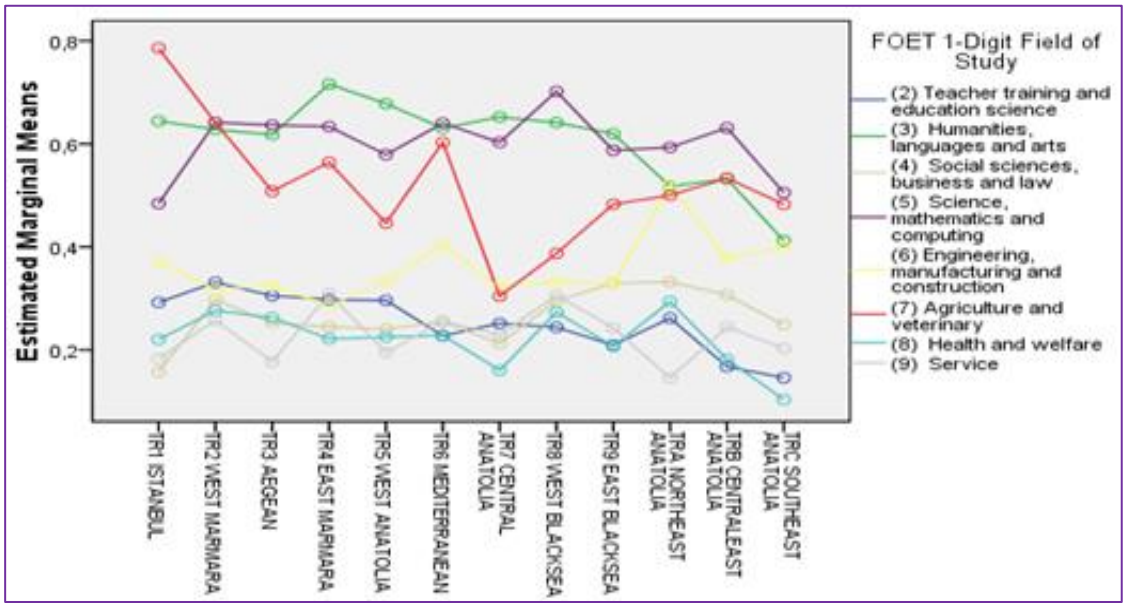

Figure 5. 14 Estimated Marginal Means of Field of Study Mismatch With Respect to NUTS1 Regions
Source: Own construction based on SPSS

5.5. Concluding Remarks

The main focus of this chapter was on the analysis of causes of field of study mismatch by running a binary logistic regression model in SPSS-17. The main findings regarding determinants of mismatch are presented in the following headings.

5.5.1. Summary of Empirical Findings Coming From the Literature

In the literature, the number of empirical studies which cover causes of field of study mismatch is very limited. The leading ones are Wolbers (2003), Robst (2007a), Boudarbat and Chernoff (2009), Montt (2015), OECD (2016), Verhaest et al (2017). In those studies, the likelihood of having field of study mismatch is regressed over the potential determinants of field of study mismatch by applying binary logistic models or multilevel multinomial logit models. For the studies which include Turkey, it is very clear that there is a huge literature gap on mismatch issues of Turkey. To the best of my knowledge, there is only one study that includes Turkey, which covers causes of field of study mismatch. It is OECD (2016).

After analyzing the empirical studies, it can be said that the causes of field of study mismatch is analyzed around some similar determinants. The determinants are generally grouped as individual characteristics, job/firm specific characteristics and labor market related conditions.

5.5.2. Summary of Data and Variables for Binary Logistic Regression Model

The data for the binary logistic regression model comes from TURKSTAT 2016 Labor Force Survey. After some iterations on data, the target group consisting of 25.957 individuals is reached and defined as follows:

> "at the time of survey year of 2016, the wage-based employees graduated from vocational and technical high schools and universities who have been working since 2009"

The dependent variable is field of study mismatch. The coding scheme, which was updated by Montt (2015) is used for the measurement of field of study mismatch. (Appendix A presents the coding scheme and its two dimensions which are ISCO-08 occupation codes and FOET-99 classification of fields of study)

The field of study mismatch is a categorical variable and has the value of 1 if there is a mismatch according to coding scheme. It has the value of 0 (zero) if there is a well match.

Independent Variables: There are 12 variables in five different groups. These groups are the building blocks of regression model. All of the independent variables are categorical. The five groups of variables are (i) labor market conditions, (ii) demographic characteristics, (iii) education background, (iv) job-specific characteristics and (v) work place related characteristics.

The Model Specification: Under the framework of the above data and variables, and by following Wolbers (2003) and Montt (2015), the binary logistic regression model on SPSS is employed by using the block entry method. In fact, these blocks are the variable groups that are proposed for regression.

5.5.3. Summary of Interpretation of Odds Ratios and Beta Coefficients

Causes of field of study mismatch is analyzed by using TURKSTAT 2016 labor force survey. A binary logistic regression analysis is conducted in SPSS-17 version. The coding scheme is used for measuring field of study mismatch by following Wolbers (2003) and Montt (2015). As Montt (2015) and Wolbers (2003) did, the focus was on the wage-based employees from vocational and technical high schools and universities. Furthermore, a graphical analysis is conducted to provide complementary findings on the basis of each field of study. For this purpose, the interactions between estimated marginal means of field of study mismatch and some variables are examined by each FOET 99 1-digit classification of field of study. As a

result, the association between field of study mismatch and the independent variables are examined visually for each field of study.

In sum, regression results yield that labor market conditions, demographic characteristics, education background, job-specific characteristics and work-place related characteristics are found to be statistically significant on having field of study mismatch.

The critical results to be specifically mentioned are the ones regarding education background and labor market context. More specifically,

- Employees from vocational and technical high schools are 156.8% more likely to have mismatch than those from 2-4 year of higher education.
- Overeducated employees are more far more likely (289.1%) to have mismatch than vertically well-matched ones.
- One of the alarming finding is that the overeducated employees who are graduated from 2-4 year higher education level have the highest likelihood of being field of study mismatch. The graduates who cannot find job in their field search for jobs in different occupation groups which are at lower levels. Therefore, if they find such a job, they move to that occupation group where majority of employees are coming from high school levels. This movement results in field of study mismatch and overeducation. Moreover, this is an another evidence for the shift of employment pattern, from university graduates to high school graduates, where high school graduates face difficulty in finding jobs time to time, and hence increasing the unemployment rates for high school graduates.
- Another finding is that the younger overeducated employees are far more likely to be field of study mismatch. This result might indicate that the younger graduates are having difficulty in finding jobs in their fields and at their education levels which results in higher likelihood of being mismatch and overeducation.
- More importantly, likelihood of field-of-study mismatch increases as "field specific employment rate in starting year of current job" decreases, which indicates that mismatch does not result uniquely from workers' choice, but is highly responsive to labor market context.
- The above findings imply that less demand for or excess supply of graduates may force job-seekers to accept jobs outside their fields-of-study. Balancing supply of graduates and improving effectiveness of labor market mechanism may be primary policy recommendations to be proposed by focusing on high priority fields which have the highest incidences with the worst labor market indicators.

Moreover, the following findings are also thought to be critical for policy makers and researchers.

- Among the employees who told that they have a job as of 2016 survey time, the ones who have started to work recently (i.e. in 2016) have higher likelihood of being mismatch than the ones who have started to work in the past. (i.e. in 2005). This finding implies that the new/recent graduates are having difficulty in finding relevant jobs because those restricted job opportunities have already been captured by the older graduates, and new job vacancies are not created sufficiently.
- More specifically, "humanities, languages and arts" has the lowest level of field specific employment rate. This is one of a worse finding. However, the situation gets worse than that because this field has also the highest level of likelihood of being mismatch. In other words, although very low proportion (53% to 58%) of graduates from "humanities, languages and arts" are able to work in any job, most of those working ones are unfortunately working in different occupation groups. This finding has the highest priority which requires some further assessments.
- The fields called "agriculture and veterinary" and the "engineering, manufacturing and construction" have the highest level of field specific employment rate which can be seen as a good indicator because this means that most of the graduates from those fields are working in any job. However, despite this high level of absorption capacity, the graduates from "agriculture and veterinary" are more inclined to be field of study mismatch. Two opposing assessments can be done regarding this finding. The first perspective claims that this is not a problem because they are able to find and work in any job, whether well-match or mismatch. The other might say that this is a problem because working as a field of study mismatched employee has some individual and national level consequences which can cause low wage, lower productivity, less satisfaction, opportunity cost, sunk cost of education etc.
- For the "science, mathematics and computing", the youngest graduates have very high likelihood of being mismatch when compared to older ones. This is an alarming situation for new graduates from this field because they can not find jobs related to their field. Interestingly, the oldest age-group easily find jobs close to their field although they start to work in their current jobs after 2008. In other words, for this field, the employers prefer the experienced and older graduates when needed.

On the other side, some findings are found to be different from the previous empirical literature. These are listed as follows.

- The target group was a little bit different. It consists of wage-based employees who start to work in their current job between 2009 and 2016 because the objective of thesis is to analyze the causes of field of study mismatch on the basis of FOET-99 1-digit classification, not on the country average. In this context, in order to use field specific variables such as employment and unemployment rates, FOET-99 classification is needed. Since FOET-99 was started to be used in 2009 in Turkey, the data of regression covers the employees who have been working since 2009.
- Although Wolbers (2003) and Montt (2015) used 3-digit ISCO occupation codes for measuring field of study mismatch, I was able to use 2-digit ISCO-occupation codes because 3-digit codes are not available in TURKSTAT labor force surveys. This thesis develops its own coding scheme (based on Montt (2015)) by aggregating 3-digit codes into 2-digit codes. This aggregation produced a larger well-match coding scheme. This situation, in turn, generates lower incidence of field of study mismatch when compared to mismatch level measured by using original 3-digit ISCO occupation codes. Hence, this a very significant limitation on the findings. I claim that the incidence of field of study mismatch would be higher if 3- digit occupation codes were available and used in labor force surveys.
- Most of the regression findings are in parallel with Wolbers (2003), Robst (2007a), Boudarbat and Chernoff (2009), Montt (2015), Verhaest et al (2017). There are only two differences. The first one is that the field specific unemployment rate, which is a 4-level categorical variable, resulted in an unexpected sign of relationship for its second category when compared to reference category. Moreover, the other two categories found to be statistically insignificant. The second difference is that the part-time employees are les less likely to be field of study mismatch than the full-time employees unexpectedly.
- Moreover, three novel determinants are used as explanatory variables. These are field specific employment rate, field specific unemployment rate and NUTS-1 regions. For example by using field specific employment rate at the starting year of current job, I think that the explanation power of labor market conditions is enriched while discussing the causes of field of study mismatch.

CHAPTER 6

CONCLUSIONS AND POLICY RECOMMENDATIONS

In this chapter, there are six sections. The first one refreshes briefly the logical sequence of cause and effect relations. The second section presents the conclusions derived from the analysis of incidence of field of study mismatch. Under this heading, first the main findings on the basis of country average is provided. Then, the priority level of policy actions for vocational and technical high schools and higher education are presented separately on the basis of FOET-99 2-digit classification.[8] The third section provides the main conclusions derived from the analysis of causes of field of study mismatch. The fourth section summarizes the overall conclusions and presents the evidence for policy makers and researchers. In the fifth section, policy recommendations and policy tools are proposed which are based on those conclusions and evidences. Finally, the imitations on data and directions for further research are provided.

6.1. Logical Sequence of Thesis in Brief

The starting point for this thesis was the fact that the sharp increase in the supply of graduates from higher education has given rise to concerns whether the economy can provide sufficient positions to accommodate those graduates.

After the literature survey, this concern is supported by the empirical findings of previous studies such as Wolbers (2003), Flisi et al (2014), Montt (2015) and Verhaest et al (2017). They stated that increased supply of university graduates over the past few decades caused quantitative mismatch between the education system and labor market, which in turn is a main driver for field of study mismatch and/or vertical mismatch in several countries. Moreover, it is found that field of study mismatch is not only a personal or willingly choice but it is highly responsive to labor market conditions.

[8] The findings from the analysis of incidence of field of study mismatch are presented on the basis of both FOET-99 1- digit and 2-digit classifications in chapter 4. However, as mentioned before in the relevant section of chapter 4, focusing on 1-digit classification might mislead the researchers or policy makers because there are some sub-fields (2-digit fields) which have very high incidences although their main field (1-digit) has low level of incidence or vice versa. Therefore, focusing on 2-digit classification will provide more accurate and comprehensive insight for policy makers.

Hence, a quick preliminary analysis for Turkey is conducted. It is found that expansion in higher education has caused some preliminary consequences. When compared to 2005, as of 2018, these consequences are;

a. The number of graduates potentially entering to labor market increased by 2.6 times from 322 thousand to 844 thousand.
b. The percentage of idle capacities of quotas of university entrance examination reached to more than 20 % in 2017 and 2018.
c. Among the applicants who take university entrance examination, the share of university graduates increased from 2.4 % in 2006 to 8 % in 2018. Likewise, the share of applicants who are currently student at any university is also at an increasing trend, which increased from 13.2 % in 2006 to 20.3 % in 2018.

Those consequences can be considered as critical factors which might be potential signals for an imbalance between the supply of and demand for labor force. Moreover, it is found that this imbalance could be a main determinant for the worsening situation of employment rate, unemployment rate and inactivity rate. Furthermore, the worsening labor market indicators, the quantitative imbalance between the education system and the labor market, and some other factors are all thought to cause field of study mismatch.

Hence, by taking into account the above rationale from the empirical literature and the findings from Turkish situation, the claim of this thesis is proposed. This thesis claims that

> *Turkey has been facing a high incidence of field of study mismatch at an increasing trend over time mainly because of the rapid expansion in higher education. More specifically, this mismatch might be more problematic for some fields of study.*

As a result, the aim of this thesis is to analyze the incidence and causes of field of study mismatch with an emphasis on the effect of labor market indicators, and propose policy recommendations to eliminate the main drivers of it to some extent.

Then, to achieve the claim and aim of thesis, two analyses are conducted. The first one is to measure and analyze the incidence of field of study mismatch. The second one is to analyze the causes of field of study mismatch.

The conclusions derived from those analyses are presented in the next sections.

The cause and effect diagram regarding the logical sequence is presented in Figure 6.1.

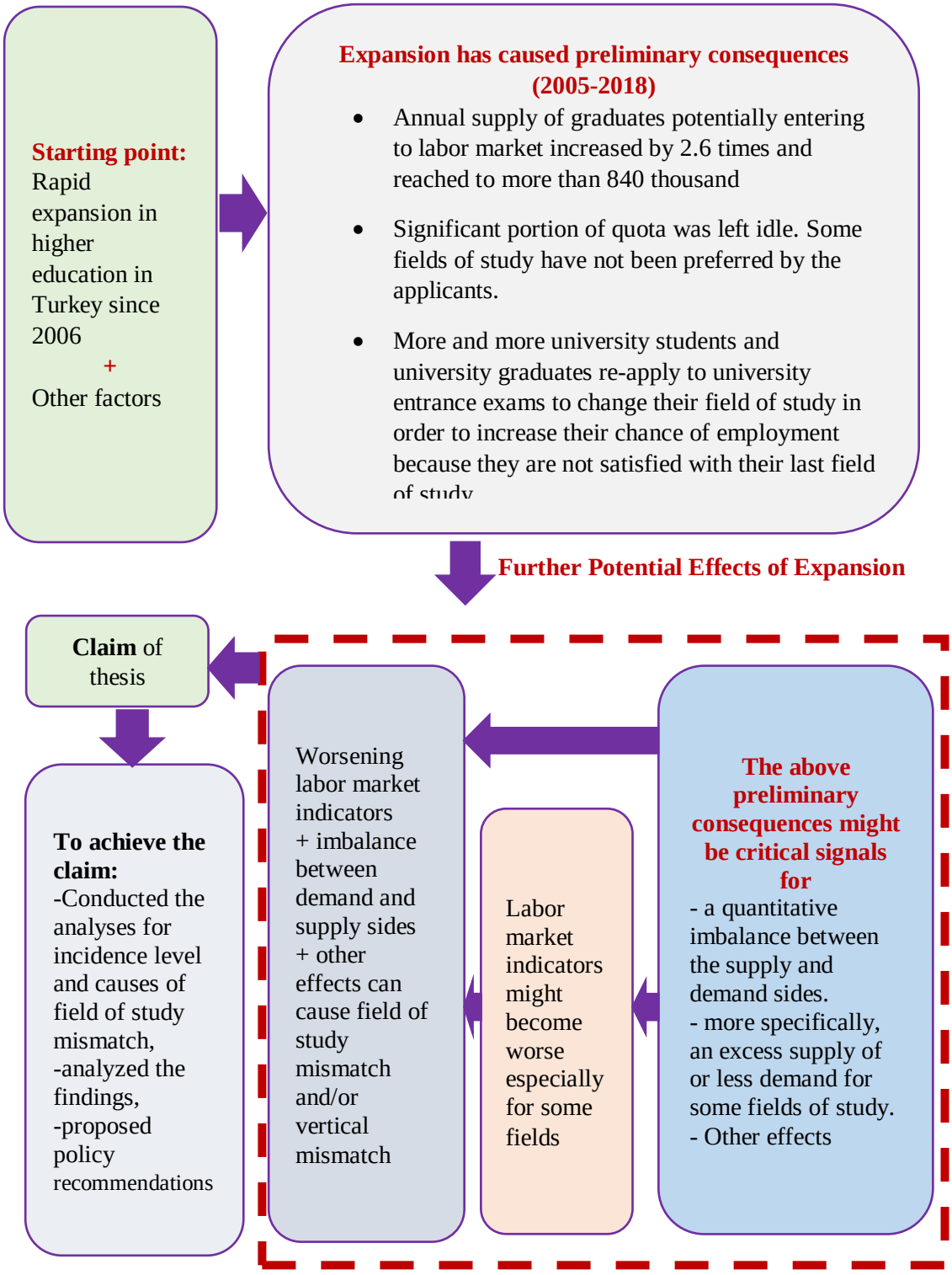

Figure 6. 1 The Logical Sequence of Cause and Effect Diagram of Thesis
Source: Own construction

6.2. Conclusions Derived from Analysis of Incidence of Field of Study Mismatch

The incidence of field of study mismatch is measured by using coding scheme which is originally developed by Wolbers (2003) and updated by Montt (2015). The data comes from TURKSTAT labor force surveys for the period between 2012 and 2016. It is measured for three separate groups. These are vocational and technical high schools, higher education and sum of them.

The basic findings from the analysis of incidence of field of study mismatch are presented in the next sub-sections. These conclusions can be considered as evidence for policy makers.

6.2.1. Country Average of Incidence of Field of Study Mismatch

In this subsection, the country averages of incidence of field of study mismatch for vocational and technical high schools, higher education and sum of them are presented briefly. This thesis found that (Table 6.1);

Table 6. 1 Country Average of Incidence of Field of Study Mismatch, 2012 and 2016

	(A) Vocational and Technical High Schools	**(B) Higher Education**	**Overall Country Average: sum of A and B**	**Explanation**
2012	42.4%	21.9%	28.4%	The field of study mismatch of country averages increases over time for all groups. The incidence level is much higher for vocational and technical high schools but % increase (9.5 %) for higher education is remarkably high within only four years of time period.
2016	44.9%	24.0%	30.3 %	
Change Between 2012 and 2016	+2.5 percentage points (+ 5.8 % increase)	+2.1 percentage points (+9.5 % increase)	+1.9 percentage points (+ 6.7% increase)	

Source: Own construction

- The overall country average including sum of higher education and vocational and technical high schools is found to be 30.3 % in 2016. It is much higher for vocational and technical high schools (44.9 %).

- And more importantly, the mismatch increased over time for all groups. However, the incidence for higher education increased by 9.5 %, which is remarkably high within only four years of time period. This is very important finding to be paid attention.

On the other side, when those findings are compared with the empirical literature, it is found that the overall country average of field of study mismatch in 2016 (30.3 %) is lower than the findings of Turkey in Quintini (2011b) and OECD (2016). As remembered, Quintini (2011b) found that the incidence of field of study mismatch for Turkey was 37 % by using 2005 data. It was 31 % for the OECD average. OECD (2016) found that it was 43.7 % for Turkey and 39.6 % for OECD average by using 2012 and 2015 PIAAC data.

It can be considered that the incidence found in this thesis, which is 30.3 %, is an improvement when compared to the findings of Turkey from Quintini (2011b) and OECD (2016). However, the finding is expected to be higher than 30.3% if three-digit ISCO-08 occupation codes were used in coding scheme of this thesis. Originally, Wolbers (2003) and Montt (2015) used three-digit codes in the coding scheme while determining the well-matched employees. Since two-digit ISCO occupation codes are available in TURKSTAT labor force surveys, three-digit codes are aggregated into two-digit codes which increases the range of well-matched employees and hence reduces the incidence of field of study mismatch as expected. For example, in Montt's (2015) coding scheme, if the graduates from teacher training and education science works in occupation code 342 (ISCO-08 occupation code), she/he is treated as well-matched (Appendix A). However, there are also two more occupation codes starting with 34 according to ISCO-08 codes. These are 341 and 343 (Appendix A). When I design my own two-digit coding scheme, the codes 341 and 343 are aggregated into two-digit codes of 34. Hence, the graduates working in 341 and 343 are now well-matched, although they were not matched in Montt's (2015) original coding scheme. In other words, the range for well-matched individuals becomes larger. This larger coding scheme results in more well-watched individuals, which reduces the incidence of field of study mismatch. Therefore, I claim that the overall country average of incidence of mismatch would be much higher than 30.3% if three-digit occupation codes were available and used in this thesis.

In sum, Turkey has been facing a high incidence of field of study mismatch at an increasing trend over time between 2012 and 2016. The increase is remarkably high for higher education. Those findings should be considered as key insights for policy makers.

6.2.2. Priority Level of Policy Actions for Vocational and Technical High Schools on the Basis of FOET-99 2-Digit Classification

In this subsection, for vocational and technical high schools, the fields of study which have the highest priority of policy actions are presented. For this purpose, the basic findings from Figure 4.9 and Figure 4.10 in chapter 4 are taken into account. As a result, for vocational and technical high schools, as seen from Table 6.2, policy makers may take into account the following evidence when they are determining their relevant policy priorities. Therefore, five fields of study should have the highest priority because their incidence of mismatch is higher than country average in both 2012 and 2016. The problem is that their incidence of field of study mismatch is very high, which is more than 60 %. Besides two of them have remarkably high incidence of mismatch which is around 90 %. Moreover, for the other four fields, policy makers have to be careful because they have the potential to increase their incidence levels in the future. Although their incidence level, as of 2016, is below the country average, their increase is more than the country average of increase between 2012 and 2016.

Table 6. 2 The Priority Level of Fields of Study, Vocational and Technical High Schools Only

Fields of study whose incidence of field of study mismatch is more than country average in both 2012 and 2016	**!!! Fields of study whose incidence of field of study mismatch is lower than country average but whose increase over time (between 2012 and 2016) is more than country average**
The highest priority(*)	**Be careful!! Eyes should be kept on them (**).**
(2) Arts:92.5%	(13) Manufacturing, processing:11.1 percentage points increase
(11) Computing:89.2%	(20) Transportation services and environmental protection: 5.5 percentage points increase
(3) Humanities:80.9%	(14) Architecture and building:4.6 percentage points increase
(15) Agriculture, forestry:72.7%	(6) Business administration:4.2 percentage points increase
(18) Social services:61.7%	

(*) The incidence levels shown next to each field of study belongs to 2016. Country average of incidence in 2016 is 44.9 %.
(**) Country average of increase between 2012 and 2016 is 2.5 percentage points.
Source: Own construction

6.2.3.Priority Level of Policy Actions for Higher Education on the Basis of FOET-99 2-Digit Classification

For higher education, while determining the policy priorities, we have additional data coming from the analysis of labor market indicators which is obtained in chapter 3. As seen from Table

6.3, three fields were worse than country averages in terms of 3 indicators (field specific employment rate, unemployment rate, inactivity rate) in both 2010 and 2016. The other 7 fields are also problematic because they are getting worse. They were safe in the past, but they are worse now. The last three fields are safe as of now although they were worse in the past.

Table 6. 3 Summary of Findings from Labor Market Indicators, Higher Education Only, 2010 and 2016

Field of Study Based on FOET-99 2-Digit Classification	Progress Over Time
2-Arts 18-Social services 19-Personal services	They were worse in the past, are still worse now. They were worse than country averages in terms of 3 indicators both in 2010 and 2016.
3-Humanities 4-Social and behavioral science 5-Journalism and information 10-Mathematics and statistics 11-Computing 13-Manufacturing and processing 20-Transport services and environmental protection	They are getting worse. They did not have worse position than country average in terms of 3 indicators in 2010 but they are now worse than the country average in 2016.
9- Physical Science 14- Architecture and building 15- Agriculture, forestry and fishery	They are getting well. They were worse than country averages in terms of 3 indicators in 2010 but now they have more safe indicators than country average.

Source: Own construction based on Table 3.4

Hence, for higher education, the priority level of fields is determined by considering jointly

- the findings from analysis of labor market indicators (Table 6.3)
- the incidences of field of study mismatch (Figure 4.11 and Figure 4.12 in chapter 4)

In this context, Table 6.4 presents the priority level of policy actions for higher education. There are three criteria to determine the priority level for higher education. These are the incidence level, increase in incidence level and labor market indicators. Hence, four different policy actions are classified. These are the “highest priority”, “high priority”, “moderate priority” and “keeping the current progress”.

As a result, for higher education, it is proposed that policy makers may design relevant policies by focusing on the fields of study which have the highest incidences with the worst labor market indicators. In other words, five fields of study in the highest priority group should be the ones that policy makers may focus on.

Table 6. 4 The Priority Level of Fields of Study, Higher Education Only								
FOET 99 2-Digit Classification		Incidence of Field of Study Mismatch		Change in % Points (2016-2012)	Is the Incidence More Than Country Average Both in 2012 and 2016?	Is the Increase in Incidence More Than Country Average?	Does it Have the Worst Labor Market Indicators? (*)	Policy Action (**)
	Field	2012	2016					
	Country Average	**21.9**	**24.0**	**2.1**				
11	Computing	54.3	71.2	16.9	Yes	Yes	Yes	The highest priority with the highest incidence and the highest increase
13	Manufacturing and processing	38.9	52.3	13.4	Yes	Yes	Yes	The highest priority
2	Arts	52.8	51.9	-0.9	Yes	No	Yes	The highest priority
15	Agriculture, forestry and fishery	47.5	48.9	1.5	Yes	No	No	The highest priority but moderate labor market indicators
18	Social Services	37.2	40.2	3.0	Yes	Yes	Yes	The highest priority
10	Mathematics and Statistics	29.6	36.8	7.2	Yes	Yes	Yes	High priority
20	Transport services and environ. Prot.	72.0	36.2	-35.8	Yes	No	Yes	High priority
12	Engineering and Engineering Trade	33.3	35.6	2.3	Yes	Yes	No	High priority but moderate labor market indicators
9	Physical Science	32.2	33.0	0.8	Yes	No	No	High priority but moderate labor market indicators
19	Personal Services	25.0	27.1	2.1	Yes	No	Yes	Moderate priority
8	Life Science	26.2	26.5	0.3	Yes	No	No	Moderate priority
3	Humanities	24.1	26.1	2.0	Yes	No	Yes	Moderate priority
14	Architecture and building	25.9	24.7	-1.2	Yes	No	No	Moderate priority
1	Teacher training and education	20.7	21.1	0.4	No	No	No	Keep the current progress
16	Veterinary	12.4	20.0	7.6	No	Yes	No	Keep the current progress
6	Business and administration	16.5	19.4	2.9	No	Yes	No	Keep the current progress
4	Social and behavioral science	13.7	14.8	1.1	No	No	Yes	Keep the current progress but track the progress with high attention
5	Journalism and information	3.4	12.3	9.0	No	Yes	Yes	Keep the current progress but track the progress with high attention
7	Law	5.0	10.3	5.3	No	Yes	No	Keep the current progress
21	Security services	7.6	7.9	0.3	No	No	No	Keep the current progress
17	Health	6.2	6.4	0.2	No	No	No	Keep the current progress

Source: Own construction.
(*) Based on analysis of labor market indicators in chapter 3 (Table 3.4).
(**) The highest priority has more than 40 % of incidence, high priority has incidence between 30 % and 40 %, the moderate priority has incidence between country average and 30%. The data is ranked in an descending order by incidence of 2016.

6.3. Conclusions Derived from Analysis of Causes of Field of Study Mismatch

After the incidence of field of study mismatch is measured and analyzed, the next step is to analyze the causes of field of study mismatch in Turkey by estimating a binary logistic regression model in SPSS, with an emphasis on the effect of labor market conditions.

The data comes from TURKSTAT 2016 Labor Force Survey. After some iterations on data, the target group consisting of 25.957 individuals is reached and defined as:

> "at the time of survey year of 2016, the wage-based employees graduated from vocational and technical high schools and universities who have been working since 2009"

Dependent variable is field of study mismatch. It is a categorical variable and has the value of 1 if there is a mismatch according to coding scheme. It has the value of 0 (zero) otherwise.

Independent Variables: The past empirical studies were made use of when proposing the relevant independent variables. Moreover, three unique variables are proposed and used in this thesis. They are field specific employment rate, field specific unemployment rate, and NUTS-1 regions. There are 12 variables in five different groups. These groups are the building blocks of regression model. All of the independent variables are categorical. The five groups of variables are (i) labor market conditions, (ii) demographic characteristics, (iii) education background, (iv) job-specific characteristics and (v) work place related characteristics.

Regression results yield that labor market conditions, demographic characteristics, education background, job-specific characteristics and work-place related characteristics are found to be statistically significant on having field of study mismatch. Moreover, for each variable, this thesis develops a hypothesis. Most of them are based on the previous empirical findings. However, for NUTS1 regions, this thesis develops its own hypothesis.

The regression analysis provided the effects of each variable on having field of study mismatch. Those findings are not on the basis of each field of study. In other words, the regression is not run for each field of study. Moreover, the interaction effects of independent variables are not included in the regression because of degrees of freedom problem. Therefore, a graphical analysis is conducted to provide complementary findings on the basis of each field of study. For this purpose, the interactions between estimated marginal means of field of study mismatch and some variables are examined for each FOET 99 1-digit classification of field of study. In this context, Table 6.5 summarizes the hypotheses, the regression results and the findings from graphical analysis for each variable.

Table 6. 5 Summary of the Interpretation of Regression Results and Graphical Analysis			
Variable Groups	**Hypotheses Proposed for Each Relevant Variable**	**Regression Results**	**The Graphical Analysis with Estimated Marginal Means of Field of Study Mismatch[9]**
Labor market conditions	Employees who start to work at higher field-specific employment rates in the starting year of current job are less likely to be field of study mismatch.	Field Specific Employment Rate: It is the unique variable because employment rate is used for the first time. The likelihood of being field of study mismatch decreases as the field specific employment rate increases. Higher values of field specific employment rate is preferable because it means that there is high demand for those graduates or sufficient demand with a sufficient supply. The results and the direction of effects are in line with what I expected. When compared to reference category of 53-63%, the graduates who start to work in the year when the field specific employment rate is between -63.1% and 64.5% are 18.8% less likely -64.6% and 69.1%. are 24.3% less likely - more than 69.2 % are 31.3% less likely to be field of study mismatch.	Regarding each field of study, it is found that except for the "agriculture and veterinary", the likelihood of being field of study mismatch decreases as the field specific employment rate of that field increases.
	Employees who start to work at higher field specific unemployment rates at the time of entry to the labor market are more likely to be field of study mismatched.	Field Specific Unemployment Rate: It is also a unique variable because it is field specific, not the country average. The former models used country average of unemployment rate. In the periods of high unemployment, workers are more likely to accept a job in which they are mismatched by field of study. However, the regression yields an unexpected result. When compared to reference category of unemployment rate of 6%-8,5%, the graduates who start to work in the year when the field specific unemployment rate is between 8.6% and 9.9% are 11.1% less likely to be field of study mismatch. It was expected to have a higher likelihood of mismatch as the unemployment rate increases. The other two categories are found to be insignificant.	It is found that, there is not a clear trend of increase (decrease) in estimated marginal means of field of study mismatch as the unemployment rates increases (decreases).

[9] The Estimated Marginal Means in **SPSS GLM** tells us the mean response for each factor, adjusted for any other variables in the model. Graphical analysis is conducted to provide complementary findings on the basis of each field of study. Hence, it contributes to interpretation of regression results by providing more detailed information on the basis of 1-digit fields of study. For this purpose, I examined the interactions between estimated marginal means of field of study mismatch and some variables. The detailed figure are presented in 5.4.

Table 6.5 Summary of the Interpretation of Regression Results and Graphical Analysis (cont'd)			
Variable Groups	**Hypotheses Proposed**	**Regression Results**	**The Graphical Analysis with Estimated Marginal Means of Field of Study Mismatch**
Demographic characteristics	Male workers are more likely to be mismatched by field of study	Gender: Since our reference is males, females are 33.7% less likely to be field of study mismatch as expected.	Regarding each field of study, It is found that males are, in general, more likely to be field of study mismatch in many fields. The only field of study where the females have higher likelihood of mismatch is the "engineering, manufacturing and construction". This finding might be explained in such a way that the females who are graduated from this field willingly prefer to work in other occupation groups or the demand for the male graduates is higher than females.
	Older workers are more likely to be mismatched by field of study	Age: It is found that as workers age, their likelihood of being mismatch increases as expected. When compared to reference age-group (15-19 age), employees who are in age group of -30-44 are 10.7% more likely - more than 44 are 27.6% more likely to be field of study mismatch. As workers age, their likelihood of being mismatch increases. Since the target group consists of employees who start to work in their current jobs between 2009 and 2016, it is clear that the older workers are most probably working in their 2nd, 3rd or 4th jobs or be the retired ones. Retired employees might prefer to work in any job which is not close to his/her field of study because their motivation is to earn additional income in Turkish socio-economic context.	It is found that teacher training and education science" is the only field where the likelihood of the oldest graduates are far more likely to be field of study mismatch. When we recall that the regression analysis covers the employees who start to work in their current job between 2009 and 2016, the oldest graduates from this field find jobs outside their field mostly because they are retired or they face less demand than their younger colleagues in their fields. For "science, mathematics and computing", the youngest graduates have very high likelihood of being mismatch when compared to older ones. This is an alarming situation for new graduates from this field because they can not find jobs related to their field.
Job-specific characteristics	Workers with a temporary and/or part-time contract are more likely to have field of study mismatched job than workers with a permanent and/or full-time contract	Part-time or full time: An unexpected result is found. In the literature while the part-time workers have higher likelihood of being field of study mismatch, I found that part-time workers are 47.9 % less likely to have mismatch than the full-time workers. Permanent or temporary: It is found that the workers who work in temporary jobs are 18.5% more likely to be field of study mismatch than the ones who work in permanent jobs. It is an expected result.	Regarding each field of study, For the "services",it is found that part-time graduates are far more likely to be mismatch than the others. For permanency of job, the findings are the same as regression results for each field of study.

Table 6.5 Summary of the Interpretation of Regression Results and Graphical Analysis (cont'd)			
Variable Groups	**Hypotheses Proposed**	**Regression Results**	**The Graphical Analysis with Estimated Marginal Means of Field of Study Mismatch**
Education background	Graduates from a higher level of education are less likely to be field of study mismatch.	<u>Education Level</u>: It is found that the likelihood of being field of study mismatch decreases as the level of education increases as expected. When compared to the reference category of 2-4 years of higher education, - the graduates from 5 or 6 year faculties or those who have masters or doctorate degree is 85.3 % less likely - the graduates from vocational and technical high schools are much more likely (156.8 %) to be field of study mismatch.	<u>Regarding each field of study</u>, it is found that -Except for the "services", the graduates from all other fields of study at high school level are more likely to be mismatch than the reference category. The "services" has the highest mismatch for master or Phd graduates. - Except for three fields, the graduates from all other fields of study at highest level of education are less likely to be mismatch than the reference category. The graduates from higher degrees (master or doctorate) in "Teacher training and education science", "services" and the "engineering, manufacturing and construction" are more likely to be field of study mismatch.
	Graduates from more general study programmes are more likely to be mismatched by any type than the graduates from specialized programmes.	<u>Type of Field of Study:</u> The findings are in parallel with the general discussion of literature that occupation specific programmes reduce the risk of having a mismatch. When compared to reference category, "teacher training and education science"; The graduates from - humanities, languages and arts, (the odds ratio: 2.071) (P:0,67) - science, mathematics and computing (the odds ratio: 2.145) (P:0,68) - agriculture and veterinary (the odds ratio: 2.652) (P:0,72) are more likely to be field of study mismatch The graduates from - social sciences, business and law (the odds ratio: 0.455) (P:0.31) - engineering, manufacturing and construction (the odds ratio: 0.514) (P:0.34) - health and welfare (the odds ratio: 0.433) (P:0.30) - services (the odds ratio: 0.217) (P:0.178) are less likely to be field of study mismatch	The overeducated graduates from three fields are more likely to be mismatch than the vertically well-matched ones. These are "teacher training and education science", "social sciences, business ad law" and "services". The difference of estimated marginal means of field of study mismatch between the overeducated and vertically well-matched ones are significantly very large. The same difference is very small or negligible for the fields where the likelihood of field of study mismatch is higher for educationally well-matched ones.
	Overeducated employees are more likely to be field of study mismatch.	<u>Overeducation</u>: When compared to well-matched ones, it is found that overeducated employees are 289.1 % more likely to be field of study mismatch as expected. The main reason for the above findings is the less demand for or excess supply of them. They are forced to move to a different occupation group and/or below their education level which cause them to be overeducated in their new occupation group.	

Table 6.5 Summary of the Interpretation of Regression Results and Graphical Analysis (cont'd)			
Variable Groups	**Hypotheses Proposed**	**Regression Results**	**The Graphical Analysis with Estimated Marginal Means of Field of Study Mismatch**
Work place related characteristics	Workers working in larger firms are less likely to have field of study mismatch than the ones working in small firms	Firm Size: It is found that the likelihood of being mismatch decreases as the firm size increases as expected. When compared to reference category of less than 10, the employees working in; -firms having 10-19 employee are 27.7% less likely -firms having 20-49 employee are 30% less likely -firms having more than 50 employees are 11.1 % less likely to have field of study mismatch.	Regarding each field of study, it is found that for some fields, the lowest likelihood of mismatch is observed in 20-49 firm size and then increases again for the largest firm size group. The smooth decrease in likelihood of mismatch is observed in "engineering, manufacturing and construction" and the "health and welfare".
	The employees working in public sector are less likely to be field of study mismatch.	Status of Work Place: When compared to reference category of private sector, it is found that - the employees working in public sector are 42 % less likely - the employees working in NGOs and foundations are 67.8 % more likely to be mismatch	It is found that, only the graduates from "engineering, manufacturing and construction" working in public sector are more likely to be mismatch than the ones working in private sector. The graduates from "agriculture and veterinary" and "teacher training and education science" who are working in NGOs are the ones whose likelihood of being mismatch is the lowest. This indicates that when they work in NGOs, they are better fitted to their fields of study. In other words, they work in their sector specific NGO
	The employees working in eastern Anatolia are more likely to have field of study mismatch than the ones working in Istanbul	NUTS1 Regions: It is a unique variable. In general, it is hard to state that there is a clear increase towards eastern part of Turkey. The likelihood of mismatch increases for the following regions when compared to Istanbul region. The employees working in -TR5-West Anatolia are 14.7% more likely -TR6-Mediterranean region are 13.9% more likely - TRA North east Anatolia are 55.9% more likely to have field of study mismatch.	It is hard to state that there is a clear increase or decrease of likelihood of having mismatch towards eastern part of Turkey. However, there is a very prominent decrease in "agriculture and veterinary", "humanities, languages and arts", "teacher training and education science" and "health and welfare.

6.4. Summary of Overall Conclusions-Evidence for Policy Makers and Researchers

It takes significant individual and societal investments (human capital investments) for a person to complete their higher education and gain competence in a field. Hence, it is highly important to make investments in the fields that will bring a maximum contribution to both the person and the economy. Therefore, it is inevitable to harmonize the structure, functions, and products of higher education with the economic and societal needs (Alpaydın, 2015).

Turkey has been facing a significant expansion in higher education since 2006. This policy action can be considered as a rationale step in order to meet the intense demand for higher education, increase the education level of population, reduce the interregional migration and foster the regional development. However, Turkey has to deal with two challenging issues. The first one is keeping the quantitative expansion in balance with the quality of education. The second one is improving the harmony between the education system and the labor market.

Regarding those challenges, some institutional and legislative arrangements have been already carried out by the government. For example, within YOK, the Advisory Board for Quota Planning was formed officially and has already started to reduce the quotas of some education programs which are less preferred by the students. Moreover, to improve the role of universities in development process, the process of mission differentiation of universities was started. Some of the newly established state universities were selected as regional pioneers of mission differentiation, and some prestigious universities were selected as research universities. Furthermore, the Quality Council has been officially established under YOK to improve quality of education (Ministry of Development 2013; Ministry of Development 2017). The findings and evidence from this thesis might contribute to the above achievements and to new policy actions to improve the harmony between the education system and the labor market. However, by taking into account the aim and scope of this thesis, the quality of education is out of scope of this thesis.

In this context, the overall conclusions are summarized as follows.

Preliminary Consequences of Expansion in Higher Education: It is found that the expansion in higher education has caused some preliminary consequences in Turkey. These consequences are;

a. The sharp increase in the annual supply of graduates. When compared to 2005, as of 2018, the annual supply of graduates increased from 322 thousand to 844 thousand.
b. Significant portion of quotas of university entrance examination is left idle. Some fields of study have not been preferred by the applicants to a larger extent for the recent years.

c. More and more university students and university graduates re-apply to university entrance exams to change their field of study in order to increase their chance of employment because they are not satisfied with their last field of study. The share of applicants who are currently student at any university increased from 13.2 % in 2006 to 20.3 % in 2018. Likewise, the share of applicants who are currently university graduates from any university increased from 2.4 % in 2006 to 8.0 % in 2018.

Those consequences can be considered as critical signals for an imbalance between the education system and the labor market. Moreover, it is found that the imbalance between demand and supply sides could cause worsening situation of employment rate, unemployment rate and inactivity rate. Furthermore, it is found that (i) the worsening labor market indicators, (ii) the quantitative imbalance between the education system and the labor market, and (iii) some other factors are all thought to be considered as main causes field of study mismatch. The above consequences, the worsening labor market indicators and the literature gap on Turkey's field of study mismatch are the main motivations to study this thesis. To achieve the claim of thesis, the required analyses are conducted and critical evidence are obtained for the policy makers and researchers. They are all presented in the following sections.

Fields of Study Which Have the Highest Priority of Policy Actions: The incidence of field of study mismatch is measured by using coding scheme with the micro dataset from TURKSTAT labor force surveys for the period between 2012 and 2016. It is found that;

- Turkey has been facing a high incidence of field of study mismatch at an increasing trend over time between 2012 and 2016.
- The overall country average including sum of higher education and vocational and technical high schools is found to be 30.3 % in 2016. The country average for vocational and technical high schools is 44.9 % and it is 24.0 % for higher education. Hence, it is found that it is much higher for vocational and technical high schools.
- More importantly the mismatch increased over time for all groups. However, the incidence for higher education increased by 9.5 %, which is remarkably high within only four years of time period. This is a very important finding to be focused on.
- 5 fields in vocational and technical high schools and 13 fields in higher education have higher incidence than country average in both 2012 and 2016. The findings are remarkably much worse for some fields. For example, 92.5% of graduates from "arts" at vocational and technical high schools and 71.2% of graduates from "computing" at higher education work in jobs that are unrelated to their fields.

- For vocational and technical high schools, from the perspective of this thesis, the highest priority fields are determined by taking into account only the findings from the analysis of incidence of field of study mismatch. It is proposed that the policy makers may take into account those five fields of study whose incidence of field of study mismatch is more than country average in both 2012 and 2016 (Table 6.6).
- For higher education, the priority level of policy actions are determined by considering jointly the incidence of mismatch and findings from analysis of labor market indicators. By using those criteria, four types of priority levels are determined. These are the highest priority, high priority, moderate priority and keeping the current progress.

In this context, this thesis proposes that the highest priority fields should be the ones on which policy makers should focus. Hence, Table 6.6 presents the fields of study which have the highest priority of policy actions.

Table 6. 6. Fields of Study Which Have The Highest Priority of Policy Actions for Higher Education and Vocational and Technical High Schools

The Highest Priority Fields for Vocational and Technical High Schools	**The Highest Priority Fields for Higher Education**
(2) Arts:92.5%	(11) Computing:71.2%
(11) Computing:89.2%	*(13)Manufacturing and Processing:52.3%*
(3) Humanities:80.9%	(2) Arts:51.9%
(15) Agriculture, forestry:72.7%	(15) Agriculture, forestry:48.9%
(18) Social services:61.7%	(18) Social services:40.2%

Note: The fields of study are on the basis of FOET-99 2-digit classification.
The detailed education programs under each field of study are presented in www.tuik.gov.tr/metabilgi/sınıflama sunucusu/eğitim sınıflaması/FOET-99 . For example, computer engineering is not included under field of study called "computing". It is included under "engineering and engineering trade". The website provides all the included and excluded programs under each field of study
The incidence levels shown next to each field of study belongs to 2016. For vocational and technical high schools, country average of incidence in 2016 is 44.9 %. It is 24.0% for higher education.
Source: Own construction

As seen from Table 6.6, four of those fields of study are common in both higher education and vocational and technical high schools. These are (2) Arts-92.5%, (11) Computing-89.2%, (15) Agriculture, forestry-72.7% and (18) Social services-61.7%. Moreover, (3) Humanities-80.9% at vocational and technical high schools and Manufacturing and Processing-52.3% at higher education are the other highest priority fields of study.

These findings signal that there might be excess supply of and/or less demand for those graduates. I think that this might be because of the initial effects of rapid and sharp expansion

in higher education which has been started in 2006. Balancing the supply of those graduates and/or improving the relevant labor market mechanism are thought to be critical policy actions to improve the harmony between the education system and labor market.

Evidence from the Analysis of Determinants of Field of Study Mismatch: The critical evidence for policy makers come from the regression analysis which determine the main causes of having field of study mismatch. It is found that demographic characteristics, labor market context, work-place related characteristics, education background and job-specific characteristics are statistically significant in having field of study mismatch.

Regarding the effect of labor market context, one of the significant results from regression model is that the field specific employment rate in the starting year of current job was found to be significant as an explanatory variable. This finding supports Adams et al (1992) who stated that employment rate is one of the indicators or signals in the labor markets which contribute to determine the mismatch between supply of and demand for labor force. As this rate increases, the mismatch decreases because higher employment rate shows the high demand for those graduates or it indicates that there are sufficient jobs available in the labor market. Therefore, this finding supports also Montt (2015) who claimed that field of study mismatch is not an individual outcome or one that results uniquely from workers' choice, it is highly responsive to the broader labor market context. As a result, it is found in this thesis that the findings from the analysis chapters are in parallel with the mismatch literature which claims that the excess supply of graduates can cause imbalance between the supply side and the demand side, which in turn be a determinant of field of study mismatch.

To my opinion, the labor market indicators of employment rate, unemployment rate and inactivity rate convey information about not only the demand side but also the quantity of supply of graduates. For example, the higher inactivity rate for any field might indicate that there are excess supply of graduates from that field (much higher than the available jobs in the market) which causes some job seekers to lose their hope to find a job. As a result they left the labor market. For another example, higher employment rates might indicate that there is sufficient level of supply of graduates, at least there is not any shortage for that field. Although this type of information is not represented in the regression model, employment rate can also represent information regarding the supply level of graduates. Hence, since employment rate is found to be significant in regression model, it has the power of explaining both the demand and supply sides which contribute to theoretical background of assignment theory.

Hence, regarding the labor market context of the regression results, it is found that field of study mismatch is highly responsive to labor market context, which implies that less demand for or excess supply of graduates may force some job-seekers to accept jobs outside their fields-of-study and/or below their education level. Balancing supply of graduates and improving effectiveness of labor market mechanism may be primary policy recommendations to be proposed by focusing on high priority fields which have the highest incidences with the worst labor market indicators. The findings are all in parallel with the literature, and contribute to literature in terms improving the explanatory power of labor market conditions because of use of field specific labor market indicators as independent variables.

Regarding the individual education background, the regression model yields that the graduates from vocational and technical high schools are much more likely to be field of study mismatch when compared to 2-4 year of university graduates. The findings from measurement of incidence of field of study mismatch also showed that this group has very high level of mismatch, in which this level is more than 80 % for some particular fields. Hence effective policy measures should be taken specifically to vocational and technical education including both the high school level and MYO (associate degree) level to reduce the mismatch level and increase the decent employment of graduates from this education level.

Regarding the individual demographic characteristics, it is found that the field of study mismatch increases as the workers get older. However, it is found that the younger overeducated employees are far more likely to be field of study mismatch. This result might indicate that the younger graduates are having difficulty in finding jobs in their fields and at their education levels which might result in higher likelihood of being mismatch and overeducation. Hence, it is critical to start with the right job as well-match because having mismatch has individual, social and economic level consequences. Therefore, a policy recommendation should focus on improving the job seeking skills of students at high schools and universities. Moreover, increasing the awareness of students about the professions and occupations is also critical for starting in more well-matched jobs.

Regarding the firm-size, the regression resulted in the fact that the employees who work in firms which have less than 10 employees are far more likely to be field of study mismatch. This finding might necessitate a policy action oriented towards these very small firms to improve their recruiting processes.

6.5. Policy Recommendations

The aim of this section is to propose policy recommendations which have their own specific policy aims and policy tools. Policy aims clarify the purpose of policy recommendations. Policy tool is the way that defines how to achieve the policy recommendation (Topal, 2016). Moreover, key activities and tasks are determined to achieve the policy tools.

The findings, policy recommendations and policy tools from this thesis are expected to contribute to policy design process in relevant governmental bodies. Besides, most of the proposed policy recommendations and policy tools in this thesis had been already proposed earlier in several macro and sectoral policy documents. However, this thesis aims to emphasize the importance of implementing those policy actions with a new perspective of evidence obtained from this thesis.

In sum, when we take into account the conclusions and evidence of this thesis, the main goal of the government should be to improve the harmony between the labor market and education system. Hence, the policy goal is proposed as follows.

Main Policy Goal: *The harmony between the education system and the labor market should be enhanced by equipping people with the right skills and competences and by employing them in the well-matched jobs.*

Several policy recommendations can be proposed to achieve the main goal. However, by considering the aim and scope of this thesis, the policy recommendations relevant to this thesis should be centered at the following issues to reduce the quantitative mismatch and hence the field of study mismatch (Figure 6.2)

Policy makers may take into account the evidence from Table 6.6 which indicates the fields of study which have the highest priority of policy actions. They may first focus on those fields of study when they are designing relevant policies to balance the supply of graduates and improve the effectiveness of labor market. This thesis proposes to design relevant policies for higher education and vocational and technical high schools separately but by focusing on the systemic interaction between those two education levels. Moreover, the conclusions regarding the effect of labor market conditions on having field of study mismatch also re-emphasize the importance of balancing the supply of graduates and improving the effectiveness of labor market mechanism. Moreover, by considering the other results of regression, it is critical to design policies which are specifically targeted to vocational and technical education and youth.

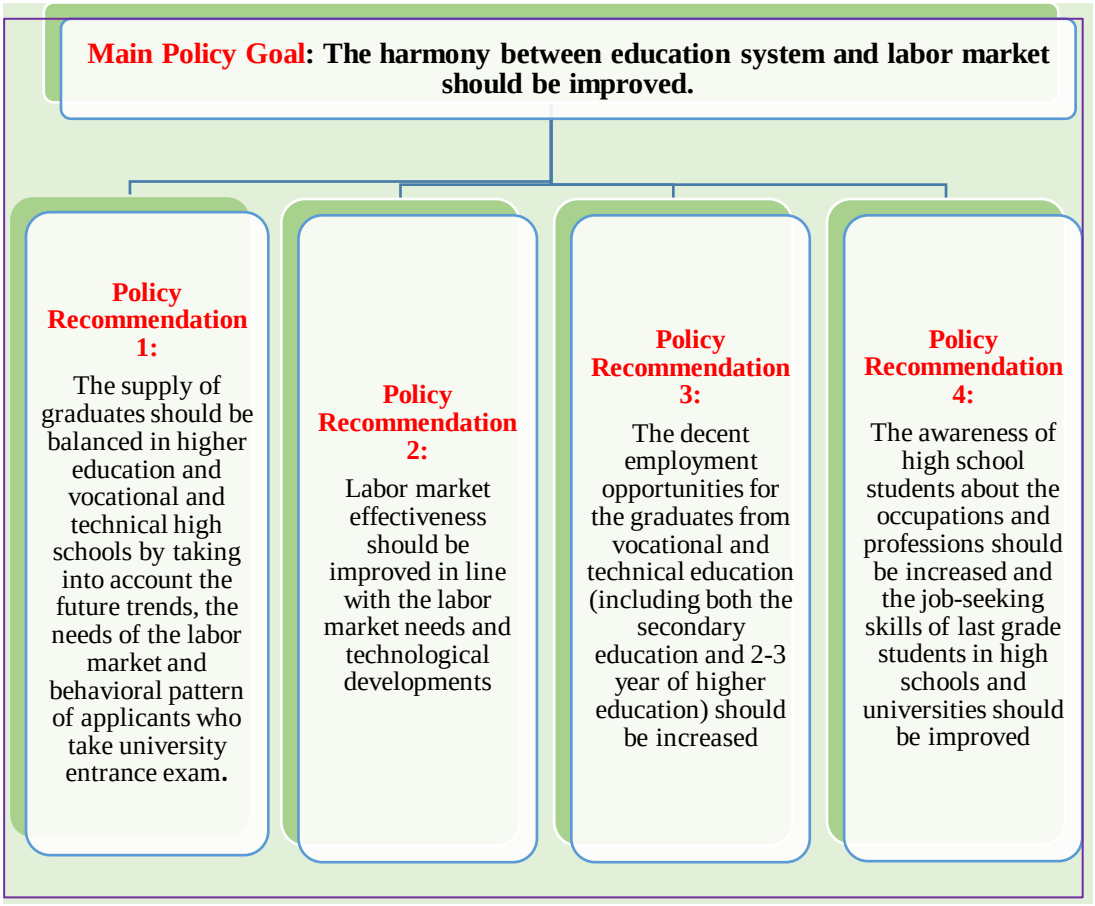

Figure 6. 2 Policy Recommendations Proposed to Achieve the Main Policy Goal of Improving the Harmony Between Education System and Labor Market
Source: Own construction
Note: Please note that the policy aims and the policy tools to achieve the policy recommendations are given in Table 6.7

6.5.1. Balancing the Supply of Graduates

The findings from the labor market indicators, the expansion in higher education and the incidence of field of study mismatch indicate that there is a quantitative mismatch between the supply of and demand for labor force. This result is more severe for some fields of study which have worse situations continuously over time. Moreover, the field specific employment rate is found to be as a significant factor in having field of study mismatch. In other words, field of study mismatch is found to be highly responsive to the labor market conditions such as employment rate. These findings are all in parallel with the empirical literature such as Wolbers (2003), Flisi et al (2014), Montt (2015) and Verhaest et al (2017) because they also found that increased supply of university graduates over the past few decades caused quantitative mismatch between the education system and labor market, which in turn is a main driver for field of study mismatch in several countries.

In this context, the first step should be to reduce the quantitative imbalance between the supply of and demand for graduates. For this purpose, the supply of graduates should be quantitatively balanced in accordance with the signals coming from the labor market (the demand side) and the education system (supply side). The balancing of supply of graduates should be applicable to both higher education and vocational and technical high schools. While designing the relevant policies, the policy makers can make use of the policy priority level of fields of study which is proposed in Table 6.6. Hence, the first policy recommendation is as follows.

Policy recommendation 1: *The supply of graduates should be balanced in higher education and vocational and technical high schools by taking into account the future trends, the needs of the labor market and behavioral pattern of applicants who take university entrance exam.*

Turkey has already initiated a policy tool to balance the supply of graduates. As mentioned before, the Advisory Board for Quota Planning was established officially within YOK and has already started to decrease the quotas of some education programs which are less preferred by the students. This thesis provides a new perspective from field of study mismatch issue.

The target group for this policy recommendation consists of students or the potential labor force only. It does not include the unemployed individuals, the ones who left labor force and the employed ones. The policy aims for this policy recommendation are to reduce the quantitative mismatch between the education system and the labor market, and hence to reduce field of study mismatch.

In order to achieve the first policy recommendation, three policy tools are proposed. The first one is to determine the future framework for the new occupations and skill sets which arise due to technological developments and digital transformation. The second policy tool is to determine the occupations and skills demanded by the labor market. The third one is to analyze the behavioral and preference pattern of applicants who take university entrance examination. All of those three policy tools can be considered as prerequisite framework which is required to determine match or mismatch level between the existing and demanded occupations and skills. The gap between those two poles will be the main focus of the policy recommendation.

The first policy tool can be achieved by conducting technology foresight. It will provide the general framework for determining the desired skills and competencies of Turkey in the medium-term. Surveys (structured surveys, questionnaires, in-depth interviews etc.) are required to achieve the second and third policy recommendations. This thesis contributes to policy makers to some extent by providing solid evidence or signals which can be used as an insight when designing policies. However, more detailed, comprehensive and periodic surveys are needed to feed into the process of evidence based policy formulation. These proposed

surveys should generate the relevant data and information regarding the expectations of the private sector and the current profiles of students, graduates and labor force. This survey will take a static photo of the dynamic linkage between the education system and the labor market in every five years.

As understood, the survey is the most critical part of the process because it provides the most relevant data and information as an evidence for the policy formulations. This survey can be a comprehensive one which consists of sub-surveys targeted to different groups such as the current employees, the inactive ones, unemployed ones, students at high schools, students in the universities, private companies, government institutions and other related stakeholders.

The survey seeks the answers for the following questions which are asked to different target groups. The following questions provide input not only to first policy recommendation but also to other three policy recommendations. The design of relevant survey questions is very critical to collect the required data and information.

- Determining the expectations of last grade students in high schools.
    - Which field of study will she/he choose and why?
    - How does she/he determine the occupation that she/he will work?
    - What is her/his expectation to find a job?
- Determining the reasons why the idle capacity of quotas of university entrance examination is getting higher for the last years.
    - Why do some of the students not prefer some fields of study?
    - Which fields of study are preferred less than the others?
    - Although some of the students are placed to any field of study, why some of them do not go and register to that program?
    - Why does the share of applicants (to university exam) who are currently a university graduate or a university student increase? Why do those university students or graduates feel the need for entering university exam again?
- Determining the sectoral basic skills and competencies demanded in the labor market.
    - What type of skills do the private companies demand?
    - Which occupations or professions are demanded by them?
    - What do they expect from the education system?
- Analyzing and determining the existing skills and competencies acquired in different education programs of higher education and vocational and technical high schools.
    - Which ISCO-08 occupations require higher education, and which occupations require vocational and technical education in the labor market?

- Are those programs in line with the emerging professions/skills parallel to the developments in Turkey and the world?

- Determining the main reasons why the field of study mismatched employees chose to work in such a mismatched job by asking the relevant survey questions.
- Identifying the main reasons why the inactive individuals (those who are not in the labor force) left the labor force by asking the relevant survey questions.

6.5.2. Improving the Effectiveness of Labor Market Mechanism

The other side of the coin is the labor market. The second policy recommendation for aligning education system with labor market is to improve the effectiveness of labor market mechanism. The target group for this policy recommendation consists of job seekers who are unemployed, the individuals who left labor force and the employees who seek new opportunities. Students are not included in this group.

İŞKUR is the main government actor for labor market mechanisms. It has been providing significant services for the graduates and employers by implementing various active labor market programs. For example, ISKUR is matching job seekers and vacant positions, carrying out vocational training and labor adjustment programs and providing counseling and guidance services for the job seekers. Moreover, ISKUR has started to conduct labor market survey to perform needs analysis of labor markets since 2007. However, the effectiveness of those programs should be increased. The second policy recommendation is proposed as follows.

Policy recommendation 2: *Labor market effectiveness should be improved in line with the labor market needs and technological developments.*

The policy aims behind this policy recommendation are to reduce unemployment rate, the inactivity rate and the field of study mismatch. In order to improve the effectiveness of labor market mechanism, three policy tools are proposed. The first one is to increase the efficiency and effectiveness of active labor market programs offered by İSKUR. The second tool is to ensure that all graduates be reached by job and occupational counselors of ISKUR. The third one is about improving the quality of statistical data on education system and labor market. The first policy recommendation is expected to feed this policy recommendation by providing the required input for some of its policy tools.

The key activities to achieve the first policy tool can be (i)streamlining the career counseling services by taking into account the above periodic surveys and related analyses conducted for

labor market, (ii) increasing the share of private sector and professional organizations in providing training services and (iii) establishing a monitoring and evaluation system for active labor market programs. Two of those activities are currently in use which need an update or improvement in providing the relevant services. However, establishing an effective monitoring and evaluation system is a niche one which would be considered as a key process for improving the quality and quantity of the relevant services offered by ISKUR.

For the second policy tool of expanding the services provided by job and occupational counselors, there are three key activities to be proposed. The first one is to strengthen the institutional capacity of ISKUR in terms of human resource and physical infrastructure. The next activity is to increase the quantity and quality of skill development facilities carried out in lifelong learning centers and public education centers. By realizing those activities, ISKUR would be a strong mediator between the employers and job seekers. The third key activity is about the small firms which have high likelihood of having mismatch. ISKUR already provides consultancy services for employers. However, by considering the regression results for small firms which have less than 10 employees, it is very critical to improve the recruitment process of small firms to increase the well-matched employees which in turn increase the productivity of firms and employees.

For the third policy tool, it is very important to use the same language and have common understanding of data among the government institutions, professional organizations, academia and private sector. Therefore, it is very critical to collect the right data with the same definition, scope and methodology in accordance with international statistical classifications. For this purpose, ad-hoc committees can be established for designing data collection mechanisms regarding education system and labor market. Moreover, the relevant government institutions should be trained accordingly.

6.5.3. Increasing the Decent Employment of Graduates from Vocational and Technical Education

The discussion on the weak linkage between the vocational and technical education and the labor market has been a critical issue for a long time. Besides, there is perception of low quality education in society. Moreover, the government has implemented various strategies and action plans to solve these types of problems. In this context, the following policy recommendation and its policy tools would not be niche ones. However, they are proposed again to shed light on solving those underlined problems by taking into account the findings regarding the regression results and incidences of field of study mismatch. Hence, it is proposed as follows.

Policy recommendation 3: *The decent employment opportunities for the graduates from vocational and technical education (including both the secondary education and 2-3 year of higher education) should be increased.*

The third policy recommendation is targeted to students from vocational and technical education at both the secondary education level and 2-3 year of higher education (MYOs-associate degree) level. If this policy recommendation is achieved, then it will contribute to increase in the employment of those students. In other words, just after graduation from secondary education, more graduates will be able to directly enter into the labor market which reduces their demand for higher education which in turn decreases the pressure on higher education or on university entrance examinations. This will also contribute to the process of balancing the supply of graduates in higher education.

There are two policy tools for this policy recommendation. The first one is about enhancing the physical and technical infrastructure of vocational and technical education. The second tool is to strengthen the cooperation between schools and the industry. The first policy recommendation is again expected to feed this policy recommendation by providing the required input for designing the policy tools.

For the first policy tool, four key activity is proposed. The first activity is about restructuring the link and curriculum of vocational and technical education between secondary education level and 2-3 year of higher education level. This type of education at two levels might be combined under one roof which is led by the private sector. In other words, vocational and technical education can be restructured under one roof. The second activity is about modernizing the technical laboratories of vocational and technical education which in turn generates the right and updated technological competences required for the private sector. The next activity is about updating and increasing the National Occupational Standards and National Qualifications that constitute the basis of vocational and technical education. These standards and qualifications are the main framework for the content of education. The final key activity is about the weak perception of vocational and technical education in society. Hence, organizing promotional activities might affect this perception positively.

For the second policy tool, four key activities are proposed. These are all targeted to improve the cooperation between schools and the industry. The first activity is about increasing the quantity and quality of mission-oriented joint business protocols. The second one is to increase the internship opportunities. The third activity is to increase the number of industry owned schools by allocating more government incentives. This activity is one of the key steps towards restructuring the vocational and technical education under one roof. This education can be

provided and managed by the private sector. The last activity is about increasing "on the job training programs" of ISKUR by allocating more government support for employment incentives. This activity would create an opportunity for the employers to choose the right and well-matched employees by observing their potential skills and competences.

6.5.4. Improving the Job-Seeking Skills of Last Grade Students

ISKUR provides services for improving job-seeking skills for the graduates. Many universities have centers for career guidance services. However, there is not any systematic or institutional services which are targeted to students. Therefore, a comprehensive and well-structured system is needed to be established for all last grade students in higher education and high schools. Hence, the fourth policy recommendation is formulated as follows.

Policy recommendation 4: *The awareness of high school students about the occupations/professions should be increased and the job-seeking skills of last grade students in high schools and universities should be improved.*

The main policy tools behind this policy recommendation are to ensure the youth graduates start to work in more well-matched jobs and reduce the transition time from school to work. Two policy tools are proposed. The first one is to increase the awareness of high school students about the occupations/professions. The second policy tool is improving job-seeking skills of last grade students in high schools and universities. Three key activities are needed to be realized to achieve the first policy tool. The first one is establishing a career guidance system to support career selection processes that will allow students to recognize themselves and the professions. The second and third activities are about introducing and promoting the occupations/professions at schools by organizing seminars and preparing online (web) materials. For the second policy tool, three key activities are proposed. The first one is very critical because the guidance teachers in high schools should have updated knowledge about career guidance. Hence, they should be trained continuously at high schools to guide students for job-seeking. The second activity is organizing seminars to promote ISKUR services (job-seeking, active labor market programs) at schools and universities. The last one is about providing online materials such as videos, useful links and knowledge about improving job-seeking skills. It is clear that this policy recommendation might make use of the input produced by the first policy recommendation. (The detailed information including all the policy implications is provided in Table 6.7.).

Table 6. 7 Policy Implications: Policy Tools and Key Activities for Each Policy Recommendation

- ***Policy Recommendation 1:*** ***The supply of graduates should be balanced in higher education and vocational and technical high schools by taking into account the future trends, the needs of the labor market and behavioral pattern of applicants who take university entrance exam.***

Policy Aims to Clarify the Purpose of Policy Recommendation: *The policy aims for this policy recommendation are to reduce the quantitative mismatch between the education system and the labor market, and hence to reduce field of study mismatch.*

Key Policy Tools to Achieve Policy Recommendations	Key Activities/Tasks to Realize Policy Tools
1.1.Determine the new skill sets and occupations that will arise due to technological developments and Industry 4.0, and analyze their effects on the structure of current jobs/occupations	1.1.1.Conduct a technology foresight for Turkey to frame the technological vision and its reflections. 1.1.2.Establish ad-hoc committees to determine the effect of technological developments and digital transformation on the basis of each ISCO-08 occupation.
1.2.Determine the occupations and competences demanded by the labor market	1.2.1.Conduct periodic surveys (questionnaires, interviews etc) in every five years to collect relevant data and information from the top managers, department heads and other relevant stakeholders. 1.2.2.Design and implement a national portal for identifying sectoral occupations demanded by the labor market 1.2.3.Establish ad-hoc committees consisting of job analysts, human resource experts and other relevant stakeholders to match the fields of study with the occupations on the basis of FOET/ISCED classification and ISCO-08 occupation codes
1.3.Analyze the behavioral and preference pattern of applicants who take university entrance examinations	1.3.1.Conduct in-depth analysis of the quota of university entrance examination and determine the pattern of student flow 1.3.2.Conduct periodic surveys to analyze the reasons why the share of university students/graduates who apply to the university exam is increasing 1.3.3.Conduct periodic surveys to determine the reasons why some fields of study are not preferred and left idle by the students

Table 6.7 Policy Implications: The Policy Tools and Key Activities for Each Policy Recommendation (cont'd)	
Policy Recommendation 2: ***Labor market effectiveness should be improved in line with the labor market needs and technological developments*** ***Policy Aims to Clarify the Purpose of Policy Recommendation:*** *The policy aims behind this policy recommendation are to reduce unemployment rate, the inactivity rate and the field of study mismatch*	
Key Policy Tools to Achieve Policy Recommendations	**Key Activities/Tasks to Realize Policy Tools**
2.1.Increase the efficiency and effectiveness of active labor market programs offered by İŞKUR	2.1.1.Update and streamline the career counseling services by taking into account the periodic field surveys and related analyses conducted for labor market. 2.1.2.Increase the share of private sector and professional organizations in providing training services 2.1.3.Establish monitoring and evaluation system for active labor market programs
2.2.Ensure that all graduates be reached by job and occupational counselors of İŞKUR	2.2.1.Strengthen the institutional capacity of ISKUR in terms of human resource and physical infrastructure 2.2.2.Increase the quantity and quality of basic skills development activities carried out in lifelong learning centers and public education centers. 2.2.3.Provide training services for the recruiting process of small firms which have less than 10 employees
2.3.Improve the quality of statistical data on education system and labor market	2.3.1.Establish ad-hoc committees for designing data collection mechanisms regarding education system and labor market 2.3.2.Train the relevant government institutions to ensure them use the same definition and methodology by taking into account the international statistics classifications

Table 6.7 Policy Implications: The Policy Tools and Key Activities for Each Policy Recommendation (cont'd)	
Policy Recommendation 3: ***The decent employment of graduates from vocational and technical education (including both the secondary education and 2-3 year of higher education level (MYOs-associate degree)) should be increased.*** ***Policy Aims to Clarify the Purpose of Policy Recommendation:*** *The policy aims for this policy recommendation are to increase the number of graduates who directly enter into the labor market which reduces their demand for university entrance examinations, and hence to contribute to the process of balancing the supply of graduates in higher education.*	
Key Policy Tools to Achieve Policy Recommendations	**Key Activities/Tasks to Realize Policy Tools**
3.1.Enhance the physical and technical infrastructure of vocational and technical education.	3.1.1.Restructure the link and curriculum of vocational and technical education between secondary education level and 2-3 year of higher education level. 3.1.2.Modernize the laboratories of all vocational and technical education by taking into account the needs of labor market. 3.1.3.Update and increase the National Occupational Standards and National Qualifications that constitute the basis of vocational and technical education. 3.1.4.Organize promotional activities to improve the perception of vocational and technical education in society
3.2.Strengthen the cooperation between schools and the industry	3.2.1.Increase the quantity and quality of mission-oriented protocols to enhance the cooperation between vocational and technical education and the industry. 3.2.2.Increase the internship opportunities and relevant government incentives 3.2.3.Increase the number of industry owned schools by allocating more government incentives 3.2.4.Increase "on the job training programs" of İŞKUR by allocating more government support for employment incentives

Table 6.7 Policy Implications: The Policy Tools and Key Activities for Each Policy Recommendation (cont'd)	
Policy Recommendation 4: ***The awareness of high school students about the occupations/professions should be increased and the job-seeking skills of last grade students in high schools and universities should be improved*** ***Policy Aims to Clarify the Purpose of Policy Recommendation:*** *The main policy tools behind this policy recommendation are to ensure the youth graduates start to work in more well-matched jobs and reduce the transition time from school to work.*	
Key Policy Tools to Achieve Policy Recommendations	**Key Activities/Tasks to Realize Policy Tools**
4.1. Increase the awareness of high school students about the occupations/professions	4.1.1.Establish a career guidance system to support career selection processes that will allow students to recognize themselves and the professions 4.1.2.Organize seminars to introduce and promote the occupations/professions 4.1.3.Prepare online (web) material for introducing the occupations /professions
4.2.Improve job-seeking skills of last grade students in high schools and universities	4.2.1.Train the trainers or guidance teachers at high schools to guide students for job-seeking. 4.2.2.Organize seminars to promote İŞKUR services (job-seeking, active labor market programs) at schools and universities 4.2.3.Provide online materials such as videos, useful links and knowledge about improving job-seeking skills

Source: Own construction

6.6. Limitations of the Thesis and Directions for Further Research

This thesis has a number of limitations resulting mainly from the change in data structure over time and lack of data. Those limitations are provided in the relevant chapters or sections of the thesis. However, a summary of them is presented as follows.

Limitation on Annual Data Coverage: The coding scheme was used for measuring field of study mismatch. It was developed by Wolbers (2003) and updated by Montt (2015). There are two dimensions in designing coding scheme. The first dimension is the field of study and the second dimension is the occupation codes. Wolbers (2003) and Montt (2015) both used FOET 99 classification for the field of study dimension. For the occupation codes, Wolbers (2003) used ISCO-88 codes. However, after the new occupation codes were published in 2008, Montt (2015) updated it to ISCO-08 codes. They both used three digit codes of occupation.

The FOET-99 classification was started to be used in Turkey in 2009. However, later in 2013, International Standard Classification of Education (ISCED) was published. This new classification has been used in Turkey since 2014. The two classification (FOET-99 and ISCED-13f) were used together between 2014 and 2016 surveys. FOET-99 did not take place in the surveys starting from 2017. As a result, since coding scheme depends originally on FOET 99 classification, the data will cover at most the period 2009-2016. On the other side, although ISCO-08 code was first published in 2008, it has been used in Turkey since 2012. Therefore, the data is narrowed to the period 2012-2016.

Lack of Data-Limitation on Determining Range of Coding Scheme for Turkey: ISCO codes are originally available at most in four digit codes. Wolbers (2003) and Montt (2015) both used three digit codes while designing the coding scheme to match individuals. However, Turkey uses two-digit classification of ISCO-08 codes in annual TURKSTAT labor force surveys. Hence, the original coding scheme was not used in this thesis. Therefore, three digit codes are aggregated into two digit ones. However, aggregating three digits into two digit codes resulted in larger range for well-matched individuals which generated lower incidence of field of study mismatch in this thesis as expected.

The Data for Vertical Mismatch: The data for level of education is critical for measuring vertical mismatch. However, the relevant survey question which captures the education level of an individual was changed in 2014. Before 2014, the graduates from higher education was grouped in only one category including MYOs-associate degree, bachelor degrees, the masters and PhD degrees. Since 2014, the new question has had a two option for higher education graduates. These are (i) 2, 3 or 4 year higher education and (ii) 5 or 6 years of higher education, masters degree and doctorate. Hence, since the new data structure is more detailed for the

higher educated individuals, the vertical mismatch is measured for 2014 and beyond. Moreover, the incidence of vertical mismatch is found to be different from the previous findings which used the same measurement method. One of the main reason for this difference is the above change in data structure used for identifying the education level.

Implicit Assumptions: For the coding scheme, the underlying premise is that for a job available in a particular occupational group, those graduates from the corresponding field are assumed to better aligned for the job and have a higher standing in the hiring queue than graduates from other fields. Moreover, the level of employment in a field of study is assumed to be constant for all of the employees in that field. There might be segmentation within the field. Therefore, using more detailed classification for field of study or occupation codes would provide different results.

Moreover, coding scheme is like a universal matrix. However, the cultural, economic and social context of countries are unique. So, the content of coding scheme might not fit 100% to every country in the same manner. But, for cross-country analysis, such matrix is needed. For the country specific issues regarding labor market context, it is known and tested before that labor market institutions and regulations such as minimum wage, collective bargaining, unemployment compensation, active and passive labor force policies, and so forth, have significant impacts on supply of and demand for labor force. Hence it is also effective on having field of study mismatch. Since there is not any relevant data for those determinants, they were not used in this thesis.

Direction for Further Research: The empirical studies on vertical and field of study mismatch are very limited in Turkey. The following research topics are proposed as further studies.

For vertical mismatch, by using TURKSTAT labor force surveys, the progress on vertical mismatch between 2014 and most recent data can be analyzed to study whether the rapid expansion in higher education cause a reduction or increase in overeducation. Moreover, the effect of vertical mismatch on wages can also be studied as a new one.

For field of study mismatch, by using TURKSTAT labor force surveys, additional studies can be conducted for Turkey. The first one can be analyzing the consequences of field of study mismatch by using 2016 data. For example, the sunk cost of education or social cost of field of study mismatch can be analyzed. Moreover, the effect of field of study mismatch on wages can also be studied. The second study can be on having more recent incidence of field of study mismatch. For this purpose, the transformation or correspondence matrix between FOET-99 and ISCED-F 2013 must be used carefully. However, this would be the first coding scheme which uses ISCED-F 2013. If achieved, more recent incidences of field of study mismatch can

be measured. By using these incidences, new regression studies by using most recent data can be conducted to analyze both the causes and consequences of field of study mismatch. The third study might be analyzing the causes of field of study mismatch for only the higher education graduates with different variables. This thesis analyzed the causes of field of study mismatch for the target group consisting of sum of vocational and technical education and higher education graduates because one of the significant concern was to seek answer for the question "Which education level is more or less likely to have field of study mismatch over the other one?" The fourth research idea might be measuring and analyzing the incidences, causes and consequences of field of study mismatch on the basis of occupation codes (i.e managers only). The fifth one might be measuring and analyzing any type of mismatch on the basis of only one field of study mismatch (i.e. engineering only or STEM only). Or, only the younger employees can be targeted in any mismatch study.

Moreover, the proposed research topics can also be studied by using PIAAC data for Turkey which was collected in 2015. However, there is a very limited number of data in PIAAC survey which is around 5 thousand when compared to 380 thousand in TURKSTAT labor force surveys.

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APPENDICES

APPENDIX A: CODING SCHEME, FOET-99 AND ISCO-08 CLASSIFICATIONS

Table A. 1 FOET 99 Classification of Fields of Study

FOET 99 1- Digit Classification		FOET 99 2-Digit Classification	
Code	**Field**	**Code**	**Field**
2	Teacher training and education science	1	Teacher training and education science
3	Humanities, languages and arts	2	Arts
		3	Humanities
4	Social sciences, business and law	4	Social and behavioral science
		5	Journalism and information
		6	Business and administration
		7	Law
5	Science, mathematics and computing	8	Life Science
		9	Physical Science
		10	Mathematics and Statistics
		11	Computing
6	Engineering, manufacturing and construction	12	Engineering and Engineering Trade
		13	Manufacturing and processing
		14	Architecture and building
7	Agriculture and veterinary	15	Agriculture, forestry and fishery
		16	Veterinary
8	Health and welfare	17	Health
		18	Social Services
9	Service	19	Personal Services
		20	Transport services and environtal protection
		21	Security services

Note: The detailed education programs under each field of study are presented in www.tuik.gov.tr/metabilgi/sınıflama sunucusu/eğitim sınıflaması/FOET-99 . For example, computer engineering is not included under field of study called "computing". It is included under "engineering and engineering trade". The website provides all the included and excluded programs under each field of study.
Source: Own construction based on TURKSTAT

Table A. 2 International Standard Classification of Occupations (ISCO)-08 4-Digit Classification				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
1	**Managers**		**134**	Professional services managers
11	Chief executives, senior officials and legislators		1341	Child care services managers
111	Legislators and senior officials		1342	Health services managers
1111	Legislators		1343	Aged care services managers
1112	Senior government officials		1344	Social welfare managers
1113	Traditional chiefs and heads of village		1345	Education managers
1114	Senior officials of special-interest organizations		1346	Financial and insurance services branch managers
112	Managing directors and chief executives		1349	Professional services managers not elsewhere classified
1120	Managing directors and chief executives		**14**	Hospitality, retail and other services managers
12	Administrative and commercial managers		**141**	Hotel and restaurant managers
121	Business services and administration managers		1411	Hotel managers
1211	Finance managers		1412	Restaurant managers
1212	Human resource managers		**142**	Retail and wholesale trade managers
1213	Policy and planning managers		1420	Retail and wholesale trade managers
1219	Business services and administration managers not elsewhere classified		**143**	Other services managers
122	Sales, marketing and development managers		1431	Sports, recreation and cultural centre managers
1221	Sales and marketing managers		1439	Services managers not elsewhere classified
1222	Advertising and public relations managers		**2**	**Professionals**
1223	Research and development managers		**21**	Science and engineering professionals
13	Production and specialized services managers		**211**	Physical and earth science professionals
131	Production managers in agriculture, forestry and fisheries		2111	Physicists and astronomers
1311	Agricultural and forestry production managers		2112	Meteorologists
1312	Aquaculture and fisheries production managers		2113	Chemists
132	Manufacturing, mining, construction, and distribution managers		2114	Geologists and geophysicists
1321	Manufacturing managers		**212**	Mathematicians, actuaries and statisticians
1322	Mining managers		2120	Mathematicians, actuaries and statisticians
1323	Construction managers		**213**	Life science professionals
1324	Supply, distribution and related managers		2131	Biologists, botanists, zoologists and related professionals
133	Information and communications technology service managers		2132	Farming, forestry and fisheries advisers
1330	Information and communications technology service managers		2133	Environmental protection professionals

Table A.2 ISCO-08 4-Digit Classification (Cont'd) (Page-2/9)				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
214	Engineering professionals (excluding electrotechnology)		2266	Audiologists and speech therapists
2141	Industrial and production engineers		2267	Optometrists and ophthalmic opticians
2142	Civil engineers		2269	Health professionals not elsewhere classified
2143	Environmental engineers		**23**	Teaching professionals
2144	Mechanical engineers		**231**	University and higher education teachers
2145	Chemical engineers		2310	University and higher education teachers
2146	Mining engineers, metallurgists and related professionals		**232**	Vocational education teachers
2149	Engineering professionals not elsewhere classified		2320	Vocational education teachers
215	Electrotechnology engineers		**233**	Secondary education teachers
2151	Electrical engineers		2330	Secondary education teachers
2152	Electronics engineers		**234**	Primary school and early childhood teachers
2153	Telecommunications engineers		2341	Primary school teachers
216	Architects, planners, surveyors and designers		2342	Early childhood educators
2161	Building architects		**235**	Other teaching professionals
2162	Landscape architects		2351	Education methods specialists
2163	Product and garment designers		2352	Special needs teachers
2164	Town and traffic planners		2353	Other language teachers
2165	Cartographers and surveyors		2354	Other music teachers
2166	Graphic and multimedia designers		2355	Other arts teachers
22	Health professionals		2356	Information technology trainers
221	Medical doctors		2359	Teaching professionals not elsewhere classified
2211	Generalist medical practitioners		**24**	Business and administration professionals
2212	Specialist medical practitioners		**241**	Finance professionals
222	Nursing and midwifery professionals		2411	Accountants
2221	Nursing professionals		2412	Financial and investment advisers
2222	Midwifery professionals		2413	Financial analysts
223	Traditional and complementary medicine professionals		**242**	Administration professionals
2230	Traditional and complementary medicine professionals		2421	Management and organization analysts
225	Veterinarians		2422	Policy administration professionals
2250	Veterinarians		2423	Personnel and careers professionals
226	Other health professionals		2424	Training and staff development professionals
2261	Dentists		**243**	Sales, marketing and public relations professionals
2262	Pharmacists		2431	Advertising and marketing professionals
2263	Environmental and occupational health and hygiene		2432	Public relations professionals
2264	Physiotherapists		2433	Technical and medical sales professionals (excluding ICT)

Table A.2 ISCO-08 4-Digit Classification (Cont'd) (Page-3/9)				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
25	Information and communications technology professionals		2653	Dancers and choreographers
251	Software and applications developers and analysts		2654	Film, stage and related directors and producers
2511	Systems analysts		2655	Actors
2512	Software developers		2656	Announcers on radio, television and other media
2513	Web and multimedia developers		2659	Creative and performing artists not elsewhere classified
2514	Applications programmers		**3**	**Technicians and associate professionals**
2519	Software and applications developers not elsewhere classified		**31**	Science and engineering associate professionals
252	Database and network professionals		**311**	Physical and engineering science technicians
2521	Database designers and administrators		3111	Chemical and physical science technicians
2522	Systems administrators		3112	Civil engineering technicians
2523	Computer network professionals		3113	Electrical engineering technicians
2529	Database and network professionals not elsewhere classified		3114	Electronics engineering technicians
26	Legal, social and cultural professionals		3115	Mechanical engineering technicians
261	Legal professionals		3116	Chemical engineering technicians
2611	Lawyers		3117	Mining and metallurgical technicians
2612	Judges		3118	Draughtspersons
2619	Legal professionals not elsewhere classified		3119	Physical and engineering science technicians not elsewhere classified
262	Librarians, archivists and curators		**312**	Mining, manufacturing and construction supervisors
2621	Archivists and curators		3121	Mining supervisors
2622	Librarians and related information professionals		3122	Manufacturing supervisors
263	Social and religious professionals		3123	Construction supervisors
2631	Economists		**313**	Process control technicians
2632	Sociologists, anthropologists and related professionals		3131	Power production plant operators
2633	Philosophers, historians and political scientists		3132	Incinerator and water treatment plant operators
2634	Psychologists		3133	Chemical processing plant controllers
2635	Social work and counselling professionals		3134	Petroleum and natural gas refining plant operators
2636	Religious professionals		3135	Metal production process controllers
264	Authors, journalists and linguists		3139	Process control technicians not elsewhere classified
2641	Authors and related writers		**314**	Life science technicians and related associate professionals
2642	Journalists		3141	Life science technicians (excluding medical)
2643	Translators, interpreters and other linguists		3142	Agricultural technicians
265	Creative and performing artists		3143	Forestry technicians
2651	Visual artists		**315**	Ship and aircraft controllers and technicians
2652	Musicians, singers and composers		3151	Ships' engineers

Table A.2 ISCO-08 3-Digit Classification (Cont'd) (Page-4/9)				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
3152	Ships' deck officers and pilots		**332**	Sales and purchasing agents and brokers
3153	Aircraft pilots and related associate professionals		3321	Insurance representatives
3154	Air traffic controllers		3322	Commercial sales representatives
3155	Air traffic safety electronics technicians		3323	Buyers
32	Health associate professionals		3324	Trade brokers
321	Medical and pharmaceutical technicians		**333**	Business services agents
3211	Medical imaging and therapeutic equipment technicians		3331	Clearing and forwarding agents
3212	Medical and pathology laboratory technicians		3332	Conference and event planners
3213	Pharmaceutical technicians and assistants		3333	Employment agents and contractors
3214	Medical and dental prosthetic technicians		3334	Real estate agents and property managers
322	Nursing and midwifery associate professionals		3339	Business services agents not elsewhere classified
3221	Nursing associate professionals		**334**	Administrative and specialized secretaries
3222	Midwifery associate professionals		3341	Office supervisors
323	Traditional and complementary medicine associate professionals		3342	Legal secretaries
3230	Traditional and complementary medicine associate professionals		3343	Administrative and executive secretaries
324	Veterinary technicians and assistants		3344	Medical secretaries
3240	Veterinary technicians and assistants		**335**	Regulatory government associate professionals
325	Other health associate professionals		3351	Customs and border inspectors
3251	Dental assistants and therapists		3352	Government tax and excise officials
3252	Medical records and health information technicians		3353	Government social benefits officials
3253	Community health workers		3354	Government licensing officials
3254	Dispensing opticians		3355	Police inspectors and detectives
3255	Physiotherapy technicians and assistants		3359	Regulatory government associate professionals not elsewhere classified
3256	Medical assistants		**34**	Legal, social, cultural and related associate professionals
3257	Environmental and occupational health inspectors and associates		**341**	Legal, social and religious associate professionals
3258	Ambulance workers		3411	Legal and related associate professionals
3259	Health associate professionals not elsewhere classified		3412	Social work associate professionals
33	Business and administration associate professionals		3413	Religious associate professionals
331	Financial and mathematical associate professionals		**342**	Sports and fitness workers
3311	Securities and finance dealers and brokers		3421	Athletes and sports players
3312	Credit and loans officers		3422	Sports coaches, instructors and officials
3313	Accounting associate professionals		3423	Fitness and recreation instructors and program leaders
3314	Statistical, mathematical and related associate professionals			
3315	Valuers and loss assessors			

Table A.2 ISCO-08 4-Digit Classification (Cont'd) (Page-5/9)				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
343	Artistic, cultural and culinary associate professionals		4226	Receptionists (general)
3431	Photographers		4227	Survey and market research interviewers
3432	Interior designers and decorators		4229	Client information workers not elsewhere classified
3433	Gallery, museum and library technicians		**43**	Numerical and material recording clerks
3434	Chefs		**431**	Numerical clerks
3435	Other artistic and cultural associate professionals		4311	Accounting and bookkeeping clerks
35	Information and communications technicians		4312	Statistical, finance and insurance clerks
351	ICToperations and user support technicians		4313	Payroll clerks
3511	Information and communications technology operations technicians		**432**	Material-recording and transport clerks
3512	Information and communications technology user support technicians		4321	Stock clerks
3513	Computer network and systems technicians		4322	Production clerks
3514	Web technicians		4323	Transport clerks
352	Telecommunications and broadcasting technicians		**44**	Other clerical support workers
3521	Broadcasting and audio-visual technicians		**441**	Other clerical support workers
3522	Telecommunications engineering technicians		4411	Library clerks
4	**Clerical support workers**		4412	Mail carriers and sorting clerks
41	General and keyboard clerks		4413	Coding, proof-reading and related clerks
411	General office clerks		4414	Scribes and related workers
4110	General office clerks		4415	Filing and copying clerks
412	Secretaries (general)		4416	Personnel clerks
4120	Secretaries (general)		4419	Clerical support workers not elsewhere classified
413	Keyboard operators		**5**	**Service and sales workers**
4131	Typists and word processing operators		**51**	Personal service workers
4132	Data entry clerks		**511**	Travel attendants, conductors and guides
42	Customer services clerks		5111	Travel attendants and travel stewards
421	Tellers, money collectors and related clerks		5112	Transport conductors
4211	Bank tellers and related clerks		5113	Travel guides
4212	Bookmakers, croupiers and related gaming workers		**512**	Cooks
4213	Pawnbrokers and money-lenders		5120	Cooks
4214	Debt-collectors and related workers		**513**	Waiters and bartenders
422	Client information workers		5131	Waiters
4221	Travel consultants and clerks		5132	Bartenders
4222	Contact centre information clerks		**514**	Hairdressers, beauticians and related workers
4223	Telephone switchboard operators		5141	Hairdressers
4224	Hotel receptionists		5142	Beauticians and related workers

Table A.2 ISCO-08 4-Digit Classification (Cont'd) (Page-6/9)				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
515	Building and housekeeping supervisors		5329	Personal care workers in health services not elsewhere classified
5151	Cleaning and housekeeping supervisors in offices, hotels		**54**	Protective services workers
5152	Domestic housekeepers		**541**	Protective services workers
5153	Building caretakers		5411	Fire-fighters
516	Other personal services workers		5412	Police officers
5161	Astrologers, fortune-tellers and related workers		5413	Prison guards
5162	Companions and valets		5414	Security guards
5163	Undertakers and embalmers		5419	Protective services workers not elsewhere classified
5164	Pet groomers and animal care workers		**6**	**Skilled agricultural, forestry and fishery workers**
5165	Driving instructors		**61**	Market-oriented skilled agricultural workers
5169	Personal services workers not elsewhere classified		**611**	Market gardeners and crop growers
52	Sales workers		6111	Field crop and vegetable growers
521	Street and market salespersons		6112	Tree and shrub crop growers
5211	Stall and market salespersons		6113	Gardeners, horticultural and nursery growers
5212	Street food salespersons		6114	Mixed crop growers
522	Shop salespersons		**612**	Animal producers
5221	Shop keepers		6121	Livestock and dairy producers
5222	Shop supervisors		6122	Poultry producers
5223	Shop sales assistants		6123	Apiarists and sericulturists
523	Cashiers and ticket clerks		6129	Animal producers not elsewhere classified
5230	Cashiers and ticket clerks		**613**	Mixed crop and animal producers
524	Other sales workers		6130	Mixed crop and animal producers
5241	Fashion and other models		**62**	Market-oriented skilled forestry, fishery and hunting workers
5242	Sales demonstrators		**621**	Forestry and related workers
5243	Door to door salespersons		6210	Forestry and related workers
5244	Contact centre salespersons		**622**	Fishery workers, hunters and trappers
5245	Service station attendants		6221	Aquaculture workers
5246	Food service counter attendants		6222	Inland and coastal waters fishery workers
5249	Sales workers not elsewhere classified		6223	Deep-sea fishery workers
53	Personal care workers		6224	Hunters and trappers
531	Child care workers and teachers' aides		**63**	Subsistence farmers, fishers, hunters and gatherers
5311	Child care workers		**631**	Subsistence crop farmers
5312	Teachers' aides		6310	Subsistence crop farmers
532	Personal care workers in health services		**632**	Subsistence livestock farmers
5321	Health care assistants		6320	Subsistence livestock farmers

Table A.2 ISCO-08 4-Digit Classification (Cont'd) (Page-7/9)				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
6330	Subsistence mixed crop and livestock farmers		7223	Metal working machine tool setters and operators
634	Subsistence fishers, hunters, trappers and gatherers		7224	Metal polishers, wheel grinders and tool sharpeners
6340	Subsistence fishers, hunters, trappers and gatherers		**723**	Machinery mechanics and repairers
7	**Craft and related trades workers**		7231	Motor vehicle mechanics and repairers
71	Building and related trades workers, excluding electricians		7232	Aircraft engine mechanics and repairers
711	Building frame and related trades workers		7233	Agricultural and industrial machinery mechanics and repairers
7111	House builders		7234	Bicycle and related repairers
7112	Bricklayers and related workers		**73**	Handicraft and printing workers
7113	Stonemasons, stone cutters, splitters and carvers		**731**	Handicraft workers
7114	Concrete placers, concrete finishers and related workers		7311	Precision-instrument makers and repairers
7115	Carpenters and joiners		7312	Musical instrument makers and tuners
7119	Building frame and related trades workers not elsewhere classified		7313	Jewellery and precious-metal workers
712	Building finishers and related trades workers		7314	Potters and related workers
7121	Roofers		7315	Glass makers, cutters, grinders and finishers
7122	Floor layers and tile setters		7316	Sign writers, decorative painters, engravers and etchers
7123	Plasterers		7317	Handicraft workers in wood, basketry and related materials
7124	Insulation workers		7318	Handicraft workers in textile, leather and related materials
7125	Glaziers		7319	Handicraft workers not elsewhere classified
7126	Plumbers and pipe fitters		**732**	Printing trades workers
7127	Air conditioning and refrigeration mechanics		7321	Pre-press technicians
713	Painters, building structure cleaners and related trades workers		7322	Printers
7131	Painters and related workers		7323	Print finishing and binding workers
7132	Spray painters and varnishers		**74**	Electrical and electronic trades workers
7133	Building structure cleaners		**741**	Electrical equipment installers and repairers
72	Metal, machinery and related trades workers		7411	Building and related electricians
721	Sheet and structural metal workers, moulders and welders		7412	Electrical mechanics and fitters
7211	Metal moulders and coremakers		7413	Electrical line installers and repairers
7212	Welders and flamecutters		**742**	Electronics and telecommunications installers and repairers
7213	Sheet-metal workers		7421	Electronics mechanics and servicers
7214	Structural-metal preparers and erectors		7422	Information and communications technology installers and servicers
7215	Riggers and cable splicers		**75**	Food processing, wood working, garment and other craft and related trades
722	Blacksmiths, toolmakers and related trades workers		**751**	Food processing and related trades workers
7221	Blacksmiths, hammersmiths and forging press workers		7511	Butchers, fishmongers and related food preparers
7222	Toolmakers and related workers		7512	Bakers, pastry-cooks and confectionery makers

Table A.2 ISCO-08 4-Digit Classification (Cont'd) (Page-8/9)				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
7513	Dairy-products makers		**814**	Rubber, plastic and paper products machine operators
7514	Fruit, vegetable and related preservers		8141	Rubber products machine operators
7515	Food and beverage tasters and graders		8142	Plastic products machine operators
7516	Tobacco preparers and tobacco products makers		8143	Paper products machine operators
752	Wood treaters, cabinet-makers and related trades workers		**815**	Textile, fur and leather products machine operators
7521	Wood treaters		8151	Fibre preparing, spinning and winding machine operators
7522	Cabinet-makers and related workers		8152	Weaving and knitting machine operators
7523	Woodworking-machine tool setters and operators		8153	Sewing machine operators
753	Garment and related trades workers		8154	Bleaching, dyeing and fabric cleaning machine operators
7531	Tailors, dressmakers, furriers and hatters		8155	Fur and leather preparing machine operators
7532	Garment and related pattern-makers and cutters		8156	Shoemaking and related machine operators
7533	Sewing, embroidery and related workers		8157	Laundry machine operators
7534	Upholsterers and related workers		8159	Textile, fur and leather products machine operators not elsewhere classified
7535	Pelt dressers, tanners and fellmongers		**816**	Food and related products machine operators
7536	Shoemakers and related workers		8160	Food and related products machine operators
754	Other craft and related workers		**817**	Wood processing and papermaking plant operators
7541	Underwater divers		8171	Pulp and papermaking plant operators
7542	Shotfirers and blasters		8172	Wood processing plant operators
7543	Product graders and testers (excluding foods and beverages)		**818**	Other stationary plant and machine operators
7544	Fumigators and other pest and weed controllers		8181	Glass and ceramics plant operators
7549	Craft and related workers not elsewhere classified		8182	Steam engine and boiler operators
8	**Plant and machine operators, and assemblers**		8183	Packing, bottling and labelling machine operators
81	Stationary plant and machine operators		8189	Stationary plant and machine operators not elsewhere classified
811	Mining and mineral processing plant operators		**82**	Assemblers
8111	Miners and quarriers		**821**	Assemblers
8112	Mineral and stone processing plant operators		8211	Mechanical machinery assemblers
8113	Well drillers and borers and related workers		8212	Electrical and electronic equipment assemblers
8114	Cement, stone and other mineral products machine operators		8219	Assemblers not elsewhere classified
812	Metal processing and finishing plant operators		**83**	Drivers and mobile plant operators
8121	Metal processing plant operators		**831**	Locomotive engine drivers and related workers
8122	Metal finishing, plating and coating machine operators		8311	Locomotive engine drivers
813	Chemical and photographic products plant and machine operators		8312	Railway brake, signal and switch operators
8131	Chemical products plant and machine operators		**832**	Car, van and motorcycle drivers
8132	Photographic products machine operators		8321	Motorcycle drivers
814	Rubber, plastic and paper products machine operators		8322	Car, taxi and van drivers

Table A.2 ISCO-08 4-Digit Classification (Cont'd) (Page-9/9)				
Code	**ISCO 08-4 Digit Classification**		**Code**	**ISCO 08-4 Digit Classification**
833	Heavy truck and bus drivers		**933**	Transport and storage labourers
8331	Bus and tram drivers		9331	Hand and pedal vehicle drivers
8332	Heavy truck and lorry drivers		9332	Drivers of animal-drawn vehicles and machinery
834	Mobile plant operators		9333	Freight handlers
8341	Mobile farm and forestry plant operators		9334	Shelf fillers
8342	Earthmoving and related plant operators		**94**	Food preparation assistants
8343	Crane, hoist and related plant operators		**941**	Food preparation assistants
8344	Lifting truck operators		9411	Fast food preparers
835	Ships' deck crews and related workers		9412	Kitchen helpers
8350	Ships' deck crews and related workers		**95**	Street and related sales and service workers
9	**Elementary occupations**		**951**	Street and related service workers
91	Cleaners and helpers		9510	Street and related service workers
911	Domestic, hotel and office cleaners and helpers		**952**	Street vendors (excluding food)
9111	Domestic cleaners and helpers		9520	Street vendors (excluding food)
9112	Cleaners and helpers in offices, hotels and other establishments		**96**	Refuse workers and other elementary workers
912	Vehicle, window, laundry and other hand cleaning workers		**961**	Refuse workers
9121	Hand launderers and pressers		9611	Garbage and recycling collectors
9122	Vehicle cleaners		9612	Refuse sorters
9123	Window cleaners		9613	Sweepers and related labourers
9129	Other cleaning workers		**962**	Other elementary workers
92	Agricultural, forestry and fishery labourers		9621	Messengers, package deliverers and luggage porters
921	Agricultural, forestry and fishery labourers		9622	Odd job persons
9211	Crop farm labourers		9623	Meter readers and vending-machine collectors
9212	Livestock farm labourers		9624	Water and firewood collectors
9213	Mixed crop and livestock farm labourers		9629	Elementary workers not elsewhere classified
9214	Garden and horticultural labourers		**0**	**Armed forces occupations**
9215	Forestry labourers		**01**	Commissioned armed forces officers
9216	Fishery and aquaculture labourers		**011**	Commissioned armed forces officers
93	Labourers in mining, construction, manufacturing and transport		0110	Commissioned armed forces officers
931	Mining and construction labourers		**02**	Non-commissioned armed forces officers
9311	Mining and quarrying labourers		**021**	Non-commissioned armed forces officers
9312	Civil engineering labourers		0210	Non-commissioned armed forces officers
9313	Building construction labourers		**03**	Armed forces occupations, other ranks
932	Manufacturing labourers		**031**	Armed forces occupations, other ranks
9321	Hand packers		0310	Armed forces occupations, other ranks

Table A. 3 Coding Scheme, The Matching Occupations Based on ISCO Occupation Codes and FOET 99 Fields of Study		
FOET 99 1 Digit Classification	**Matching Occupations Based on ISCO-88, 3-digit Codes (Wolbers 2003)**	**Matching Occupations Based on ISCO-08, 3-digit Codes (Montt 2015)**
2-Teacher training and education science	200, 230, 231-235, 300, 330, 331-334	231-235, 342, 531
3-Humanities, languages and arts	200, 230, 231, 232, 243, 245, 246, 300, 347, 348, 500, 520, 521, 522	216, 231-233, 262-265, 341, 343
4- Social sciences, business and law	100, 110, 111, 121-123, 130, 131, 200, 230-232, 241-245, 247, 300, 341-344, 346, 400, 401-422	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
5- Science, mathematics and computing	200, 211-213, 221, 230-232, 300, 310-313, 321	211-213, 226, 231-233, 251-252, 311, 313,314, 321, 331, 351-352
6- Engineering, manufacturing and construction	200, 213, 214, 300, 310-315, 700, 710-714, 721-724, 730-734, 740-744, 800, 810-817, 820-829, 831-834	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
7- Agriculture and veterinary	200, 221, 222, 300, 321, 322, 600, 611-615, 800, 833, 900, 920, 921	213, 225, 231-232, 314, 321, 324-325, 611-613, 621-622, 631-634, 751, 754, 834, 921
8- Health and welfare	200, 221-223, 244, 300, 321-323, 330, 332, 346, 500, 510, 513, 900, 910, 913	213, 221-227, 231, 234, 263, 321-325, 341, 516, 531, 532, 541,
9- Service	300, 345, 400, 410-419, 421, 422, 500, 510-514, 516, 520, 522, 800, 831-834, 900, 910, 913	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

Source: Own construction based on Wolbers (2003) and Montt (2015)

Note: The above correspondence defines well matched individuals based on their field of study. For example, if an individual is graduated from teacher training and education science and works in a job whose ISCO-08 code is 231, then she/he is treated as well matched because code 231 is a matching code in the above scheme. However, if she/he works in code 236, then she/he is treated as field of study mismatched because code 236 does not take place in the correspondence matrix above. The followings are coded as missing and not used in the analysis. All self-employed workers and those who majored in "general programmes"; armed forces occupations (ISCO major group 0); legislators and senior officials (ISCO 111); and refuse workers and other elementary workers (ISCO 961-962).All the other details can be seen on the aforementioned articles.

My analysis is based on Montt's (2015) coding scheme but with two digit ISCO-08 codes because TURKSTAT does not use three digit codes while collecting relevant data. Hence, three-digit codes are aggregated into two-digit codes which results in larger range of well-match individuals, which in turn yields lower incidence of field of study mismatch when compared to that of using three-digit codes. Hence, I claim that the incidence of field of study mismatch found in this thesis will be higher if three-digit codes were available in labor force surveys.

APPENDIX B: NATIONAL AND CROSS-COUNTRY DATA FOR LABOR MARKET INDICATORS

Table B. 1 Employment Rate of Population (25-64 Age-Group) with Tertiary Education by Fields of Study in OECD Countries, 2016 or Latest Available

Country	Education	Arts and humanities	Social sciences, journalism and information	Business, administration and law	Engineering, manufacturing & construction	Health and welfare	Services	STEM	Country Average
Greece	72.8	62.1	67.8	71.7	72.1	77.1	69.1	72.0	70.4
Turkey	**71.1**	**66.5**	**68.1**	**72.9**	**78.4**	**78.3**	**71.0**	**76.8**	**75.0**
Italy	79.8	73.1	75.9	81.2	84.8	85.5	76.8	82.4	79.7
Mexico	79.9	75.8	74.5	79.9	83.3	79.3	66.3	82.3	79.8
Spain	77.1	74.3	79.7	80.1	81.5	86.2	73.0	82.2	79.8
Slovak Republic	81.8	76.0	80.4	80.0	85.5	81.8	81.5	82.9	81.3
OECD - Average	**83.9**	**79.5**	**82.9**	**85.5**	**87.0**	**87.5**	**83.5**	**86.4**	**84.5**
European Union 23 members in OECD	**83.9**	**79.5**	**83.2**	**85.6**	**87.0**	**88.0**	**83.8**	**86.4**	**84.8**
Estonia	81.5	88.5	88.2	86.3	84.1	83.4	81.3	85.0	84.9
France	92.9	75.6	79.4	85.2	91.7	90.8	83.6	89.4	85.0
Hungary	82.0	82.6	85.2	84.4	87.5	88.7	80.2	88.7	85.0
Slovenia	86.6	74.3	88.5	88.3	92.1	91.6	84.5	88.4	85.2
Belgium	83.5	79.6	84.5	85.2	89.1	87.5	81.7	87.8	85.2
Czech Republic	82.8	84.3	81.3	85.5	90.8	83.8	86.5	89.7	85.6
Denmark	87.8	80.4	83.3	88.5	87.0	88.7	90.2	86.0	85.9
Austria	83.7	81.1	85.4	86.7	87.6	88.5	87.5	87.2	86.2
Latvia	88.3	78.9	86.0	88.7	85.4	93.5	82.6	87.4	87.2
Poland	83.8	83.2	86.7	89.5	88.3	91.8	87.8	88.9	87.5
Germany	86.6	84.1	84.1	89.7	90.2	89.3	88.3	89.7	88.3
Netherlands	84.5	84.3	88.2	90.3	90.6	88.0	90.5	90.0	88.4
Switzerland	88.2	83.9	85.3	88.3	91.3	88.2	89.2	91.1	88.5
Norway	89.0	81.4	89.2	91.3	89.2	90.8	92.9	88.3	88.8
Sweden	90.5	82.1	88.9	89.4	91.0	91.7	90.8	90.0	89.6
Lithuania	89.8	84.4	90.5	92.3	90.8	94.9	89.9	91.1	91.0

Source: Own construction based on OECD Stat Data
The countries are ranked in an ascending order by Country Average
The data for (i)natural sciences, mathematics and statistics, (ii) ICTs, (iii) Agriculture, forestry, fisheries and veterinary are below the publication limit in most of the countries. Hence, they are not analyzed. Moreover, the missing data are also deleted.

Table B. 2 Unemployment Rate of Population (25-64 Age-Group) with Tertiary Education in OECD Countries, 2016 or Latest Available

Country	Education	Arts and humanities	Social sciences, journalism and information	Business, administration and law	Engineering, manufacturing & construction	Health and welfare	Services	STEM	Country Average
Greece	12.2	25.9	18.3	16.4	18.3	11.8	9.7	18.4	17.2
Spain	12.2	15.1	12.3	10.9	10.8	7.0	14.1	10.4	10.9
Turkey	**6.7**	**12.7**	**10.2**	**10.8**	**8.7**	**4.7**	**8.6**	**9.4**	**9.4**
Italy	6.6	8.7	8.4	6.2	4.8	4.1	10.5	5.3	6.6
Slovenia	7.5	13.2	6.5	7.2	5.3	3.9	10.6	7.6	6.0
Slovak Republic	5.4	7.6	5.6	5.9	3.8	3.6	5.6	4.2	5.1
France	2.0	11.3	10.7	7.5	4.5	3.0	9.0	5.1	5.1
European Union 23 members in OECD	**4.2**	**7.9**	**6.0**	**5.4**	**5.1**	**3.0**	**5.6**	**5.4**	**4.9**
Denmark	5.7	10.0	8.2	5.9	6.3	3.5	4.4	7.3	4.9
OECD - Average	**3.9**	**7.6**	**5.8**	**5.3**	**5.0**	**2.9**	**5.3**	**5.3**	**4.5**
Mexico	1.5	5.1	6.1	4.6	5.7	2.6	2.1	5.7	4.4
Latvia	2.5	4.8	3.7	5.2	4.4	2.0	3.2	4.0	4.0
Sweden	2.2	7.1	4.2	4.4	4.1	1.7	2.8	4.5	3.8
Belgium	1.5	6.7	5.1	4.7	2.7	1.8	5.3	3.3	3.7
Estonia	2.8	2.8	1.8	3.0	5.8	1.3	6.4	4.9	3.7
Austria	2.1	4.9	3.6	3.7	3.7	2.0	2.5	3.9	3.4
Netherlands	3.5	4.9	3.8	3.3	3.1	2.5	3.7	3.1	3.4
Switzerland	1.6	4.2	4.9	4.2	2.9	1.8	3.3	3.0	3.3
Poland	2.5	3.6	3.2	2.9	2.8	1.9	2.9	2.7	3.0
Norway	1.4	6.5	2.7	2.4	3.0	1.0	2.2	3.8	3.0
Lithuania	2.5	5.8	2.8	2.9	2.8	1.4	2.2	2.5	2.7
Germany	1.4	3.5	4.1	2.1	2.0	1.2	2.1	2.3	2.2
Czech Republic	1.6	2.6	2.2	2.3	1.3	1.4	1.3	1.6	1.8
Hungary	1.2	3.9	1.3	0.9	1.7	1.1	1.9	2.2	1.7

Source: Own construction based on OECD Stat Data
The countries are ranked in an ascending order by Country Average
The data for (i)natural sciences, mathematics and statistics, (ii) ICTs, (iii) Agriculture, forestry,fisheries and veterinary are below the publication limit in most of the countries. Hence, they are not analyzed. Moreover, the missing data are also deleted.

Table B. 3 Inactivity Rate of Population (25-64 Age-Group) with Tertiary Education in OECD Countries, 2016 or Latest Available									
Country	**Education**	**Arts and humanities**	**Social sciences, journalism and information**	**Business, administration and law**	**Engineering, manufacturing & construction**	**Health and welfare**	**Services**	**STEM**	**Country Average**
Turkey	**23.8**	**23.9**	**24.3**	**18.3**	**14.1**	**17.8**	**22.3**	**15.4**	**17.2**
Mexico	18.8	20.1	20.7	16.3	11.7	18.6	32.3	12.7	16.6
Greece	17.0	16.2	17.0	14.2	11.8	12.6	23.5	11.8	14.9
Italy	15.0	20.1	17.1	13.3	10.4	10.7	16.0	12.3	14.6
Slovak Republic	13.5	17.8	14.8	14.9	11.1	15.1	13.7	13.5	14.4
Hungary	17.1	14.0	13.6	14.8	11.0	10.3	18.2	9.3	13.6
Czech Republic	15.8	13.4	16.8	12.5	8.0	15.1	12.4	8.8	12.8
Estonia	16.1	9.0	10.2	11.0	10.7	15.5	13.1	10.6	11.9
OECD - Average	**12.7**	**14.0**	**11.7**	**9.7**	**8.5**	**9.9**	**12.7**	**8.9**	**11.6**
Belgium	15.2	14.7	11.0	10.6	8.4	10.9	13.8	9.3	11.5
European Union 23 members in OECD	**12.1**	**13.6**	**11.1**	**9.4**	**8.3**	**9.3**	**11.7**	**8.7**	**10.8**
Austria	14.5	14.7	11.4	9.9	9.1	9.6	10.3	9.2	10.7
France	5.2	14.8	11.2	7.9	3.9	6.4	8.2	5.8	10.5
Spain	12.1	12.5	9.1	10.0	8.6	7.4	15.1	8.2	10.4
Poland	13.6	13.7	10.2	7.9	9.2	6.4	9.6	8.5	9.8
Germany	12.2	12.8	12.3	8.4	8.0	9.6	9.7	8.2	9.7
Denmark	6.9	10.6	9.2	6.0	7.2	8.0	5.6	7.2	9.7
Slovenia	6.4	14.4	5.4	4.9	2.8	4.7	5.5	4.3	9.3
Latvia	9.5	17.1	10.7	6.4	10.6	4.5	14.7	9.0	9.2
Norway	9.7	13.0	8.2	6.4	8.1	8.3	5.0	8.2	8.5
Netherlands	12.4	11.3	8.3	6.6	6.5	9.8	6.1	7.2	8.5
Switzerland	10.4	12.5	10.3	7.9	5.9	10.1	7.7	6.0	8.5
Sweden	7.5	11.5	7.5	6.3	5.1	6.7	5.3	5.7	6.9
Lithuania	7.9	10.3	6.9	4.9	6.5	3.8	8.0	6.6	6.4

Source: Own construction based on OECD Stat Data

The countries are ranked in an ascending order by Country Average

The data for (i)natural sciences, mathematics and statistics, (ii) ICTs, (iii) Agriculture, forestry,fisheries and veterinary are below the publication limit in most of the countries. Hence, they are not analyzed. Moreover, the missing data are also deleted.

APPENDIX C: DETAILED DATA FOR INCIDENCE AND NUMBER OF FIELD OF STUDY MISMATCH

Table C. 1 The Change in Incidence of Field of Study Mismatch by the Latest Educational Level on the Basis of FOET-99 1-Digit Classification, 2012 and 2016

FOET 99 1-Digit Classification	(A) Vocational and Technical High Schools		Change in % Points (2016-2012)	(B) Higher Education (University + Graduate Study)		Change in % Points (2016-2012)	Total (A+B)		Change in % Points (2016-2012)
	2012	2016		2012	2016		2012	2016	
(2) Teacher training and education science	n/a	n/a	n/a	20.7	21.1	0.4	20.9	21.2	0.3
(3) Humanities, languages and arts	86.1	82.7	-3.4	32.2	32.5	0.3	56.3	53.8	-2.5
(4) Social sciences, business and law	39.0	43.0	4.0	15.2	17.9	2.7	20.3	22.5	2.2
(5) Science, mathematics and computing	86.7	89.2	2.5	35.9	41.0	5.1	42.1	51.0	8.9
(6) Engineering, manufacturing and construction	33.4	35.8	2.4	32.2	35.5	3.3	33.0	35.7	2.7
(7) Agriculture and veterinary	67.3	66.7	-0.6	35.6	39.6	4.0	37.0	40.4	3.4
(8) Health and welfare	29.2	31.5	2.3	6.8	9.6	2.8	13.1	16.3	3.2
(9) Service	20.3	20.9	0.6	18.4	17.9	-0.5	18.8	18.5	-0.3
Country Average	**42.4**	**44.9**	**2.5**	**21.9**	**24.0**	**2.1**	**28.4**	**30.3**	**1.9**

Source: Own construction

Note: Incidence of mismatch is not calculated for the fields which have less than 30 observations in the sample size. These fields are written as n/a. The change in percentage points is the difference in the incidence of field of study mismatch between the values of 2016 and 2012.

Table C. 2 The Change in Incidence of Field of Study Mismatch by the Latest Educational Level on the Basis of FOET-99 2-Digit Classification, 2012 and 2016

FOET 99 2-Digit Classification		Vocational and Technical High Schools		Change in % Points (2016-2012)	Higher Education (University + Graduate Study)		Change in % Points (2016-2012)	Total		Change in % Points (2016-2012)
		2012	2016		2012	2016		2012	2016	
1	Teacher training and education science	n/a	n/a	n/a	20.7	21.1	0.4	20.9	21.2	0.3
2	Arts	92.0	92.5	0.5	52.8	51.9	-0.9	70.4	64.5	-5.9
3	Humanities	83.8	80.9	-2.9	24.1	26.1	2.0	50.7	51.0	0.3
4	Social and behavioral science	n/a	n/a	n/a	13.7	14.8	1.1	13.7	14.8	1.1
5	Journalism and information	n/a	n/a	n/a	3.4	12.3	9.0	4.9	11.9	7.0
6	Business and administration	39.0	43.2	4.2	16.5	19.4	2.9	22.6	24.8	2.2
7	Law	n/a	n/a	n/a	5.0	10.3	5.3	5.4	10.2	4.8
8	Life Science	n/a	n/a	n/a	26.2	26.5	0.3	26.2	26.5	0.3
9	Physical Science	n/a	n/a	n/a	32.2	33.0	0.8	32.2	33.4	1.2
10	Mathematics and Statistics	n/a	n/a	n/a	29.6	36.8	7.2	29.8	36.9	7.1
11	Computing	87.2	89.2	2.0	54.3	71.2	16.9	66.6	80.9	14.3
12	Engineering and Engineering Trade	32.0	34.3	2.2	33.3	35.6	2.3	32.5	34.8	2.3
13	Manufacturing and processing	35.8	41.3	5.5	38.9	52.3	13.4	36.4	45.4	9.0
14	Architecture and building	37.3	41.9	4.6	25.9	24.7	-1.2	29.4	30.0	0.6
15	Agriculture, forestry and fishery	69.8	72.7	3.0	47.5	48.9	1.5	48.7	49.7	1.0
16	Veterinary	n/a	n/a	n/a	12.4	20.0	7.6	13.4	20.7	7.3
17	Health	8.6	6.9	-1.7	6.2	6.4	0.2	6.6	6.5	-0.1
18	Social Services	53.5	61.7	8.3	37.2	40.2	3.0	51.9	54.7	2.8
19	Personal Services	19.2	17.7	-1.5	25.0	27.1	2.1	23.2	24.2	1.0
20	Transport services and environmental protection	26.8	37.9	11.1	72.0	36.2	-35.8	58.9	37.1	-21.8
21	Security services	n/a	n/a	n/a	7.6	7.9	0.3	8.3	7.9	-0.4
	Country Average	**42.4**	**44.9**	**2.5**	**21.9**	**24.0**	**2.1**	**28.4**	**30.3**	**1.9**

Source: Own construction

Note: Incidence of mismatch is not calculated for the fields which have less than 30 observations in the sample size. These fields are written as n/a. The change in percentage points is the difference in the incidence level of field of study mismatch between the values of 2016 and 2012.

Table C. 3 Number and Incidence Level of Field of Study Mismatch for Wage Based Employees Who Are Graduates of Sum of Vocational and Technical High Schools and Higher Education, 2012-2016, FOET 2-Digit Classification

FOET 99 2-Digit Classification		Number of Sample Size					Number of Field of Study Mismatched Ones					Incidence Level of Field of Study Mismatch				
		2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
1	Teacher training and education science	4833	4938	4709	5008	5393	1008	1003	1030	1090	1146	20.9	20.3	21.9	21.8	21.2
2	Arts	1063	1129	820	856	860	748	825	531	561	555	70.4	73.1	64.8	65.5	64.5
3	Humanities	2696	2817	2939	3122	3264	1367	1442	1396	1550	1664	50.7	51.2	47.5	49.6	51.0
4	Social and behavioural science	1956	2022	2256	2282	2228	267	267	287	319	329	13.7	13.2	12.7	14.0	14.8
5	Journalism and information	61	54	79	88	84	3	6	13	8	10	4.9	11.1	16.5	9.1	11.9
6	Business and administration	8863	9495	9022	9876	10137	2002	2195	2076	2377	2519	22.6	23.1	23.0	24.1	24.8
7	Law	447	402	328	433	472	24	34	36	45	48	5.4	8.5	11.0	10.4	10.2
8	Life Science	351	355	348	355	366	92	100	100	112	97	26.2	28.2	28.7	31.5	26.5
9	Physical Science	883	941	699	696	706	284	331	263	260	236	32.2	35.2	37.6	37.4	33.4
10	Mathematics and Statistics	410	443	422	430	398	122	135	130	145	147	29.8	30.5	30.8	33.7	36.9
11	Computing	796	895	818	860	900	530	643	637	679	728	66.6	71.8	77.9	79.0	80.9
12	Engineering and Engineering Trade	6872	7047	7955	8264	8584	2232	2375	2640	2764	2984	32.5	33.7	33.2	33.4	34.8
13	Manufacturing and processing	2346	2404	1695	1711	1629	854	979	762	785	739	36.4	40.7	45.0	45.9	45.4
14	Architecture and building	1251	1266	1331	1366	1368	368	400	401	460	410	29.4	31.6	30.1	33.7	30.0
15	Agriculture, forestry and fishery	751	754	723	740	688	366	375	353	334	342	48.7	49.7	48.8	45.1	49.7
16	Veterinary	372	344	281	270	328	50	58	50	46	68	13.4	16.9	17.8	17.0	20.7
17	Health	2666	2623	2557	2542	2624	176	194	146	147	171	6.6	7.4	5.7	5.8	6.5
18	Social Services	445	403	572	662	666	231	246	327	349	364	51.9	61.0	57.2	52.7	54.7
19	Personal Services	856	843	839	877	963	199	193	207	217	233	23.2	22.9	24.7	24.7	24.2
20	Transport services and environmental protection	141	123	93	116	116	83	70	52	44	43	58.9	56.9	55.9	37.9	37.1
21	Security services	912	861	772	760	720	76	82	48	54	57	8.3	9.5	6.2	7.1	7.9
	Country Total/Average	**38971**	**40159**	**39258**	**41314**	**42494**	**11082**	**11953**	**11485**	**12346**	**12890**	**28.4**	**29.8**	**29.3**	**29.9**	**30.3**

Source: Own construction based on measurement of incidence of mismatch

Table C. 4 Number and Incidence Level of Field of Study Mismatch for Wage Based Employees Who Are Graduates of Higher Education Only, 2012-2016, FOET 2-Digit Classification

FOET 99 2-Digit Classification		Number of Sample Size					Number of Field of Study Mismatched Ones					Incidence Level of Field of Study Mismatch				
		2012	**2013**	**2014**	**2015**	**2016**	**2012**	**2013**	**2014**	**2015**	**2016**	**2012**	**2013**	**2014**	**2015**	**2016**
1	Teacher training and education science	4815	4931	4701	5001	5380	996	998	1026	1088	1133	20.7	20.2	21.8	21.8	21.1
2	Arts	587	661	495	564	593	310	374	234	292	308	52.8	56.6	47.3	51.8	51.9
3	Humanities	1494	1523	1591	1676	1782	360	376	377	455	465	24.1	24.7	23.7	27.1	26.1
4	Social and behavioural science	1956	2021	2256	2282	2228	267	266	287	319	329	13.7	13.2	12.7	14.0	14.8
5	Journalism and information	59	49	79	87	81	2	5	13	8	10	3.4	10.2	16.5	9.2	12.3
6	Business and administration	6449	6989	6640	7435	7804	1061	1224	1128	1368	1512	16.5	17.5	17.0	18.4	19.4
7	Law	442	396	322	430	468	22	32	32	45	48	5.0	8.1	9.9	10.5	10.3
8	Life Science	351	355	348	355	366	92	100	100	112	97	26.2	28.2	28.7	31.5	26.5
9	Physical Science	881	933	691	694	700	284	326	257	258	231	32.2	34.9	37.2	37.2	33.0
10	Mathematics and Statistics	409	443	422	430	397	121	135	130	145	146	29.6	30.5	30.8	33.7	36.8
11	Computing	499	558	447	418	417	271	351	309	282	297	54.3	62.9	69.1	67.5	71.2
12	Engineering and Engineering Trade	2411	2575	2903	3006	3155	803	860	1003	1065	1124	33.3	33.4	34.6	35.4	35.6
13	Manufacturing and processing	424	462	585	645	598	165	220	306	330	313	38.9	47.6	52.3	51.2	52.3
14	Architecture and building	862	863	907	920	948	223	238	244	259	234	25.9	27.6	26.9	28.2	24.7
15	Agriculture, forestry and fishery	708	710	686	708	666	336	344	328	317	326	47.5	48.5	47.8	44.8	48.9
16	Veterinary	363	335	274	261	320	45	56	47	44	64	12.4	16.7	17.2	16.9	20.0
17	Health	2190	2124	2004	1995	2074	135	141	104	112	133	6.2	6.6	5.2	5.6	6.4
18	Social Services	43	26	136	187	219	16	9	49	63	88	37.2	34.6	36.0	33.7	40.2
19	Personal Services	591	592	568	583	664	148	144	157	175	180	25.0	24.3	27.6	30.0	27.1
20	Transport services and environmental protection	100	101	51	60	58	72	66	32	27	21	72.0	65.3	62.7	45.0	36.2
21	Security services	864	861	772	760	719	66	82	48	54	57	7.6	9.5	6.2	7.1	7.9
	Country Total/Average	**26498**	**27508**	**26878**	**28497**	**29637**	**5795**	**6347**	**6211**	**6818**	**7116**	**21.9**	**23.1**	**23.1**	**23.9**	**24.0**

Source: Own construction based on measurement of incidence of mismatch

Table C. 5 Number and Incidence Level of Field of Study Mismatch for Wage Based Employees Who Are Graduates of Vocational and Technical High Schools Only, 2012-2016, FOET 2-Digit Classification

FOET 99 2-Digit Classification		Number of Sample Size					Number of Field of Study Mismatched Ones					Incidence Level of Field of Study Mismatch				
		2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
1	Teacher training and education science	18	7	8	7	13	12	5	4	2	13	n/a	n/a	n/a	n/a	n/a
2	Arts	476	468	325	292	267	438	451	297	269	247	92.0	96.4	91.4	92.1	92.5
3	Humanities	1202	1294	1348	1446	1482	1007	1066	1019	1095	1199	83.8	82.4	75.6	75.7	80.9
4	Social and behavioural science	0	1	0	0	0	0	1	0	0	0	n/a	n/a	n/a	n/a	n/a
5	Journalism and information	2	5	0	1	3	1	1	0	0	0	n/a	n/a	n/a	n/a	n/a
6	Business and administration	2414	2506	2382	2441	2333	941	971	948	1009	1007	39.0	38.7	39.8	41.3	43.2
7	Law	5	6	6	3	4	2	2	4	0	0	n/a	n/a	n/a	n/a	n/a
8	Life Science	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
9	Physical Science	2	8	8	2	6	0	5	6	2	5	n/a	n/a	n/a	n/a	n/a
10	Mathematics and Statistics	1	0	0	0	1	1	0	0	0	1	n/a	n/a	n/a	n/a	n/a
11	Computing	297	337	371	442	483	259	292	328	397	431	87.2	86.6	88.4	89.8	89.2
12	Engineering and Engineering Trade	4461	4472	5052	5258	5429	1429	1515	1637	1699	1860	32.0	33.9	32.4	32.3	34.3
13	Manufacturing and processing	1922	1942	1110	1066	1031	689	759	456	455	426	35.8	39.1	41.1	42.7	41.3
14	Architecture and building	389	403	424	446	420	145	162	157	201	176	37.3	40.2	37.0	45.1	41.9
15	Agriculture, forestry and fishery	43	44	37	32	22	30	31	25	17	16	69.8	70.5	67.6	53.1	72.7
16	Veterinary	9	9	7	9	8	5	2	3	2	4	n/a	n/a	n/a	n/a	n/a
17	Health	476	499	553	547	550	41	53	42	35	38	8.6	10.6	7.6	6.4	6.9
18	Social Services	402	377	436	475	447	215	237	278	286	276	53.5	62.9	63.8	60.2	61.7
19	Personal Services	265	251	271	294	299	51	49	50	42	53	19.2	19.5	18.5	14.3	17.7
20	Transport services and environmental protection	41	22	42	56	58	11	4	20	17	22	26.8	18.2	47.6	30.4	37.9
21	Security services	48	0	0	0	1	10	0	0	0	0	n/a	n/a	n/a	n/a	n/a
	Country Total / Average	**12473**	**12651**	**12380**	**12817**	**12857**	**5287**	**5606**	**5274**	**5528**	**5774**	**42.4**	**44.3**	**42.6**	**43.1**	**44.9**

Source: Own construction based on measurement of incidence of mismatch

Note: Incidence level is not calculated for the fields which have less than 30 observations in the sample size. These fields are written as n/a.

Table C. 6 The Number and Incidence Level of Field of Study Mismatch for Wage-Based Employees by Education Level, FOET 1-Digit Classification, 2012-2016															
	Number of Sample Size					Number of Field of Study Mismatch ones					Incidence of Field of Study Mismatch				
A. Vocational and Technical High Schools	**2012**	**2013**	**2014**	**2015**	**2016**	**2012**	**2013**	**2014**	**2015**	**2016**	**2012**	**2013**	**2014**	**2015**	**2016**
(2) Teacher training and education science	18	7	8	7	13	12	5	4	2	13	n/a	n/a	n/a	n/a	n/a
(3) Humanities, languages and arts	1678	1762	1673	1738	1749	1445	1517	1316	1364	1446	86.1	86.1	78.7	78.5	82.7
(4) Social sciences, business and law	2421	2518	2388	2445	2340	944	975	952	1009	1007	39.0	38.7	39.9	41.3	43.0
(5) Science, mathematics and computing	300	345	379	444	490	260	297	334	399	437	86.7	86.1	88.1	89.9	89.2
(6) Engineering, manufacturing and construction	6772	6817	6586	6770	6880	2263	2436	2250	2355	2462	33.4	35.7	34.2	34.8	35.8
(7) Agriculture and veterinary	52	53	44	41	30	35	33	28	19	20	67.3	62.3	63.6	46.3	66.7
(8) Health and welfare	878	876	989	1022	997	256	290	320	321	314	29.2	33.1	32.4	31.4	31.5
(9) Service	354	273	313	350	358	72	53	70	59	75	20.3	19.4	22.4	16.9	20.9
Country Total / Average	**12473**	**12651**	**12380**	**12817**	**12857**	**5287**	**5606**	**5274**	**5528**	**5774**	**42.4**	**44.3**	**42.6**	**43.1**	**44.9**
B. Higher Education															
(2) Teacher training and education science	4815	4931	4701	5001	5380	996	998	1026	1088	1133	20.7	20.2	21.8	21.8	21.1
(3) Humanities, languages and arts	2081	2184	2086	2240	2375	670	750	611	747	773	32.2	34.3	29.3	33.3	32.5
(4) Social sciences, business and law	8906	9455	9297	10234	10581	1352	1527	1460	1740	1899	15.2	16.2	15.7	17.0	17.9
(5) Science, mathematics and computing	2140	2289	1908	1897	1880	768	912	796	797	771	35.9	39.8	41.7	42.0	41.0
(6) Engineering, manufacturing and construction	3697	3900	4395	4571	4701	1191	1318	1553	1654	1671	32.2	33.8	35.3	36.2	35.5
(7) Agriculture and veterinary	1071	1045	960	969	986	381	400	375	361	390	35.6	38.3	39.1	37.3	39.6
(8) Health and welfare	2233	2150	2140	2182	2293	151	150	153	175	221	6.8	7.0	7.1	8.0	9.6
(9) Service	1555	1554	1391	1403	1441	286	292	237	256	258	18.4	18.8	17.0	18.2	17.9
Country Total / Average	**26498**	**27508**	**26878**	**28497**	**29637**	**5795**	**6347**	**6211**	**6818**	**7116**	**21.9**	**23.1**	**23.1**	**23.9**	**24.0**
Total (A+B)*															
(2) Teacher training and education science	4833	4938	4709	5008	5393	1008	1003	1030	1090	1146	20.9	20.3	21.9	21.8	21.2
(3) Humanities, languages and arts	3759	3946	3759	3978	4124	2115	2267	1927	2111	2219	56.3	57.5	51.3	53.1	53.8
(4) Social sciences, business and law	11327	11973	11685	12679	12921	2296	2502	2412	2749	2906	20.3	20.9	20.6	21.7	22.5
(5) Science, mathematics and computing	2440	2634	2287	2341	2370	1028	1209	1130	1196	1208	42.1	45.9	49.4	51.1	51.0
(6) Engineering, manufacturing and construction	10469	10717	10981	11341	11581	3454	3754	3803	4009	4133	33.0	35.0	34.6	35.3	35.7
(7) Agriculture and veterinary	1123	1098	1004	1010	1016	416	433	403	380	410	37.0	39.4	40.1	37.6	40.4
(8) Health and welfare	3111	3026	3129	3204	3290	407	440	473	496	535	13.1	14.5	15.1	15.5	16.3
(9) Service	1909	1827	1704	1753	1799	358	345	307	315	333	18.8	18.9	18.0	18.0	18.5
Country Total / Average	**38971**	**40159**	**39258**	**41314**	**42494**	**11082**	**11953**	**11485**	**12346**	**12890**	**28.4**	**29.8**	**29.3**	**29.9**	**30.3**

Source: Own construction based on measurement of incidence of mismatch

Note: Incidence level is not calculated for the fields which have less than 30 observations in the sample size. These fields are written as n/a

Table C. 7 The Number and Incidence of Field of Study Mismatch by Age Group, Gender, Work Place, Firm Size, Contract Type and NUTS1, 2012 and 2016

Age-Group	A. Vocational and Technical High Schools		B. Higher Education (University)		Total (A+B)	
	2012	2016	2012	2016	2012	2016
The Number of Sample Size						
15-19 age	605	755	9	18	614	773
20-24 age	2069	2121	2429	2744	4498	4865
25-29	2369	1953	5331	6011	7700	7964
30-44 age	5735	6034	13821	15292	19556	21326
45-64 age	1681	1979	4830	5455	6511	7434
65+ age	14	15	78	117	92	132
Total	12473	12857	26498	29637	38971	42494
The Number of Field of Study Mismatched Ones						
15-19 age	249	339	3	6	252	345
20-24 age	854	972	594	760	1448	1732
25-29	982	902	1202	1427	2184	2329
30-44 age	2510	2713	2877	3693	5387	6406
45-64 age	684	838	1099	1192	1783	2030
65+ age	8	10	20	38	28	48
Total	5287	5774	5795	7116	11082	12890
The Incidence Level of Field of Study Mismatch						
15-19 age	41.2	44.9	33.3	33.3	41.0	44.6
20-24 age	41.3	45.8	24.5	27.7	32.2	35.6
25-29 age	41.5	46.2	22.5	23.7	28.4	29.2
30-44 age	43.8	45.0	20.8	24.1	27.5	30.0
45-64 age	40.7	42.3	22.8	21.9	27.4	27.3
65+ age	57.1	66.7	25.6	32.5	30.4	36.4
Total	42.4	44.9	21.9	24.0	28.4	30.3

The Number and Incidence Level of Field of Study Mismatch on the Basis of Gender by Education Level, 2012 and 2016

Gender	A. Vocational and Technical High Schools		B. Higher Education (University)		Total (A+B)	
	2012	2016	2012	2016	2012	2016
The Number of Sample Size						
Male	9834	9959	16476	18160	26310	28119
Female	2639	2898	10022	11477	12661	14375
Total	12473	12857	26498	29637	38971	42494
The Number of Field of Study Mismatched Ones						
Male	4137	4433	4397	5347	8534	9780
Female	1150	1341	1398	1769	2548	3110
Total	5287	5774	5795	7116	11082	12890
The Incidence Level of Field of Study Mismatch						
Male	42.1	44.5	26.7	29.4	32.4	34.8
Female	43.6	46.3	13.9	15.4	20.1	21.6
Total	42.4	44.9	21.9	24.0	28.4	30.3

Table C.7 The Number and Incidence Level of Field of Study Mismatch on the Basis of Type of Work Place by Education Level, 2012 and 2016 (cont'd)						
Type of Work Place	**A. Vocational and Technical High Schools**		**B. Higher Education (University)**		**Total (A+B)**	
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
The Number of Sample Size						
Private	10100	10754	10884	13312	20984	24066
Public	2266	1998	15394	16081	17660	18079
Other (Foundtion, Association etc)	107	105	220	244	327	349
Total	12473	12857	26498	29637	38971	42494
The Number of Field of Study Mismatched Ones						
Private	4409	4884	2990	3888	7399	8772
Public	816	819	2737	3142	3553	3961
Other (Foundtion, Association etc)	62	71	68	86	130	157
Total	5287	5774	5795	7116	11082	12890
The Incidence Level of Field of Study Mismatch						
Private	43.7	45.4	27.5	29.2	35.3	36.4
Public	36.0	41.0	17.8	19.5	20.1	21.9
Other (Foundtion, Association etc)	57.9	67.6	30.9	35.2	39.8	45.0
Total	42.4	44.9	21.9	24.0	28.4	30.3

The Number and Incidence Level of Field of Study Mismatch on the Basis of Permanency of Job by Education Level, 2012 and 2016						
Permanency of Job	**A. Vocational and Technical High Schools**		**B. Higher Education (University)**		**Total (A+B)**	
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
The Number of Sample Size						
Permanent	11735	11742	25870	28565	37605	40307
Temporary	738	1115	628	1072	1366	2187
Total	12473	12857	26498	29637	38971	42494
The Number of Field of Study Mismatched Ones						
Permanent	4921	5172	5609	6789	10530	11961
Temporary	366	602	186	327	552	929
Total	5287	5774	5795	7116	11082	12890
The Incidence Level of Field of Study Mismatch						
Permanent	41.9	44.0	21.7	23.8	28.0	29.7
Temporary	49.6	54.0	29.6	30.5	40.4	42.5
Total	42.4	44.9	21.9	24.0	28.4	30.3

Table C.7. The Number and Incidence Level of Field of Study Mismatch on the Basis of Contract Type by Education Level, 2012 and 2016 (cont'd)						
Full or Part Time	**A. Vocational and Technical High Schools**		**B. Higher Education (University)**		**Total (A+B)**	
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
The Number of Sample Size						
Full time	12207	12434	25278	28258	37485	40692
Part time	266	423	1220	1379	1486	1802
Total	12473	12857	26498	29637	38971	42494
The Number of Field of Study Mismatched Ones						
Full time	5160	5569	5714	6993	10874	12562
Part time	127	205	81	123	208	328
Total	5287	5774	5795	7116	11082	12890
The Incidence Level of Field of Study Mismatch						
Full time	42.3	44.8	22.6	24.7	29.0	30.9
Part time	47.7	48.5	6.6	8.9	14.0	18.2
Total	42.4	44.9	21.9	24.0	28.4	30.3

The Number and Incidence Level of Field of Study Mismatch on the Basis of Firm Size by Education Level, 2012 and 2016						
Firm Size	**A. Vocational and Technical High Schools**		**B. Higher Education (University)**		**Total (A+B)**	
	2012	**2016**	**2012**	**2016**	**2012**	**2016**
The Number of Sample Size						
Less than 10 employee	3491	4295	3555	4964	7046	9259
10-49 employee	3522	3007	9742	9561	13264	12568
More than 50 employee	5460	5555	13201	15112	18661	20667
Total	12473	12857	26498	29637	38971	42494
The Number of Field of Study Mismatched Ones						
Less than 10 employee	1705	2224	938	1381	2643	3605
10-49 employee	1569	1400	1922	1920	3491	3320
More than 50 employee	2013	2150	2935	3815	4948	5965
Total	5287	5774	5795	7116	11082	12890
The Incidence Level of Field of Study Mismatch						
Less than 10 employee	48.8	51.8	26.4	27.8	37.5	38.9
10-49 employee	44.5	46.6	19.7	20.1	26.3	26.4
More than 50 employee	36.9	38.7	22.2	25.2	26.5	28.9
Total	42.4	44.9	21.9	24.0	28.4	30.3

Table C.7. The Number and Incidence Level of Field of Study Mismatch on the Basis of NUTS1 Region by Education Level, 2012 and 2016 (cont'd)

NUTS1 Regions	A. Vocational and Technical High Schools		B. Higher Education (University)		Total (A+B)	
	2012	2016	2012	2016	2012	2016
The Number of Sample Size						
TR1 İstanbul	1551	1469	3807	3923	5358	5392
TR2 Western Marmara	1125	1311	1786	2067	2911	3378
TR3 Aegean	1611	1639	3209	3609	4820	5248
TR4 Estern Marmara	1938	1776	2490	2745	4428	4521
TR5 Western Anatloia	1876	1712	4984	4532	6860	6244
TR6 Mediterranean	1211	1306	2816	3217	4027	4523
TR7 Central Anatolia	719	777	1466	1654	2185	2431
TR8 Western Blacksea	865	1171	1506	2117	2371	3288
TR9 Eastern Blacksea	628	455	1387	1241	2015	1696
TRA North Eastern Anatolia	397	429	1214	1091	1611	1520
TRB Central Eastern Anatolia	247	407	748	1545	995	1952
TRC South Eastern Anatolia	305	405	1085	1896	1390	2301
Total	12473	12857	26498	29637	38971	42494
The Number of Field of Study Mismatched Ones						
TR1 İstanbul	625	696	853	882	1478	1578
TR2 Western Marmara	467	536	405	505	872	1041
TR3 Aegean	633	669	696	858	1329	1527
TR4 Estern Marmara	754	669	577	687	1331	1356
TR5 Western Anatloia	868	831	1019	1127	1887	1958
TR6 Mediterranean	515	613	577	769	1092	1382
TR7 Central Anatolia	283	358	301	353	584	711
TR8 Western Blacksea	401	548	296	482	697	1030
TR9 Eastern Blacksea	290	228	303	289	593	517
TRA North Eastern Anatolia	195	249	330	330	525	579
TRB Central Eastern Anatolia	124	199	190	401	314	600
TRC South Eastern Anatolia	132	178	248	433	380	611
Total	5287	5774	5795	7116	11082	12890
The Incidence Level of Field of Study Mismatch						
TR1 İstanbul	40.3	47.4	22.4	22.5	27.6	29.3
TR2 Western Marmara	41.5	40.9	22.7	24.4	30.0	30.8
TR3 Aegean	39.3	40.8	21.7	23.8	27.6	29.1
TR4 Estern Marmara	38.9	37.7	23.2	25.0	30.1	30.0
TR5 Western Anatloia	46.3	48.5	20.4	24.9	27.5	31.4
TR6 Mediterranean	42.5	46.9	20.5	23.9	27.1	30.6
TR7 Central Anatolia	39.4	46.1	20.5	21.3	26.7	29.2
TR8 Western Blacksea	46.4	46.8	19.7	22.8	29.4	31.3
TR9 Eastern Blacksea	46.2	50.1	21.8	23.3	29.4	30.5
TRA North Eastern Anatolia	49.1	58.0	27.2	30.2	32.6	38.1
TRB Central Eastern Anatolia	50.2	48.9	25.4	26.0	31.6	30.7
TRC South Eastern Anatolia	43.3	44.0	22.9	22.8	27.3	26.6
Total	42.4	44.9	21.9	24.0	28.4	30.3

Source: Own construction based on measurement of incidence of mismatch

APPENDIX D: REGRESSION RESULTS OF HIGHER EDUCATION ONLY

Table D. 1 Results of Binary Logistic Regression Analysis of Having Field of Study Mismatch of Wage-Based Employees Graduated from Higher Education Only

Variables		(1) Target Group Including Vocational and Technical High Schools and Higher Education		(2) Target Group Including Higher Education ONLY	
		Beta	Odds Ratio	Beta	Odds Ratio
Constant		**-.171****	.843	**-.243****	.785
Field Specific Employment Rate in the starting year of current job					
Target Group (1)	**Target Group (2)**				
Ref: (53%-63%)	***Ref***: 53.9% - 63.0%				
63,1%-64,5%	63.1% - 64.4 %	**-.208****	.812	-.110	.896
64,6%-69,1%	64.5 % - 66.2 %	**-.279****	**.757****	**-.176****	.839
69,2% and more	66.3% and more	**-.376****	.687	-.162	.851
Field Specific Unemployment Rate					
Ref: (6%-8,5%)	***Ref: (6%-8,5%)***				
8,6%-9,9%	8.6% - 10.8%	**-.118****	.889	.014	1.014
10%-11,9%	10.9% - 12.1%	-.033	.967	.079	1.082
12% and more	12.2 % and more	-.002	.998	**.385****	1.470
Gender *(Ref: Male)*		**-.412****	-.412	**-.613****	.542
Age Group *(Ref: 15-29 age)*					
30-44 age		**.102****	1.107	**.097****	1.102
45-65+ age		**.244****	1.276	**.328****	1.388
The latest edu. level completed *(Ref: 2, 3 or 4 year higher educ)*					
5 or 6 years faculty, Masters or Doctor.		**-1.915****	.147	**-1.652****	0.192
Vocational and Tech High Sch		**.978****	2.658	N/A	**N/A**
FOET 1-Digit Field of Study *(Ref: Teacher training and education)*					
Humanities, languages, arts		**.728****	2.071	**.373****	1.452
Social science, business, law		**-.788****	.455	**-1.166****	.312
Science, math, computing		**.763****	2.145	**.218****	1.243
Engineering, manufact., construction		**-.666****	.514	**-.489****	.613
Agriculture and veterinary		**.975****	2.652	**.741****	2.098
Health and welfare		**-.837****	.433	**-.960****	.383
Services		**-1.213****	.297	**-.854****	.426
Over educated *(Ref: Well matched)*		**1.359****	3.891	1.119**	3.063
Part time *(Ref: Full time)*		**-.653****	.521	-.973**	.378

Table D. 1 Results of Binary Logistic Regression Analysis of Having Field of Study Mismatch of Wage-Based Employees Graduated from Higher Education Only (cont'd)

Variables	(1) Target Group Including Vocational and Technical High Schools and Higher Education		(2) Target Group Including Higher Education ONLY	
	Beta	**Odds Ratio**	**Beta**	**Odds Ratio**
Permanency of job ***(Ref: Permanent)***	**.169****	1.185	**.163****	1.178
The status of work place ***(Ref: Private sector)***				
Public	-.545**	.580	**-.520****	.594
Other (Foundations, NGOs)	.518**	1.678	**.466****	1.593
Firm Size (*Ref: 10 or less*)				
10-19	**-.324****	.723	**-.427****	.653
20-49	**-.357****	.700	**-.449****	.638
50 or more	**-.118****	.889	.016	1.016
NUTS1 regions *(Ref: İstanbul)*				
TR2 WEST MARMARA	.058	1.059	**.208****	1.231
TR3 AEGEAN	.011	1.011	.137	1.147
TR4 EAST MARMARA	-.074	.929	.117	1.124
TR5 WEST ANATOLIA	**.137****	1.147	**.193****	1.212
TR6 MEDITERRANEAN	**.130****	1.139	**.163****	1.177
TR7 CENTRAL ANATOLIA	-.072	.931	-.101	.904
TR8 WEST BLACKSEA	.104	1.110	**.195****	1.215
TR9 EAST BLACKSEA	.084	1.088	.141	1.151
TRA NORTHEAST ANATOLIA	**.444****	1.559	**.423****	1.527
TRB CENTRALEAST ANATOLIA	.152	1.164	**.209****	1.232
TRC SOUTHEAST ANATOLIA	-.106	.899	-.055	.946

Source: Own construction based on regression results

APPENDIX E: CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: Ege, Ahmet Alper
Nationality: Turkish (TC)
Date and Place of Birth: 11 February 1973, Antalya
Marital Status: Married
Phone: +90 533 6591301
email: ahmetalperege@yahoo.com

EDUCATION

Degree	Institution	Year of Graduation
MS	METU Science and Technology Policy Studies	2004
MS	Portland State University, USA Technology Management	2003
BS	METU Industrial Engineering	1995

WORK EXPERIENCE

Year	Place	Enrollment
2014-2016	Ministry of Development	Director General
2009-2014	Ministry of Development	Head of Department
1997-2009	State Planning Organization	Planning Expert
1997-1997	Karel Electronics Inc.	Production Engineer
1996-1997	Pamukbank T.A.S.	Management Trainee

FOREIGN LANGUAGES

Advanced English

APPENDIX F: TURKISH SUMMARY/TÜRKÇE ÖZET

1. GİRİŞ

Eğitim sistemi ile işgücü piyasası arasındaki uyumsuzluğun sosyal ve ekonomik maliyeti giderek artmaktadır. Bu uyumsuzluk, bireysel düzeyde kişinin iş tatminini ve ücretlerini olumsuz etkilemektedir. Firma düzeyinde üretkenliği azaltmakta, çalışanları yeni iş arayışlarına yöneltmekte ve işten ayrılma ve işe başlama sirkülasyonunu artırmaktadır. Makro düzeyde ise işsizliği artırmakta, beşeri sermaye kaybına ve üretkenlikte düşüşe neden olarak GSYİH büyümesini azaltmaktadır (Quintini, 2011b). Bu nedenle, politika yapıcılar, uyumsuzluğun temel sebeplerini belirleme ve ortadan kaldırma konusuna öncelik vermektedir.

Bu tezin amacı, Türkiye'de çalışan bireylerin, "bitirmiş olduğu en son eğitim-öğretim alanı ile istihdam edildikleri meslek grubu arasındaki uyumsuzluk" düzeyini ve bu uyumsuzluğun nedenlerini analiz etmektir. Bu amaca ulaşmak için gerekli analizler yapılmakta ve ulusal inovasyon sistemi yaklaşımı benimsenerek uyumsuzluğun temel nedenlerini ortadan kaldırmak amacıyla politika önerileri geliştirilmektedir.

Tezin mantıksal çerçevesi ve ampirik gerekçesi, tezin başlangıç motivasyonları, tezin savı, ilgili analizler, analiz sonuçları ve politika önerileri aşağıdaki bölümlerde sunulmaktadır.

Diğer bölümlere geçmeden önce literatürde sıkça karşılaşılan bazı terimlerin Türkçe karşılıkları, bu tezde kullanıldığı şekliyle aşağıda sunulmaktadır.

Field of Study: Eğitim-öğretim alanı

Field of Study Mismatch: Çalışan bir bireyin bitirmiş olduğu en son eğitim-öğretim alanı ile istihdam edildiği meslek grubu arasındaki uyumsuzluk. Literatürde horizontal mismatch (eğitimde yatay uyumsuzluk) şeklinde de kullanılmaktadır.

Incidence of Field of Study Mismatch: Eğitim-öğretim alanı ile istihdam edilen meslek grubu arasındaki uyumsuzluk düzeyi.

Coding Scheme: Kodlama Şeması. Eğitim-öğretim alanı ile istihdam edilen meslek grubu arasındaki uyumsuzluğu tespit etmek için kullanılan bir eşleştirme matrisidir. Bu matriste FOET-99 sınıflandırması bazındaki eğitim-öğretim alanları ile ISCO-08 meslek sınıflandırması bazındaki meslek kodları kullanılmıştır. Başka bir ifadeyle, bir bireyin mezun olduğu eğitim-öğretim alanına göre hangi meslek kodlarında çalışabileceğini gösteren bir eşleştirme matrisidir. Bir birey, bu eşleştirme dışındaki bir meslek grubunda çalışırsa uyumsuzluk oluşmaktadır. Kodlama şeması Wolbers (2003) tarafından geliştirilmiş ve Montt (2015) tarafından güncellenmiştir.

Vertical Mismatch: Eğitimde dikey uyumsuzluk. Literatürde "education mismatch" veya "qualifications mismatch" şeklinde de kullanılmaktadır.

Overeducated (Undereducated): Aşırı Eğitimli (Eksik Eğitimli)- Bir bireyin sahip olduğu eğitim seviyesinin o bireyin çalışmakta olduğu meslek grubundaki işin gerektirdiği ortalama eğitim seviyesinden bir miktar daha yüksek (düşük) olduğu durumu ifade eder.

1.1. Tezin Mantıksal Çerçevesi ve İçerik Akışı

Türkiye, 2006 yılından bu yana yükseköğretimde bir büyüme yaşamaktadır. Bu kapsamda, üniversitelerin sayısı ve üniversiteye giriş sınavlarındaki kontenjan kademeli olarak artırılmıştır. Bu tezin başlangıç noktasını, yükseköğretimdeki bu hızlı büyümeye karşılık, ekonominin, bu mezunları istihdam edebilmek için yeterli iş imkanı sağlayıp sağlayamayacağı konusundaki endişeler oluşturmaktadır. Bu bağlamda, bu tez aşağıdaki mantıksal çerçevede yapılandırılmıştır.

a. Tezin başlangıç noktasını destekleyen ampirik arka plan araştırılmış ve tespit edilmiştir.
b. Bir sonraki adım olarak, tezin temel başlangıç motivasyonlarını belirlemek amacıyla Türkiye için bir ön analiz yapılmıştır.
c. Daha sonra, hem ön analizden hem de ampirik gerekçeden elde edilen bulgular göz önüne alınarak tezin savı ileri sürülmüştür.
d. Tezin iddiasını gerçekleştirmek için iki analiz yapılmıştır. Bunlardan ilki, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk düzeyinin belirlenmesi ve analiz edilmesidir. Veri olarak TÜİK hanehalkı işgücü anket verileri (2012-2016) kullanılmıştır. Uyumsuzluk düzeyinin belirlenmesi için kodlama şeması yöntemi uygulanmıştır. İkinci olarak, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğunun nedenleri binary lojistik regresyon modeli kullanılarak analiz edilmiştir. Bunun için sadece 2016 verileri kullanılmıştır.
e. Analizlerden elde edilen temel bulgular dikkate alınarak söz konusu uyumsuzluk düzeyini azaltmak ve böylece eğitim sistemi ile işgücü piyasası arasındaki uyumu güçlendirmek için politika önerileri geliştirilmiştir.

1.2. Ampirik Gerekçe/Arka Plan

Literatür taramasından elde edilen veriler, tezin başlangıç noktası olarak ileri sürülen temel kaygıyı destekler niteliktedir. Wolbers (2003), Flisi ve diğerleri (2014), Montt (2015) ve Verhaest ve diğerleri (2017) gibi geçmiş çalışmalardan elde edilen bulgular aşağıdaki gibidir.

- Geçtiğimiz 20-30 yılda üniversite mezun sayısı global düzeyde oldukça artmış ve bu artış eğitim sistemi ile işgücü piyasası arasında niceliksel uyumsuzluğa neden olmuştur. Bu durum bazı ülkelerde, bitirilen en son eğitim-öğretim alanı ile istihdam edilen meslek grubu arasındaki uyumsuzluğa ve /veya eğitimde dikey uyumsuzluğa neden olmuştur.
- Vasıflı işçi sayısının artması, iş arayanları, eğitim seviyelerinin altındaki ve/veya eğitim-öğretim alanlarının dışındaki işleri kabul etmeye zorlamaktadır. Belirli bir eğitim-öğretim alanındaki mezun sayısı o alandaki işlerden daha fazla ise, bazı mezunlar bir iş aramak için başka meslek gruplarına yönelebilir. Böyle bir durumda, işsiz kalmaktansa uyumsuz bir işte çalışmak tercih edilebilecektir.
- Ayrıca, bitirilen en son eğitim-öğretim alanı ile istihdam edilen meslek grubu arasındaki uyumsuzluk, sadece işçilerin kendi bilinçli seçiminden veya bu yöndeki kişisel tercihinden kaynaklanmamaktadır. Bu sonuç, aynı zamanda işgücü piyasası şartlarına da oldukça duyarlıdır.

1.3 Tezin Temel Motivasyonları

Tezin temel motivasyonlarının dayanacağı ampirik gerekçe belirlendikten sonra söz konusu temel motivasyonları tespit etmek için bir ön analiz yapılmıştır. Beş motivasyon kaynağı tespit edilmiştir. Bu faktörler, eğitim sistemi ile iş piyasası arasında sayısal uyumsuzluk olduğunu göstermektedir. Bunlar:

a. Yükseköğretim mezun sayısındaki önemli artış,
    i. Üniversite sayısı 2006'da 79 iken 2018 itibarıyla 200'ü aşmıştır.
    ii. Sınav kontenjanı 2006'da 402 bin iken 2018 yılında 800 binin üzerine çıkmıştır.
    iii. Böylece, işgücü piyasasına girme potansiyeli olan yıllık yükseköğretim mezun sayısı 322 binden 844 bine yükselmiştir.
b. Üniversiteye giriş sınavında boş kalan kontenjan sayısındaki artış,
    i. Öğrenciler tarafından tercih edilmeyerek veya tercih edilse bile kayıt yaptırılmayarak boş kalan kontenjanların oranı, 2017 ve 2018 yıllarında %

20'den fazla olmuştur. Diğer bir deyişle, son yıllarda adaylar tarafından bazı eğitim-öğretim alanları giderek daha az tercih edilmiştir.

c. Üniversite mezunu veya üniversite öğrencisi olup tekrar üniversite giriş sınavına başvuran kişilerin sayısındaki kayda değer artış
   i. Üniversite mezunu olup tekrar giriş sınavına başvuran kişilerin toplam başvuranlar içindeki payı 2006 yılında % 2,4 iken 2018'de % 8'e yükselmiştir. Bu durum özellikle son üç yıl için çok yüksektir.
   ii. Aynı şekilde, herhangi bir üniversitede okuyan ve sınava başvuranların payı da, 2006 yılında % 13.2'den 2018'de % 20.3'e yükselmiştir.

d. İstihdam oranı, işsizlik oranı ve işgücüne katılmama oranı gibi işgücü piyasası göstergelerindeki kötü performans
   i. Tüm eğitim-öğretim alanlarında, Türkiye, OECD-22 ülke ortalamasına göre daha düşük istihdam oranına, daha yüksek işsizlik oranına ve daha yüksek işgücüne katılmama oranına sahiptir. Bu alanların çoğunda, Türkiye, 22 OECD ülkesi arasında en kötü durumdadır ve performans sıralaması bakımından en son sıradadır.
   ii. Yükseköğretim mezunları için, Türkiye'deki işgücü göstergeleri itibarıyla, acil politika geliştirilmesine ihtiyaç duyan 10 eğitim-öğretim alanı tespit edilmiştir. Bu alanlar, aşağıda tanımlandığı şekilde "yüksek öncelikli" (3 alan) ve "öncelikli" (7 alan) olarak gruplandırılmıştır.
      a) Yüksek öncelikli alanlar. Hem 2010 hem de 2016'da 3 gösterge açısından ülke ortalamasından daha kötü durumda olan alanlardır. Bu alanlar: 2-Sanat, 18-Sosyal hizmetler ve 19-Kişisel hizmetler
      b) Öncelikli alanlar. 2010'da 3 gösterge açısından ülke ortalamasına göre iyi olup, 2016'da ülke ortalamasından daha kötü durumda olan alanlardır. Bu alanlar: 3-Beşeri Bilimler, 4-Sosyal ve davranış bilimleri, 5-Gazetecilik ve enformasyon, 10 -Matematik ve istatistik, 11-Bilgisayar, 13-İmalat ve işleme, 20-Ulaştırma hizmetleri ve çevre koruma.

e. Eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk konusunda Türkiye'yi içeren ampirik çalışmaların çok az sayıda olması ve bunların kayda değer sorunlu bulguları,
   i. Türkiye ile ilgili sadece iki ampirik çalışma bulunmaktadır. Bu araştırmalara göre Türkiye'nin eğitim-öğretim alanları ile istihdam edilen meslek grupları

arasındaki uyumsuzluk düzeyi OECD ortalamasından oldukça yüksektir ve daha detaylı araştırılmasında fayda bulunmaktadır.

Yukarıda sıralanan ilk 4 faktör, yükseköğretimdeki büyümenin ilk öncül sonuçları olarak değerlendirilebilir.

Özetle, mezunların arz ve talebi arasında dengesizliğe neden olabilecek şekilde mezun sayısında önemli bir artış olmuştur. Ayrıca, en son bitirdiği eğitim-öğretim alanından memnun olmayan üniversite mezunu veya devam etmekte olduğu eğitim-öğretim alanından memnun olmayan üniversite öğrencisi sayısının giderek arttığı ve bu nedenle yeniden sınava girdikleri tespit edilmiştir. Dolayısıyla, bu kişiler istihdam edilme ihtimalini arttırmak için en son okudukları veya devam ettikleri eğitim bölümlerini veya üniversitelerini değiştirmeye çalışmaktadır. Bu bulgu, öğrencilerin bazı eğitim-öğretim alanlarına karşı açık bir direnç gösterdiğini ortaya koymaktadır. Bu durumun, söz konusu eğitim-öğretim alanlarında yüksek bir doygunluk düzeyinin varlığına, bu alanlarda arz fazlası veya talep eksikliği olduğuna işaret ettiği düşünülmektedir. Ayrıca, bu durum, öğrencilerin işgücü piyasası mekanizmasındaki gelişmeleri yakından takip ettiklerini de göstermektedir.

1.4. Tezin Savı

Bu tezin iddiası (i) ampirik literatürün gerekçesi, (ii) ön analizden elde edilen bulgular ve (iii) Türkiye'deki eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk konusunu içeren araştırmaların çok az sayıda olması dikkate alınarak belirlenmiştir. Bu bağlamda, tezin savı aşağıda sunulmuştur.

Türkiye'de yükseköğretimdeki hızlı büyüme nedeniyle "eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk" düzeyi yüksektir ve zaman içinde artmaktadır. Bu uyumsuzluk sorunu bazı eğitim-öğretim alanları için daha ciddi boyutlardadır.

1.5. Araştırma Soruları

Problem tanımının temel bulgularına ilişkin cevaplanması gereken birçok soru bulunmaktadır. Ancak, bu tezin amacı ve kapsamı dikkate alınarak aşağıdaki araştırma soruları önerilmiştir.

- İstihdam oranı, işsizlik oranı ve işgücüne katılmama oranı arasındaki üçlü etkileşim açısından, hangi eğitim-öğretim alanları ülke ortalamasından daha kötü durumdadır ve önceki yıllara göre iyileşme/kötüleşme sağlamıştır?

- Türkiye'deki eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk, her bir eğitim-öğretim alanı bazında ne düzeydedir? Söz konusu uyumsuzluklar zaman içinde artmakta mı yoksa azalmakta mıdır?
- Türkiye'deki eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun ana belirleyicileri (sebepleri) nelerdir?
- Politika yapıcılar eğitim sistemi ile işgücü piyasası arasındaki uyumu güçlendirmek için neler yapabilir?

1.6. Tezin Katkısı

Bu tez, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun nedenlerini regresyon yöntemiyle analiz ederken eğitim-öğretim alanına özgü istihdam oranı ve işsizlik oranı ve NUTS1 bölgeleri gibi özgün bağımsız değişkenler kullanan ilk çalışmadır.

Eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun nedenlerini Türkiye için analiz eden ilk çalışmadır. Benzer şekilde, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğu, FOET-99 1 ve 2 basamaklı sınıflandırmalar temelinde (i) mesleki ve teknik liseler, (ii) yükseköğretim ve (iii) bu iki grubun toplamı için ölçen ve analiz eden ilk çalışmadır.

Ayrıca, bu tezden elde edilen bulgular atama teorisine (assignment theory) katkıda bulunmaktadır. Bulgular Montt (2015) ve Park (2018) ile paraleldir. Başka bir deyişle, bu tez, uyumsuzluk sorununun hem talep hem de arz taraflarından gelen kritik faktörlere bağlı olduğu varsayımına katkıda bulunmaktadır.

2. EĞİTİM-ÖĞRETİM ALANLARI İLE İSTİHDAM EDİLEN MESLEK GRUPLARI ARASINDAKİ UYUMSUZLUĞUN ÖLÇÜLMESİ VE ANALİZİ

Bu başlık altında iki bölüm bulunmaktadır. İlk bölüm, Türkiye için eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğu ölçmek için kullanılan veri ve metodolojiyi sunmaktadır. Daha sonra uyumsuzluk düzeyine ilişkin analizden elde edilen bulgular sunulmuştur. Eğitimde dikey uyumsuzluk için de aynı ölçüm ve analiz yapılmıştır.

2.1. Veri ve Yöntem

Bu tezde, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk, aslen Wolbers (2003) tarafından geliştirilen ve Montt (2015) tarafından güncellenen kodlama

şeması kullanılarak ölçülmüştür. Söz konusu ölçüm ve analizler (i) yükseköğretimden, (ii) mesleki ve teknik liselerden ve (iii) iki grubun toplamından mezun olan ve ücretli çalışan kişiler için yapılmıştır. Veri kaynağı, 2012 ve 2016 arasındaki dönemi kapsayan TÜİK hane halkı iş gücü anketleridir. Örneğin, 2016 yılı hedef kitlesi 42.494 kişiden oluşmaktadır.

Uyumsuzluk düzeyinin analizi iki boyutta yapılmıştır. Birincisi, FOET-99 1 basamaklı ve 2 basamaklı sınıflandırmalara dayanarak yapılan ve zaman içindeki değişimi kapsayan analizdir. Bilindiği üzere, FOET-99 kapsamında, bu tezde, bir haneli sınıflandırma için 8 ve iki haneli sınıflandırma için 21 eğitim-öğretim alanı kullanılmıştır. İkinci boyut, yaş grubu, cinsiyet, iş yeri türü, firma büyüklüğü, sözleşme türü, işin sürekliliği ve NUTS1 bölgeleri gibi bazı kişisel ve işe özgü özellikler bazında yapılan analizdir. (Bu özette, FOET-99 1 basamaklı sınıflandırmaya dayalı bulgular sunulmamıştır. İkinci boyuta ilişkin bulgular regresyon sonuçlarında bir özet olarak sunulmuştur).

2.2. Eğitim-öğretim Alanları ile İstihdam Edilen Meslek Grupları Arasındaki Uyumsuzluk Analizinden Elde Edilen Bulgular

Bulgular iki bölüm halinde sunulmuştur.

2.2.1. Eğitim-Öğretim Alanları ile İstihdam Edilen Meslek Grupları Arasındaki Uyumsuzluğun FOET-99 2 Haneli Sınıflandırma Bazında Analizi

Tablo 2.1'den görüldüğü üzere, Türkiye yüksek bir uyumsuzluk düzeyine sahiptir ve bu düzey 2012 ve 2016 yılları arasında artmaktadır. Bu bulgular bazı eğitim-öğretim alanları için çok daha da kötüdür.

Tablo 2.1. Türkiye'de Eğitim-öğretim Alanları ile İstihdam Edilen Meslek Grupları Arasındaki Uyumsuzluğun Ülke Ortalamasındaki Değişimi, 2012-2016

	(A) Mesleki ve Teknik Liseler	(B) Yükseköğretim	Toplam ((A) ve (B))
2012	42.4%	21.9%	28.4%
2016	44.9%	24.0%	30.3%
2012 ve 2016 Arasındaki Değişim	+2.5 puan (+ % 5.8 artış)	+2.1 puan (+ % 9.5 artış)	+ 1.9 puan (+ 6.7 % artış)

Kaynak: Analiz sonuçları baz alınarak yazar tarafından oluşturulmuştur.

Eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun ülke ortalaması zaman içinde artmıştır ve bu artış son yıllarda daha keskindir. Başka bir ifadeyle, 2016 anket yılı itibarıyla, işi olduğunu söyleyen çalışanlar arasında, yakın zamanda çalışmaya

başlayanlar (örneğin 2016'da), geçmişte (örneğin 2010 yılında) çalışmaya başlayanlardan daha yüksek uyumsuzluk eğilimine sahiptir.

Uyumsuzluk düzeyindeki artış yükseköğretim ve mesleki ve teknik liseler için de geçerlidir. Mesleki ve teknik liselerdeki uyumsuzluk düzeyi yükseköğretime göre daha yüksektir. Ancak, yükseköğretimdeki uyumsuzluk düzeyinin yüzde artışı, mesleki ve teknik liselerdeki yüzde artıştan oldukça yüksektir.

Şekil 2.1, Şekil 2.2 ve Tablo 2.2'den görüldüğü üzere;

Eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk düzeyi dikkate alındığında, (21 adet eğitim-öğretim alanının bulunduğu FOET-99 2 haneli sınıflandırma bazında) mesleki ve teknik liselerde 5 adet ve yükseköğretimde 13 adet alanın uyumsuzluk düzeyi hem 2012 hem de 2016'da ülke ortalamasından daha yüksektir.

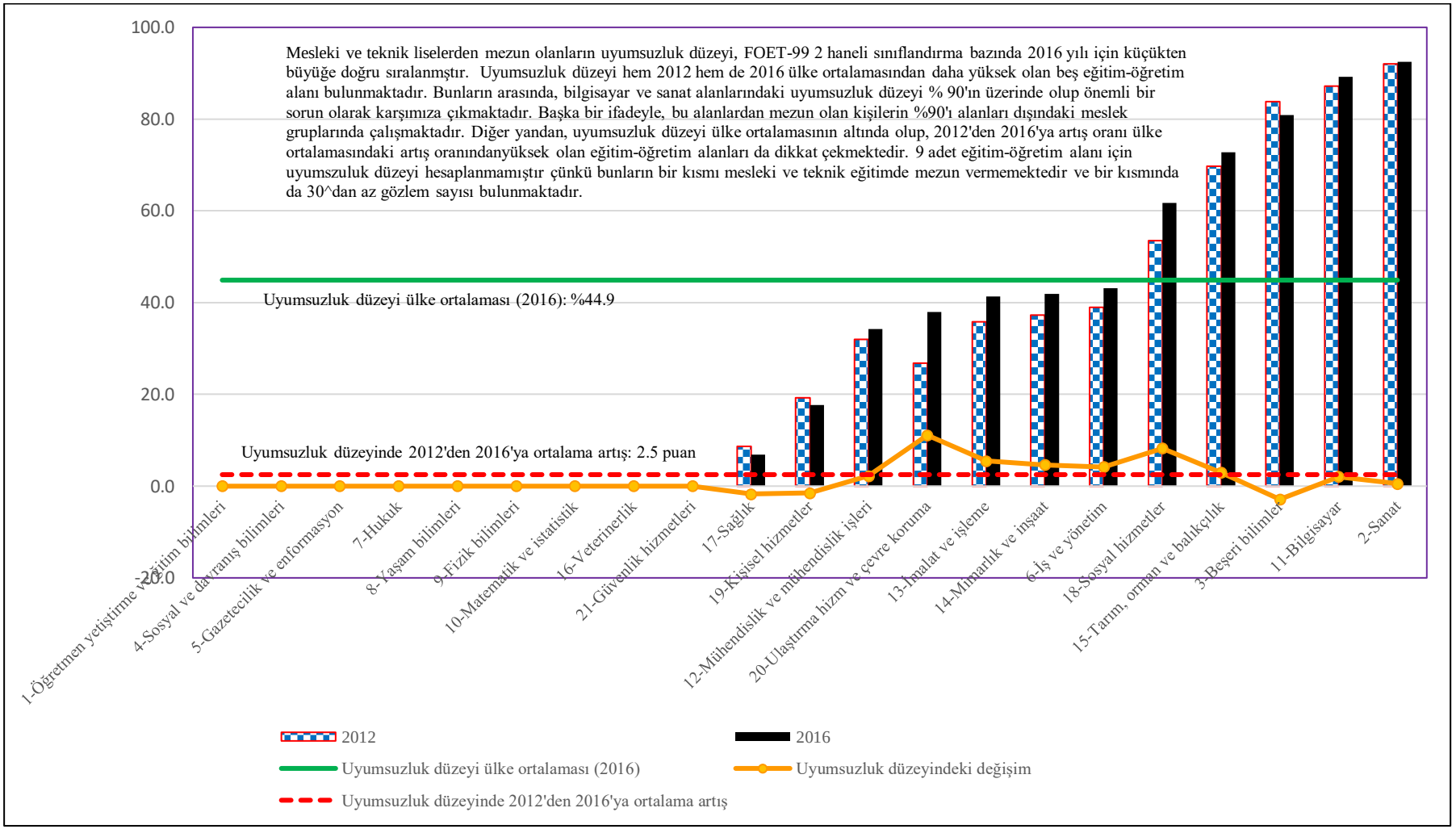
Bu alanlar yüksek öncelikli alanlar olarak tanımlanmaktadır ve politika yapıcılar tarafından öncelikli olarak değerlendirilmelidir. Bu bulgular, mezunlar için arz fazlası ve/veya bu mezunlara yetersiz talep olabileceğini göstermektedir. Bu durum, 2006'da başlayan yükseköğretimdeki büyümenin bir yansıması olarak değerlendirilmektedir.

Ayrıca, bazı eğitim-öğretim alanlarının uyumsuzluk düzeyi ülke ortalamasından düşük bile olsa 2012 ve 2016 yılları arasındaki artışı ülke ortalamasındaki değişimden daha fazladır ve bu alanların da yakından takip edilmesi önem arz etmektedir.

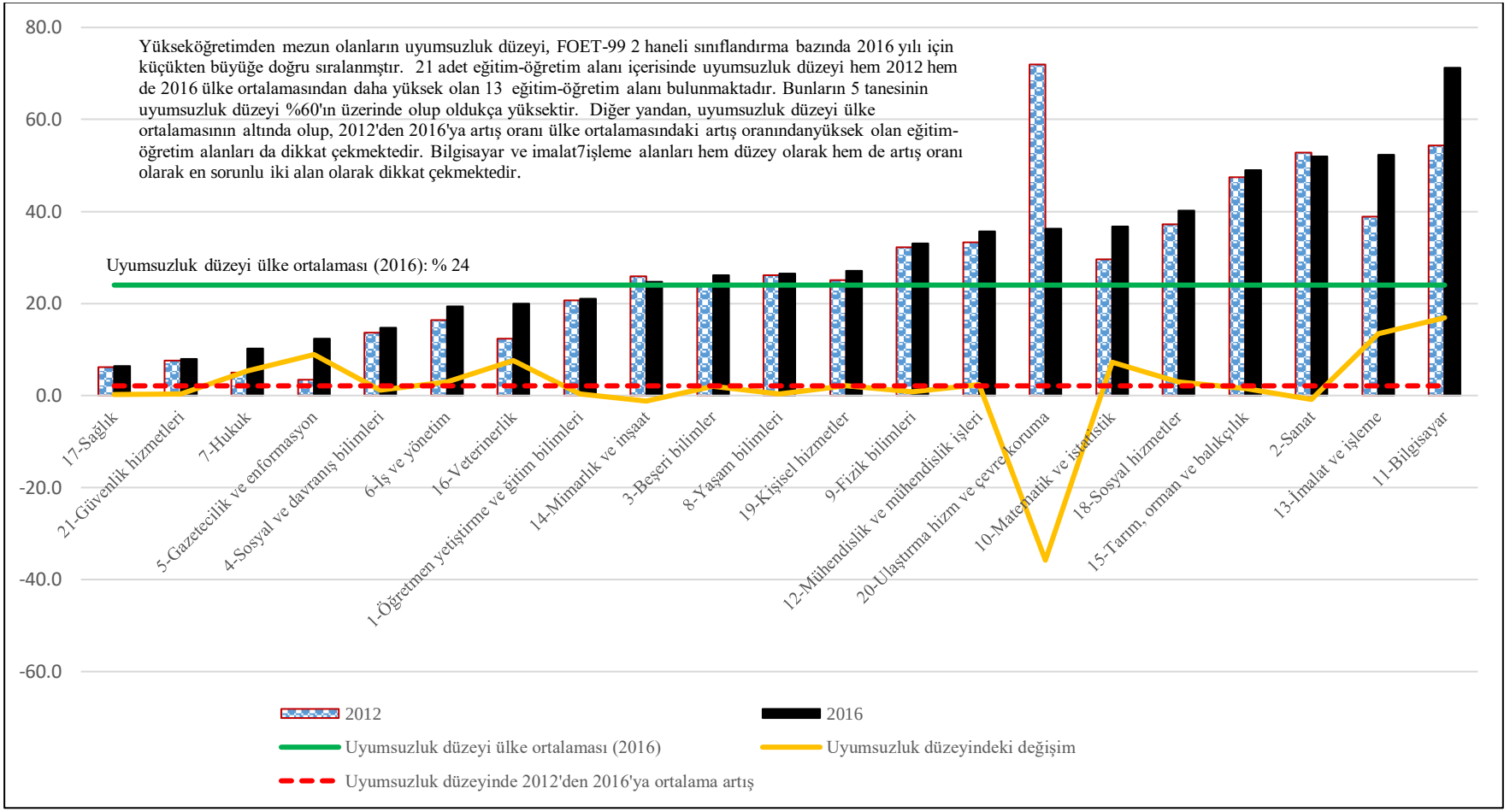
Tablo 2.2. FOET-99 2 Haneli Sınıflandırma Bazında Uyumsuzluk Düzeyinin Hem 2012 Hem de 2016 Yıllarında Ülke Ortalamasından Yüksek Olduğu Alanlar

Mesleki ve Teknik Liseler	Yükseköğretim
1. (2) Sanat-92.5% 2. (11) Bilgisayar-89.2% 3. (3) Beşeri Bilimler-80.9% 4. (15) Tarım, Orman, Balıkçılık-72.7% 5. (18) Sosyal Hizmetler-61.7%	1. (11) Bilgisayar-71.2% 2. (13) İmalat-İşleme- 52.3% 3. (2) Sanat-51.9% 4. (15) Tarım, Orman, Balıkçılık -48.9% 5. (18) Sosyal Hizmetler -40.2% 6. (10) Matematik ve İstatistik-36.8 % 7. (20) Ulaştırma Hiz ve Çevre Koruma 36.2% 8. (12) Mühendislik ve mühendislik işleri-35.6% 9. (9) Fizik Bilimleri-33.0% 10. (19) Kişisel Hizmetler-27.1% 11. (8) Yaşam Bilimleri-26.5% 12. (3) Beşeri Bilimler-26.1% 13. (14)-Mimarlık ve inaat 4.7%

Kaynak: Analiz sonuçları baz alınarak yazar tarafından oluşturulmuştur.



Şekil 2.1 Mesleki ve Teknik Liselerden Mezun Olanların FOET-99 2 Haneli Sınıflandırma Bazında Uyumsuzluk Düzeyi ve Dönemsel Değişimi 2012-2016



Şekil 2.2 Yükseköğretimden Mezun Olanların FOET-99 2 Haneli Sınıflandırma Bazında Uyumsuzluk Düzeyi ve Dönemsel Değişimi 2012-2016

2.2.2. Eğitimde Dikey Uyumsuzluğun Ölçülmesi ve Analizinden Elde Edilen Temel Bulgular

Eğitimde dikey uyumsuzluk, nesnel bir yöntem olan "gerçekleşen eşleşme" (realized matches) yöntemiyle ölçülmüştür. Veri kaynağı TÜİK 2016 işgücü anketidir. Hedef kitle, mesleki ve teknik liselerden ve yükseköğretimden mezun olup ücretli çalışanlardır. Eğitimde dikey uyumsuzluk ISCO-08 meslek grupları bazında analiz edilmiştir.

Bu tezde, aşırı eğitim oranının Türkiye ülke ortalaması 2016 yılı için % 7,7 olarak ölçülmüştür. Eksik eğitim için bu oran% 30,3'tür. Türkiye için daha önce elde edilen ampirik bulgularla karşılaştırıldığında önemli farklılıklar bulunmaktadır. Daha önceki bulgular çok geniş bir değer aralığına sahiptir. Aşırı eğitim oranının ülke ortalaması % 11,5-% 40,0 arasında değişmektedir. Eksik eğitim için bu oran % 4.0 ila% 70,8 arasındadır. Görüleceği üzere bu tezde hesaplanan aşırı eğitim oranı, önceki bulgulara göre oldukça düşmüştür. Bunun temel nedeni, yükseköğretimdeki büyüme sonucunda nüfusun eğitim seviyesinin artmasıdır. Başka bir deyişle, eğitim düzeyi arttıkça, meslek grupları itibarıyla, çalışan kişilerin ortalama eğitim yılı da artmaktadır. Meslek gruplarında çalışmakta olan kişilere ilave olarak çalışmaya başlayan yeni mezunların eğitim düzeyinin yüksek olması nedeniyle aşırı eğitim oranı azalmaktadır. Literatürde dile getirildiği üzere, bu çalışmada da, aşırı eğitimlilik, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun önemli sebeplerinden biri olarak değerlendirilmektedir.

3. TÜRKİYE'DE EĞİTİM-ÖĞRETİM ALANLARI İLE İSTİHDAM EDİLEN MESLEK GRUPLARI ARASINDAKİ UYUMSUZLUĞUN NEDENLERİNİN ANALİZİ VE ELDE EDİLEN BULGULAR

Bu bölümde, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun nedenleri regresyon yöntemiyle analiz edilmiştir. İlk olarak, veri ve yöntem sunulmuştur. Daha sonra analizden elde edilen sonuçlar özetlenmiştir.

3.1.Veri ve Yöntem

Eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun nedenleri SPSS'de binary logistik regresyon modeli tahmin edilerek analiz edilmiştir. Veriler TÜİK 2016 İşgücü Anketi'nden alınmıştır. Bağımlı değişken uyumsuz olma durumudur. Kategorik bir değişkendir ve kodlama şemasına göre bir uyuşmazlık varsa 1 değerine sahiptir.

Bağımsız değişkenler 5 grupta toplanmıştır ve hepsi kategorik olan toplam 12 açıklayıcı değişkenden oluşmaktadır. Bunlar:

a. İşgücü piyasası koşulları: İki değişken vardır. Bunlar, kişinin şimdiki işine başladığı yıldaki eğitim-öğretim alanına özgü istihdam oranı ve işsizlik oranıdır. Örneğin, herhangi bir eğitim-öğretim alanından (Örneğin A alanı) mezun olan bir kişi, şimdiki işinde 2010 yılında çalışmaya başlamışsa, 2010 yılının bu eğitim-öğretim alanına özgü istihdam oranı kullanılmıştır.
b. Demografik özellikler: İki değişken içerir. Bunlar cinsiyet ve yaş gruplarıdır.
c. Eğitim durumu: Üç değişken içerir. Bunlar, tamamlanan en son eğitim seviyesi (yükseköğretim, mesleki ve teknik lise düzeyi gibi), FOET 99'un 1 haneli eğitim-öğretim alanı sınıflaması (8 alan) ve bireyin aşırı eğitimli olup olmamasıdır.
d. İşe özgü özellikler. İki değişken içerir. Bunlar sözleşme türü (yarı zamanlı / tam zamanlı) ve işin sürekli olup olmama durumudur.
e. İşyeri ile ilgili özellikler. Üç değişken içerir. Bunlar iş yerinin türü (kamu, özel, STK), firma büyüklüğü ve NUTS1 bölgeleridir.

Regresyon modelinde, eğitim-öğretim alanına özgü istihdam ve işsizlik oranlarını kullanabilmek için FOET-99 sınıflandırmasına ihtiyaç duyulmaktadır. Bu sınıflandırma, 2009'dan bu yana TÜİK İşgücü Anketlerinde yer almaktadır. Bu nedenle, regresyon analizinin yapıldığı 2016 anketini cevaplayan kişiler arasından ücretli çalışıp işine 2009 ve sonrasında başlayan kişiler hedeflenmiştir. Başka bir deyişle, hedef grup " 2016 yılı anket yılı itibarıyla, şimdiki işine 2009 ve sonrasında başlayan, mesleki ve teknik liselerden ve üniversitelerden mezun olmuş ücretli çalışanlardır. Bu kapsamda 25.957 kişi bulunmaktadır.

Daha sonra, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun FOET-99 1 basamaklı sınıflandırma (8 çalışma alanı) bazında incelenmesi amacıyla grafiksel analiz yapılmıştır. Bilindiği üzere, regresyon analizi alan bazında yapılmamıştır. Bu amaçla, uyumsuzluğun tahmini marjinal ortalaması (estimated marginal means of field of study mismatch) üzerinden bazı değişkenler için grafiksel analiz yapılmıştır.

3.2. Eğitim-Öğretim Alanları ile İstihdam Edilen Meslek Grupları Arasındaki Uyumsuzluğun Sebeplerinin Analizinden Elde Edilen Sonuçlar

Regresyon sonuçlarına göre, işgücü piyasası koşulları, demografik özellikler, eğitim durumu, işe özgü özellikler ve işyeri ile ilgili özellikler, "eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun" yaşanmasında istatiksel olarak etkili olmaktadır.

Diğer yandan, regresyon analizi, her bir eğitim-öğretim alanı bazında yapılmamıştır. Ayrıca, serbestlik derecesi sorunu nedeniyle bağımsız değişkenler arasındaki etkileşim regresyon modeline dahil edilememiştir. Bu nedenle, her bir eğitim-öğretim alanı bazında tamamlayıcı ve destekleyici bulgular elde etmek amacıyla grafiksel analiz de yapılmıştır. Regresyon sonuçlarının yorumu aşağıda sunulmaktadır.

Değişken 1 Eğitim-Öğretim Alanına Özgü İstihdam Oranı: Bu değişken konuyla ilgili regresyon analizlerinde ilk defa kullanılmıştır. Regresyon sonucuna göre eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk ihtimali, alana özgü istihdam oranı arttıkça azalmaktadır. Bilindiği üzere, istihdam oranının yüksek olması mezunlar için bu alanda yüksek talep olduğunu veya bu alandaki arz ve talebin yeterince var olduğunu göstermektedir. Bu kapsamda, regresyondan elde edilen bulgular ileri sürülen hipotezle uyumludur. Bu değişkenin referans kategorisi %53-63 aralığıdır ve bunun dışında 3 kategori daha vardır. Bu kategoriler, verilerin histogram dağılımı baz alınarak %25'erlik eşit dilimlere denk gelecek şekilde belirlenmiştir.

Referans kategorisi ile karşılaştırıldığında, işe başladığı yıl itibarıyla eğitim-öğretim alanına özgü istihdam oranı;

% 63,1 ve% 64,5 aralığında olanların uyumsuzluk yaşama eğilimi, referans kategorisine göre %18.8 daha düşüktür.

% 64.6 ve% 69.1 aralığında olanların uyumsuzluk yaşama eğilimi, referans kategorisine göre % 24,3 daha düşüktür.

% 69,2'den büyük olanların uyumsuzluk yaşama eğilimi, referans kategorisine göre % 31,3 daha düşüktür.

Uyumsuzluğun tahmini marjinal ortalaması yöntemine göre FOET-99 1 basamaklı sınıflandırmaya dayanan grafiksel analiz, "tarım ve veterinerlik" haricindeki diğer tüm alanlarda yukarıda elde edilen etki düzeyi ve yönünün geçerli olduğunu göstermektedir.

Değişken 2 Eğitim-Öğretim Alanına Özgü İşsizlik Oranı: Bilindiği kadarıyla, daha önceki benzer çalışmalarda işsizlik oranının ülke ortalaması makro düzeyde kullanılmıştır. Bu tezde ise eğitim-öğretim alanına özgü işsizlik oranı kullanılmaktadır ve bu haliyle ilk olduğu düşünülmektedir. İşsizliğin yoğun olduğu dönemlerde literatürde de belirtildiği üzere uyumsuzluk oranının yüksek olması beklenmektedir. Bu çalışmadaki işsizlik oranı dört kategoride incelenmiştir. Referans kategorisi % 6 ila % 8,5 aralığıdır. Regresyon sonucuna göre ikinci kategorideki (% 8,6 ile% 9,9) sonuçlar beklenilen etkinin tersi yönünde bir sonuç doğurmuştur. Başka bir ifadeyle, işe başladıkları yıldaki alana özgü işsizlik oranı bu kategoride

olan çalışanların, uyumsuzluk yaşama ihtimali referans kategorisinde işe başlayanlara göre azalmıştır. Üçüncü ve dördüncü kategoriler için istatistiki olarak anlamlı sonuçlar bulunmamıştır.

Değişken 3- Cinsiyet: Kadınların, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğu yaşama eğilimi, beklendiği gibi, erkeklere göre % 33,7 daha düşüktür. Uyumsuzluğun tahmini marjinal ortalaması yöntemine göre FOET-99 1 basamaklı sınıflandırmaya dayanan grafiksel analize göre bir alanda farklı bir sonuç elde edilmiştir. Buna göre, "mühendislik, imalat ve inşaat" alanındaki kadınların, erkeklere göre daha yüksek ihtimalle uyumsuzluk yaşadığı tespit edilmiştir. Bu bulgu, bu alandan mezun olan kadınların başka meslek gruplarında çalışmayı tercih ettiklerini veya bu meslek grubunda erkek mezunların kadınlara göre daha çok tercih edildiğini göstermektedir.

Değişken 4 Yaş: Çalışanların yaşı arttıkça uyumsuzluk yaşama ihtimallerinin beklendiği gibi arttığı tespit edilmiştir. Referans yaş grubuyla karşılaştırıldığında (15-29 yaş), 30-44 yaş grubundaki çalışanların uyumsuzluk yaşama eğilimi referans kategoriye göre % 10.7 daha yüksektir. Benzer şekilde 44 yaşından büyük olanların uyumsuzluk yaşam eğilimi 15-29 yaş grubuna göre % 27.6 daha yüksektir.

Değişken 5- Yarı zamanlı veya tam zamanlı sözleşme: Literatürde yarı zamanlı çalışanların uyumsuzluk ihtimalinin daha yüksek olduğu belirtildiği halde bu tezde farklı bir sonuç elde edilmiştir. Buna göre, yarı zamanlı çalışanların uyumsuzluk yaşama eğilimi, tam zamanlı çalışanlara göre % 47,9 daha düşüktür.

Değişken 6-Kalıcı ya da geçici sözleşme: Geçici işlerde çalışan işçilerin, sürekli işlerde çalışanlara göre uyuşmazlık yaşaması % 18,5 daha çok muhtemeldir. Bu sonuç, literatürdeki benzer çalışmalara göre beklenen bir sonuçtur.

Değişken 7-Eğitim Seviyesi: Eğitim düzeyi arttıkça, uyumsuzluk ihtimali azalmaktadır. Bu değişken için üç kategori bulunmaktadır. Referans kategori 2-4 yıllık üniversite eğitimidir. Bununla karşılaştırıldığında,

- 5 veya 6 yıllık fakültelerden mezun olanlar veya yüksek lisans veya doktora derecesine sahip olanların uyumsuzluk yaşama eğilimi, 2-4 yıllık üniversite mezunlarına göre % 85,3 daha düşüktür.

- Mesleki ve teknik liselerden mezunların uyumsuzluk yaşama eğilimi, 2-4 yıllık üniversite mezunlarına göre % 156,8 daha yüksektir.

Uyumsuzluğun tahmini marjinal ortalaması yöntemine göre FOET-99 1 basamaklı sınıflandırmaya dayanan grafiksel analiz, özellikle ikinci kategoride yer alan üç alan için farklı

sonuçları işaret etmektedir. Buna göre, "öğretmen yetiştirme ve eğitim bilimleri", "hizmetler" ve "mühendislik, üretim ve inşaat" alanlarında yüksek lisans veya doktora yapanların uyumsuzluk yaşama ihtimalinin bu alanlardaki 2-4 yıllık mezunlara nazaran daha yüksek olduğu tespit edilmiştir.

Değişken 8: Eğitim-Öğretim Alanları (FOET-99 1 Haneli Sınıflandırma): Bu değişken kapsamında sekiz kategori bulunmaktadır. Referans kategori, "öğretmen yetiştirme ve eğitim bilimleri" olarak belirlenmiştir. Bunun temel sebebi daha önceki benzer çalışmalarda da bu alanın referans olarak belirlenmiş olmasıdır. Bu kapsamda, bu referans kategorisi önceki çalışmalarla karşılaştırma yapmaya imkan sağlayacak olması nedeniyle tercih edilmiştir. Diğer yandan, literatürde eğitim-öğretim alanları genel olarak iki gruba ayrılmaktadır. Birincisi, öğretmen yetiştirme ve eğitim bilimleri, doktorluk, veterinerlik gibi mesleğe özgü eğitim içeriğinin yoğun olduğu alanlardır. İkincisi ise, işletme ve sosyal bilimler gibi daha genel becerilerin öğretildiği ve sunulduğu genel programlardır. Bu açıdan bakıldığında sonuçlar, literatürden elde edilen bulgularla örtüşmektedir. Mesleğe özgü programların uyuşmazlık ihtimali genel programlara göre daha düşüktür. Diğer yandan, referans kategoriye göre ortaya çıkan karşılaştırmalar da literatürdeki bulgularla birebir örtüşmektedir. Referans kategorisi olan "öğretmen yetiştirme ve eğitim bilimleri" ile karşılaştırıldığında;

- Beşeri bilimler, diller ve sanatlar alanından mezun olanların uyumsuzluk yaşama eğilimi % 107,1 daha fazladır.

- Fen, matematik ve bilgisayar alanından mezun olanların uyumsuzluk yaşama eğilimi % 114,5 daha fazladır.

- Tarım ve veterinerlik alanından mezun olanların uyumsuzluk yaşama eğilimi % 165.2 daha fazladır.

Diğer yandan, benzer şekilde referans kategorisiyle karşılaştırıldığında;

- Sosyal bilimler, işletme ve hukuk alanından mezun olanların uyumsuzluk yaşama eğilimi % 55,5 daha düşüktür.

- Mühendislik, imalat ve inşaat alanından mezun olanların uyumsuzluk yaşama eğilimi % 48,6 daha düşüktür.

- Sağlık ve refah alanından mezun olanların uyumsuzluk yaşama eğilimi % 56.7 daha düşüktür.

- Hizmetler alanından mezun olanların uyumsuzluk yaşama eğilimi % 78,3 daha düşüktür.

Değişken 9: Aşırı Eğitimli Olma Durumu*:* Aşırı eğitimli olanların uyumsuzluk yaşama eğilimi, eğitimde dikey uyumsuzluk bakımından doğru eşleşmiş kişilere göre % 289,1 daha fazladır. Söz konusu yüksek eğilimin temel nedeni yeterli iş imkanı bulamayan mezunların, sahip oldukları eğitim düzeyinin altında eğitim düzeyi gerektiren işlere yönelerek buralarda çalışmak zorunda kalmalarıdır.

Değişken 10 Firma Büyüklüğü: Firma büyüklüğü arttıkça uyumsuzluk ihtimali azalmaktadır. Bu sonuç, ampirik bulgularla örtüşmektedir. Bu değişkende dört kategori bulunmaktadır. Çalışan sayısı 10'dan daha az olan çok küçük firmalar referans kategorisi olarak belirlenmiştir. Buna göre;

-Çalışan sayısı 10-19 olan firmalarda çalışanların uyumsuzluk yaşama eğilimi, referans kategorisinde yer alan çok küçük firmalarda çalışanlara göre % 27.7 daha azdır.

-Çalışan sayısı 20-49 olan firmalarda çalışanların uyumsuzluk yaşama eğilimi, referans kategorisinde yer alan çok küçük firmalarda çalışanlara göre % 30 daha azdır.

-50'den fazla çalışanı olan firmalarda çalışanların uyumsuzluk yaşama eğilimi referans kategorisinde yer alan çok küçük firmalarda çalışanlara göre % 11,1 daha azdır.

Değişken 11-İşyeri Türü: Bu değişken kapsamında üç kategori yer almaktadır. Özel sektör referans kategorisi olarak belirlenmiştir. Sonuçlar, literatür bulgularıyla paralellik arz etmektedir. Buna göre,

- Kamu sektöründe çalışanların uyumsuzluk yaşama eğilimi özel sektörde çalışanlara göre %42 daha düşüktür.

- STK'larda ve vakıflarda çalışanların uyumsuzluk yaşama eğilimi ise özel sektörde çalışanlara göre % 67,8' daha yüksektir.

Uyumsuzluğun tahmini marjinal ortalaması yöntemine göre FOET-99 1 basamaklı sınıflandırmaya dayanan grafiksel analiz, "mühendislik, imalat ve inşaat" mezunu olup kamu sektöründe çalışanların özel sektörde çalışanlardan daha fazla uyumsuzluk yaşama ihtimaline sahip olduğunu göstermektedir. Ayrıca, STK'larda çalışan "tarım ve veterinerlik" ve "öğretmen yetiştirme ve eğitim bilimleri" mezunlarının uyumsuzluk yaşama ihtimali diğer alanlara göre oldukça düşüktür. Bu durum, bu alanlardan mezun olup STK'larda çalıştıklarında, yaptıkları iş ile sahip oldukları eğitim-öğretim alanlarının yüksek oranda uyumlu olduğunu göstermektedir.

Değişken 12-NUTS1 Bölgeler: Daha önceki benzer çalışmalarda hiç kullanılmamış ve ilk defa bu tezde kullanılmıştır. Değişken kapsamında 12 bölge vardır ve İstanbul bölgesi referans

kategori olarak belirlenmiştir. Tezin ileri sürdüğü hipoteze göre, Türkiye'nin doğusuna doğru gittikçe uyumsuzluk eğiliminin artacağı iddia edilmiştir. Ancak, bulgular bu iddiayı çok güçlü bir şekilde doğrulamamaktadır. Sadece üç bölge için istatistiki olarak anlamlı sonuçlar elde edilmiştir. Buna göre;

-TR5-Batı Anadolu'da çalışanların uyumsuzluk yaşama eğilimi, İstanbul'da çalışanlara göre % 14,7 daha fazladır.

-TR6-Akdeniz Bölgesinde çalışanların uyumsuzluk yaşama eğilimi, İstanbul'da çalışanlara göre % 13,9 daha fazladır.

- TRA Kuzey Doğu Anadolu'da çalışanların uyumsuzluk yaşama eğilimi, İstanbul'da çalışanlara göre % 55,9 daha fazladır.

Uyumsuzluğun tahmini marjinal ortalaması yöntemine göre FOET-99 1 basamaklı sınıflandırmaya dayanan grafiksel analiz "mühendislik, imalat ve inşaat" ile "sosyal bilimler, işletme ve hukuk" alanlarından mezun olanların Türkiye'nin doğusuna ilerledikçe uyumsuzluk yaşama ihtimalinin yükseldiğini göstermektedir. Bu alanlardan mezun olanlar için bu bölgelerde yeterli ve uygun iş imkanı olmadığı anlaşılmaktadır. Diğer yandan, , "tarım ve veterinerlik", "öğretmen yetiştirme ve eğitim bilimleri "ve "sağlık ve refah" gibi mesleğe özgü alanlardan mezun olanların Türkiye'nin doğusunda uyumsuzluk yaşama eğiliminin oldukça düşük olduğu görülmektedir.

4. SONUÇ VE POLİTİKA ÖNERİLERİ

Bu bölümün amacı, politika önerilerini, politika amaçlarını ve politika araçlarını sunmaktır. Bilindiği üzere, politika amaçları, adından anlaşılacağı üzere politika önerilerinin neleri amaçladığını ifade etmektedir. Politika araçları ise bu önerileri hayata geçirmek için tasarlanan tedbir ve önlem mahiyetindeki araçlardır. (Topal, 2016). Bu bağlamda, politika önerilerine geçmeden önce, tezde elde edilen tüm bulgular ve sonuçlar tartışılarak değerlendirilecektir. Daha sonra ise politika önerileri, amaçları ve araçları özetlenmektedir.

4.1. Sonuçlar Üzerine Genel Değerlendirme

Politika Tasarımında Önceliklendirilmesi Gereken Yükseköğretim Alanları*:* Bu tezde, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluk düzeyleri hem yükseköğretim hem de mesleki ve teknik eğitim mezunları için analiz edilmiştir. Ayrıca, iş gücü piyasası analizleri sadece yükseköğretim mezunları için yapılmıştır. Bu kapsamda

yükseköğretimdeki eğitim-öğretim alanları için, her iki analiz sonuçlarını ortak bir şekilde dikkate alan bir önceliklendirme yapılmıştır. Buna göre, uyumsuzluk düzeyinin hem 2012 hem de 2016 yılı itibarıyla ülke ortalamasından yüksek olması ve üç iş gücü göstergesi bakımından hem 2010 hem de 2016 itibarıyla ülke ortalamasından kötü olması kriterlerini aynı anda sağlayan aşağıdaki alanların politika yapıcıların belirleyeceği politikalarda en öncelikli olarak ele alınması önerilmektedir.

11- Bilgisayar-% 71.2, 13- İmalat-İşleme% 52.3,
2- Sanat-% 51.9, 15- Tarım, ormancılık-% 48.9,
18- Sosyal hizmetler-% 40,2.

Mesleki ve teknik liseler için ise, politika yapıcılar, önceliklerini belirlerken sadece uyumsuzluk düzeyi kriterine göre değerlendirme yapabilecektir. Buna göre aşağıdaki eğitim-öğretim alanlarının politika yapıcıların belirleyeceği politikalarda en öncelikli olarak ele alınması önerilmektedir.

(2) Sanat-92.5% (11) Bilgisayar-89.2%
(3) Beşeri Bilimler-80.9% (15) Tarım, Orman, Balıkçılık-72.7%
(18) Sosyal Hizmetler-61.7%

Regresyon Sonuçları*:* Politika yapıcılara sadece yukarıdaki bulgular değil regresyon analizinden elde edilen sonuçlar da katkı sağlayabilecektir. Hatırlanacağı üzere, regresyon sonuçlarına göre, işgücü piyasası koşulları, demografik özellikler, eğitim durumu, işe özgü özellikler ve işyeri ile ilgili özellikler, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun yaşanmasında istatiksel olarak etkili olmaktadır.

İşgücü piyasası bağlamıyla ilgili olarak, regresyon modelinin en önemli sonuçlarından biri, kişinin mevcut işine başladığı yıldaki eğitim-öğretim alanına özgü istihdam oranının istatistiki olarak anlamlı ve etkili bir açıklayıcı değişken olarak belirlenmesidir. Bu oran arttıkça uyumsuzluk azalmaktadır, çünkü yüksek istihdam oranı bu mezunların iş gücü piyasası tarafından yüksek oranda talep edildiğini göstermektedir ya da işgücü piyasasında yeterli iş bulunduğunu göstermektedir. Bu nedenle, bu bulgu, eğitim-öğretim alanları ile istihdam edilen meslek grupları arasındaki uyumsuzluğun, sadece kişinin kendi bilinçli tercihinden değil, iş gücü piyasasındaki şartlardan da kaynaklanabileceğini göstermektedir. Bu sonuç, bu haliyle Montt (2015) 'u da desteklemektedir. Sonuç olarak, bu tezde, analiz bölümlerinden elde edilen bulgular ve sonuçlar, mezunların arzı ve mezunlara olan talep arasındaki dengesizliği konu alan ampirik bulgularla örtüşmektedir.

Kişisel görüşüm olarak, istihdam oranı, işsizlik oranı ve işgücüne katılmama oranı göstergelerinin, sadece talep (iş gücü piyasası) tarafındaki değil, aynı zamanda mezunların arz büyüklüğü hakkında da bilgi verdiğini değerlendirmekteyim. Örneğin, herhangi bir eğitim-öğretim alanı için iş gücüne katılmama oranının yüksek olması, aslında, bu alanda daha önce uzun süre iş aramış ancak iş bulma umudunu yitirince iş gücü piyasasından çıkmış kişilerin sayısının çok olduğunu ifade etmektedir. Bu durum, bu kişilere yeterli talebin olmadığını göstermekle birlikte, bu alanda gereğinden çok fazla mezun olduğunu da işaret etmektedir. Başka bir örnekte, istihdam oranının yüksek olması, bu alandan mezun olan kişiler için büyük bir talebin olduğunu göstermekle birlikte, bu büyük talebi karşılayacak kadar da fazla mezun olduğunu işaret etmektedir. Yani, arz tarafıyla ilgili zımni bilgi de içermektedir. Bu kapsamda değerlendirildiğinde, istihdam oranı regresyon modelinde anlamlı bir etken olarak ortaya çıktığı için, regresyon analizinin iş gücü piyasasıyla ilgili sonuçları hem arz hem de talep tarafındaki bilgileri içermesi bakımından atama teorisine (assignment theory) katkıda bulunmaktadır.

Regresyon analizinin iş gücü piyasasıyla ilgili sonuçları kapsamında elde edilen ön önemli bulgu, eğitim-öğretim alanı ile çalışılan meslek grubu arasındaki uyumsuzluğun yaşanma ihtimalinin işgücü piyasası koşullarına yüksek derecede duyarlı olduğudur. Bu durum, herhangi bir eğitim-öğretim alanından mezun olan kişiler için talebin düşük olması veya bu alandan mezunların fazla olması nedeniyle bu kişileri, kendi alanları dışında bir iş aramalarına ve bu işlerde çalışmalarına zorlamaktadır. Bu tür durumlarda, doğal olarak kişi işsiz kalmaktansa en son tamamladığı eğitim-öğretim alanıyla ilgili olmayan farklı alanlarda çalışmaya razı olmaktadır. Bu kapsamda, *mezun arzının dengelenmesi ve işgücü piyasası mekanizmasının etkinliğinin artırılması gibi politika önerileri geliştirilmelidir. Söz konusu politika tasarımlarında da, aynı anda hem uyumsuzluk düzeyi en yüksek olan hem de iş gücü piyasası göstergeleri en kötü olan eğitim-öğretim alanlarına öncelik verilmelidir.*

Bireyin eğitim geçmişine bakıldığında, regresyon sonuçlarına göre mesleki ve teknik liselerden mezunların uyumsuzluk yaşama eğilimi, 2-4 yıllık üniversite mezunlarına göre çok daha yüksektir. Ayrıca, uyumsuzluk düzeyi analizlerinde de bu grubun, üniversite mezunlarına nazaran, özellikle bazı alanlarda % 80'den fazla uyumsuzluk düzeyine sahip olduğu tespit edilmiştir. Dolayısıyla, uyumsuzluk seviyesini düşürmek ve mesleki ve teknik eğitimden mezunların daha uygun (iyi) işlerde istihdam edilmesini sağlamak üzere sonuç odaklı politika önlemleri alınması gerektiği önerilmektedir.

Bireysel demografik özelliklerle ilgili olarak, regresyon modeline göre, çalışanların yaşı ilerledikçe uyumsuzluk eğiliminin de arttığı tespit edilmiştir. Başka bir deyişle, işverenin bakış

açısına göre, kişilerin geçmiş deneyimleri, eğitim geçmişlerinden daha önemli olabilir. Kişiler genç yaşta uyumsuz bir işe başlasa bile zamanla işte elde ettiği tecrübe nedeniyle işverenler bu kişilerin çoğunu bu işlerde çalıştırmaya devam etmek isteyebilir. Bu tezde, her ne kadar gençlerin uyumsuzluk olasılığı daha düşük olsa da, uyumsuzluğun sebep olabileceği bireysel, sosyal ve ekonomik maliyetler dikkate alındığında bireyin en başından itibaren doğru işte doğru eşleşmeyle başlaması önem arz etmektedir. Bu nedenle, bir politika önerisi olarak, liselerde ve üniversitelerde öğrencilerin iş bulma becerilerinin geliştirilmesine yönelik tedbirlerin geliştirilmesi ve daha etkili bir şekilde uygulanması gerektiği düşünülmektedir. Ayrıca, öğrencilerin iş ve meslekler konusundaki farkındalıklarının arttırılması da bu noktada kritik bir öneme sahiptir.

4.2. Politika Önerileri

İş gücü piyasası analizi, uyumsuzluk düzeyi analizi ve uyumsuzluğa neden olan nedenlerin analizi olmak üzere üç farklı analizden elde edilen sonuçlar dikkate alındığında, *temel politika önceliği, işgücü piyasası ile eğitim sistemi arasındaki uyumun güçlendirilmesi olmalıdır*. Bu amaca ulaşabilmek için çeşitli politika önerileri geliştirilebilir. Ancak, bu tezin amacı ve kapsamı göz önünde bulundurulduğunda, eğitim-öğretim alanı ile istihdam edilen meslek grubu arasındaki uyumsuzluk düzeyini azaltmak için geliştirilecek politika önerilerinin aşağıdaki konulara odaklanmasında fayda görülmektedir. Söz konusu politika önerilerin çoğu beş yıllık kalkınma planları gibi makro politika dokümanlarında, sektörel politika ve strateji belgelerinde ve benzer çalışmalarda halihazırda önerilmiş olmakla birlikte bu tezden elde edilen bulguların söz konusu politika öncelik ve önerilerine somut kanıtlar sunacağı ve dayanak teşkil edeceği düşünülmektedir. Politika önerilerinin etkin ve sonuç odaklı şekilde uygulanması kritik öneme sahiptir.

Her politika önerisi için politika amaçları ve politika araçları aşağıda sunulmuştur.

Politika Önerisi 1: Yükseköğretim ile mesleki ve teknik liselerdeki mezunların arzı, gelecek eğilimleri, işgücü piyasasının ihtiyaçları ve üniversiteye giriş sınavındaki boş kontenjanlar dikkate alınarak dengelenmelidir.

Politika önerisinin amaçları, eğitim sistemi ile işgücü piyasası arasındaki nicel uyumsuzluğu azaltmak ve böylece eğitim-öğretim alanı ile istihdam edilen meslek grubu arasındaki uyumsuzluğu azaltmaktır.

Bu politika önerisi için üç politika aracı geliştirilmiştir. Bunlar:

• Teknolojik gelişmelere ve Endüstri 4.0'a bağlı olarak ortaya çıkacak yeni becerileri ve meslekleri belirlemek ve söz konusu gelişmelerin mevcut mesleklerin yapısı üzerindeki etkilerini analiz etmek.

• İşgücü piyasasının talep ettiği meslekleri ve yetkinlikleri belirlemek.

• Üniversiteye giriş sınavlarına başvuran adayların tercih davranışlarını analiz etmek.

Politika Önerisi 2: İşgücü piyasasının etkinliği, işgücü piyasası ihtiyaçları ve teknolojik gelişmelere paralel olarak iyileştirilmelidir.

Politika önerisinin ardındaki politika amaçları, işsizlik oranını, iş gücüne katılmama oranını ve uyumsuzluk düzeyini azaltmaktır. Bu amaçla üç politika aracı önerilmiştir. Bunlar:

• İŞKUR'un sunduğu aktif işgücü piyasası programlarının etkinliğini artırmak.

• Tüm mezunlara İŞKUR iş ve meslek danışmanları tarafından ulaşılmasını sağlamak.

• Eğitim sistemi ve işgücü piyasasına ilişkin istatistiksel verilerin niteliğini artırmak.

Politika Önerisi 3: Ortaöğretim ve yükseköğretim düzeyindeki mesleki ve teknik eğitimden mezun olanların istihdamı nicel ve nitelik olarak arttırılmalıdır.

Bu politika önerisine yönelik politika amaçları şunlardır. Mesleki ve teknik liselerden mezun olanları doğrudan işgücü piyasasına yönlendirerek onların iyi ve doğru işlerde istihdamını sağlamak ve dolaysıyla üniversiteye giriş sınavlarına olan taleplerini azaltmaktır. Böylece yükseköğretimdeki mezunların arzının dengelenmesine olumlu katkı sunulacaktır. Bunun için iki politika aracı geliştirilmiştir. Bunlar:

• Mesleki ve teknik eğitimin fiziksel ve teknik altyapısını güçlendirmek.

• Eğitim ve sanayi arasındaki işbirliğini güçlendirmek.

Politika Tavsiyesi 4: Lise öğrencilerinin meslekler konusundaki farkındalığı arttırılmalı ve hem liseler ve hem de üniversitelerdeki son sınıf öğrencilerinin iş arama becerileri geliştirilmelidir.

Bu politika önerisinin arkasındaki politika araçları, genç mezunların, eğitimlerine en uygun işlerde çalışmaya başlamasını sağlamak ve okuldan işe geçiş süresini azaltmaktır. Bu amaçla, iki politika aracı önerilmiştir. Bunlar:

• Lise öğrencilerinin meslekler hakkındaki bilincini artırmak.

• Liselerde ve üniversitelerde son sınıf öğrencilerinin iş arama becerilerini geliştirmek.

4.3. Tezde Kullanılan Veri ve Yöntemlere İlişkin Kısıtlar ve Yeni Araştırma Önerileri

Yıllık Veri Kapsamına İlişkin Sınırlamalar: Kodlama şemasının tasarlanmasında iki boyut bulunmaktadır. Bunlar eğitim-öğretim alanları ve meslek gruplarıdır. Wolbers (2003) ve Montt (2015) eğitim-öğretim alanları için FOET 99, meslek grupları için ISCO kodlarını kullanmıştır. FOET-99 sınıflandırması Türkiye'de 2009 yılında kullanılmaya başlanmıştır. Ancak, daha sonra 2013 yılında Uluslararası Standart Eğitim Sınıflandırması (ISCED) yayınlanmıştır. Bu yeni sınıflandırma, 2014 yılından bu yana Türkiye'de kullanılmaktadır. İki sınıflandırma (FOET-99 ve ISCED-13f), 2014, 2015 ve 2016 anketlerinde birlikte kullanılmıştır. FOET-99, 2017'den başlayarak yapılan anketlerde yer almamıştır. Sonuç olarak, tezin amacına uygun olarak kullanılmak üzere veriler 2009-2016 dönemini kapsayacak şekilde sınırlandırılmıştır. Diğer taraftan, ISCO-08 kodu ilk olarak 2008'de yayınlanmış olmasına rağmen, Türkiye'de 2012'den beri kullanılmaktadır. Bu nedenle, veriler daha da daraltılmış ve 2012-2016 dönemi esas alınmıştır.

Türkiye için Kodlama Şemasındaki Veri Sınırlandırması: ISCO kodları en detaylı haliyle en fazla dört basamaklı olmaktadır. Wolbers (2003) ve Montt (2015), orijinal kodlama şemasını tasarlarken, her ikisi de üç basamaklı kodlar kullanmıştır. Ancak, Türkiye'deki yıllık TÜİK işgücü anketlerinde iki basamaklı ISCO-08 kodları kullanılmaktadır. Bu nedenle, orijinal kodlama şeması bu tezde kullanılamamıştır. Dolayısıyla, bu tezde orijinal üç basamaklı kodlama şeması baz alınarak üç basamaklı kodlar iki basamaklı kodlara genişletilmiştir. Meslek grupları üç haneden iki haneye dönüşünce çalışmaya uygun veya uyumlu meslek gruplarının sayısı artmakta ve uygunluk aralığı da genişlemektedir. Yani, uyumsuzluk olasılığı azalmaktadır. Başka bir ifadeyle, üç basamağın iki basamaklı kodlar halinde toplanması sonucunda, bu tezde, beklenildiği gibi, uyumsuzluk düzeyi üç basamaklı orijinal kodlama şemasının kullanılması durumuna göre daha düşük ölçülmüştür.

Örtük Varsayımlar: Bilindiği üzere, kodlama şeması, eğitim-öğretim alanından mezun olan birinin hangi meslek gruplarında çalışabileceğini matris şeklinde göstermektedir. Bu eşleştirme yapılırken, bu alandan mezun kişilerin tüm özellikleri ve becerileri homojen varsayılıp söz konusu iş için en doğru ve en uygun kişi olduğu genel bir varsayım olarak kabul edilmektedir. Ayrıca, bir eğitim-öğretim alanına özgü iş gücü piyasası göstergelerinin de o alan için sabit olduğu varsayılmaktadır. Başka bir ifadeyle, bu alan içinde segmentasyon olabilir ve alt kırılımlardaki göstergeler farklılaşabilir. Bu nedenle, eğitim-öğretim alanları veya meslek kodları için daha ayrıntılı sınıflandırma kullanılması farklı sonuçlar verebilecektir.

Ülkelerin kendine özgü sosyo-ekonomik ve politik çerçevesi ve kültürel yapısı bulunmaktadır. Bu nedenle kodlama şeması evrensel bir matris gibi tüm ülkelere aynı oranda % 100 uyumlu olmayacaktır. İşgücü piyasası koşulları bakımından da söz konusu özgünlükler bu alanla ilgili çalışmalarda farklı sonuçlar doğurabilir. Örneğin, işgücü piyasası kurumlarının yapısı ve çalışma biçimi, asgari ücret düzeyi, toplu pazarlık imkanı, işsizlik tazminatı, aktif ve pasif işgücü politikaları gibi düzenlemeler bu tezde odaklanılan konu ve araştırma sonuçlarını etkileyebilecektir ve bunlar ülkeden ülkeye farklılaşabilecektir.

Yeni Araştırma Önerileri*:* "Eğitimde dikey uyumsuzluk" ve "eğitim-öğretim alanı ile istihdam edilen alan arasındaki uyumsuzluk" konularında Türkiye özelindeki ampirik çalışmalar çok sınırlıdır. Türkiye için aşağıdaki yeni araştırma konuları önerilmiştir.

Eğitimde dikey uyumsuzluk için, TÜİK işgücü anketleri kullanılarak (2014'ten itibaren en güncel veriler), yükseköğretimdeki hızlı büyümenin aşırı eğitimli olma durumunda bir azalmaya veya artışa neden olup olmadığının analizi yapılabilir. Ayrıca, dikey uyumsuzluğun ücretler üzerindeki etkisine ilişkin güncel bir çalışma da yapılabilir.

Eğitim-öğretim alanı ile istihdam edilen alan arasındaki uyumsuzluk için TÜİK işgücü anketleri kullanılarak Türkiye için ek çalışmalar yapılabilir. Birincisi, 2016 verileri kullanılarak uyumsuzluğun, sosyal maliyeti, eğitimdeki batık maliyeti çalışmalar yapılabilir. Ayrıca, çalışma uyumsuzluğu alanının ücretler üzerindeki etkisi de incelenebilir. İkinci çalışma, çalışma alanı uyumsuzluğu insidansının daha yeni olduğu üzerinde olabilir. Bu amaçla, FOET-99 ve ISCED 2013-f arasındaki dönüşüm veya yazışma matrisi dikkatli kullanılmalıdır. Ancak, bu ISCED 2013-f'yi kullanan ilk kodlama şeması olacaktır. Elde edilirse, çalışma alanındaki uyumsuzluğun daha yeni görülme sıklıkları ölçülebilir. Bu olayları kullanarak, çalışma alanındaki uyumsuzluğun gerekçelerini ve sonuçlarını analiz etmek için en son verileri kullanarak yeni regresyon çalışmaları yapılabilir. Politika yapıcılar böyle bir veriye ihtiyaç duyarsa, TÜİK bu analizler için daha detaylı ve güncel veriler sağlayabilir. Üçüncü çalışma, farklı değişkenlere sahip sadece yükseköğretim mezunları için çalışma alanının nedenlerini analiz ediyor olabilir. Bu tez, mesleki ve teknik eğitim toplamı ve yüksek öğrenim mezunlarının oluşturduğu hedef grup için çalışma alanı uyumsuzluğunun nedenlerini analiz etti. Çalışma alanı diğerine göre uyumsuzluk mu? "Dördüncü araştırma fikri, çalışma alanı uyumsuzluğunun olaylarını, nedenlerini ve sonuçlarını meslek kodlarına göre ölçmek ve analiz etmek olabilir. Beşincisi, herhangi bir uyuşmazlık türünü yalnızca bir çalışma alanı uyuşmazlığı (sadece mühendislik) veya bir meslek koduna (sadece yöneticiler) dayanarak ölçmek ve analiz etmek olabilir.

APPENDIX G: TEZ İZİN FORMU / THESIS PERMISSION FORM

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YAZARIN / AUTHOR

Soyadı / Surname : EGE.....

Adı / Name : Ahmet Alper .....

Bölümü / Department : Bilim ve Teknoloji Politikası Çalışmaları

TEZİN ADI / TITLE OF THE THESIS (**İngilizce** / English) : Analyzing the Incidence and Causes of Field of Study Mismatch in Turkey: Evidence from TURKSTAT Labor Force Surveys

TEZİN TÜRÜ / DEGREE**:** **Yüksek Lisans** / Master ☐ **Doktora** / PhD ☒

1. **Tezin tamamı dünya çapında erişime açılacaktır. /** Release the entire work immediately for access worldwide. ☒
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